Seventh Edition

Appleton & Lange's Review of PHARMACY

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Appleton & Lange's Review of PHARMACY

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Preface

Pharmacy licensing examinations are designed to determine whether a candidate has the requisite ability to enter and then carry out the responsibilities of the profession. A candidate preparing for the licensing examination must be prepared to demonstrate competence in many areas, any one of which may be the subject for in-depth questioning.

This book is designed as a self-testing tool for the pharmacy student to identify individual areas of strength and weakness, to suggest areas for further review, and to impart new concepts and other information useful to both the student and the practicing pharmacist. The book consists of three major sections: Chapters 1 through 6 concentrate on specific disciplines in order to improve the student's competence in each. Within each chapter, some questions dealing with related subject matter have been grouped together, whereas others have intentionally not been categorized, necessitating a return to certain areas of study in later questions to reinforce prior learning. In each chapter, questions are followed by an Answers and Explanations section, which we think is the keystone of our book. Some comments are quite extensive and represent miniature reviews, whereas others are limited to brief specifics. In every instance, the cited references offer a way for more extensive review.

Chapter 7 consists of patient profiles, each accompanied by a series of related questions. Information obtained from the questions and commentaries in Chapters 1 through 6 will probably aid in answering questions in Chapter 7.

The final section, Chapter 8, is a practice examination to test the reader who has faithfully completed all of the previous material.

A self-assessment disk is included in the Seventh Edition and helps in preparing you for the computerized format of the NAPLEX. A description of the computer-based examination is provided on page xii.

There are also two appendices: the first lists more than 200 drugs by generic names that the authors consider most likely to be dispensed by pharmacists. Included in the table are trade or brand names, manufacturing companies, a brief description of therapeutic uses, and common dosage forms and strengths. It is NOT necessary to memorize the name of the company manufacturing a certain product, especially with the numerous company name changes. However, many individuals find it easier to relate a trade name to a company. To complete the cycle, the second appendix serves as a cross-reference of trade names with generic names.

We trust that this book will not be viewed as simply a means to review material for the licensing examination. Passing this examination does not guarantee continued competence throughout a long professional career. Practicing pharmacists must not only retain their previously acquired knowledge and skill, but must remain up to date on contemporary modes of practice. We hope that this book will serve both as a means for self-assessment of competence to practice as well as a valuable guided review. A statement listing professional competency in pharmacy originally prepared by the California State Board of Pharmacy appears on page xi. Many of the test items in this book relate to these competencies.

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Gary D. Hall, MS
Barry S. Reiss, PhD

How to Use This Book

Professional Competence in Pharmacy

A competent pharmacist is one who is able to confer with a physician about the care and treatment of his or her patient. The pharmacist should appreciate the essentials of the clinical diagnosis and understand the medical management of the patient. He or she should also be informed about the drugs that may be used in the treatment of the patient—their mechanism of action; their combinations and dosage forms; the fate and disposition of the drugs (if known); the factors that may influence the physiological availability and biological activity of the drugs from their dosage forms; how age, sex, or secondary disease states might influence the course of treatment; and how other drugs, foods, and diagnostic procedures may interact to modify the activity of the drug.

A competent pharmacist is one whose overall function is to ensure optimum drug therapy. He or she should know the appropriate indications and dosage regimen for the drug therapy being undertaken as well as the contraindications and potential untoward reactions that may result during therapy. He or she should also be informed as to the proprietary products that might interact adversely with or be useful adjuncts to drug therapy, facilitating administration or improving overall patient care.

A competent pharmacist must be aware of the proposed therapeutic actions of proprietary medications, their composition, and any unique applications or potential limitations of their dosage forms. He or she should be able to objectively appraise advertising claims. At the patient's request, he or she should be able to ascertain the probable therapeutic usefulness of a certain drug in resolving the patient's complaints.

A competent pharmacist should be able to review a scientific publication and summarize the practical implications of the findings as they may relate to the clinical use of drugs. He or she should be able to analyze a published report of a clinical trial in terms of the appropriateness of the study design and the validity of the statistical analysis, and should be able to prepare an objective summary of the significance of the data and the authors' conclusions.

A competent pharmacist is a specialist as to the stability characteristics and storage requirements of drugs and drug products, the factors that influence the release of drugs from dosage forms, and the effect of the site of administration or its environment within the body on the absorption of a drug from the administered dosage form. Most importantly, the pharmacist understands the effect of the interaction of all these factors on the onset, intensity or duration of therapeutic action.

A competent pharmacist should be precisely informed as to the legal limitations on procurement, storage, distribution, and sale of drugs; the approved use of a drug as specified by federal authorities and acceptable medical practice; and his or her legal responsibilities to the patient when drugs are used in experimental therapeutic procedures.

A competent pharmacist should be able to recommend the drug and dosage form that are most likely to fulfill a particular therapeutic need, supporting his or her choice objectively with appropriate source material. In addition, he or she should be capable of identifying a drug, within a reasonable period of time, on the basis of its color, shape, and proposed use, as described in reference books or other sources.

On the basis of symptoms described in an interview with the patient, a competent pharmacist should know what additional information he or she must obtain from the patient. Based on this in-

formation, he or she should be able to refer the patient to the proper medical practitioner, specialist, or agency that would be of most help.

A competent pharmacist should be aware of drug toxicities, as well as the most effective means of treatment for them.

A competent pharmacist should be able to instruct patients on the proper administration of prescription and proprietary drugs. He or she should know which restrictions should be placed on food intake, other medication, and physical activity.

A competent pharmacist should be able to communicate with other healthcare professionals or laymen on appropriate subjects, ensuring that the recipient understands the contents of the message being communicated.

A competent pharmacist should be capable of compounding appropriate drugs or drug combinations in acceptable dosage forms.

Finally, a competent pharmacist is a person who takes appropriate measures to maintain his or her level of competency in each of the areas described above.

Computer-Based Examinations

Following the lead of the nursing profession, many professions have reorganized their entry-level professional examinations to a computer-adaptive test (CAT) format. Qualified candidates have the opportunity to take their exam almost anytime during the year. The actual exam format is similar to previous examinations. For pharmacy, this involves the use of patient profiles followed by a series of questions that may or may not require reviewing the patient's profile. Using the computer keyboard or mouse, the candidate can scroll back to the profile for any needed information to answer a specific question. The questions will be presented one at a time and must be answered in sequence—that is, one may not skip or skim questions with the intention of returning to them later. Also, once the candidate has selected an answer and entered it into the computer, it is NOT possible to retrieve the answer and make changes. Be sure that you are satisfied with your answer before entering it into the computer. Once entered, forget about that question even if later questions lead you to believe that you gave a wrong answer.

Remember that no one is expected to answer all questions correctly. Instead, the examining body has set reasonable goals based on both easy and more difficult questions or concepts. The examination is designated as a "computer-adaptive" test because the system evaluates each individual candidate by varying the question difficulty depending on the candidate's response to previous questions. Thus, different candidates at the same testing site may be answering different questions of varying difficulty. The scoring will be based at least partially on the number of questions answered correctly and the relative level of question difficulty.

When preparing for computer-based exams, the candidate should review material in the exact manner as for any other examination. It is suggested that the candidate participate in any tutorial session offered at the exam site just prior to the actual examination. These sessions will include instruction in the mechanics of operating the computer system being used. However, any anxiety about the use of the computer will soon be overcome once the exam has started. In addition, you are likely to benefit by receiving your grade and pharmacist license much earlier!

Helpful Hints

There are several ways to maximize learning from this review book. For example, the reader could answer a short series of questions before looking for the answers at the end of each chapter. Keeping score will make these chapters function as miniature tests. Unfortunately, when challenged by multiple-choice questions, even in the nonthreatening environment of a self-learning program, our behavioral response is often predictable. When more than 75% of the questions are answered correctly, satisfaction and confidence dominate. As the percentage of missed questions increases, frustration and even panic develop. Such reactions lead to a self-limiting response: namely, the quick memorization of answers. Keep in mind, however, that although you may have increased your knowledge by one fact, you may not have maximized your learning experience. Do you really expect to see the same question on another examination? Do you realize why the other answer choices are not correct? Have you read the explanations of all the questions, even

those you answered correctly? Hopefully, these explanations will contain additional tidbits of information that will increase your knowledge base. If the question mentions a drug with which you are not familiar, be sure to look up the drug in one of the reference sources at your disposal. The next time you see that drug may be when it is the subject of a question. Some questions may concern topics with which you are not familiar. This is a perfect opportunity for learning!

Rather than blindly guessing at the answers, seek information in the cited reference or other sources and then attempt to answer the question. If your answer does not agree with the one given in this book, check further in another source. Keep digging—learning cannot be passive. Recognize that a question stating "which of these does NOT" or "all of these EXCEPT" gives you four positive facts or statements. These, in themselves, have expanded your knowledge base.

References

The references listed represent a small number of source material that is available in most pharmacy libraries or represent a collection that any pharmacist or pharmacy student could accumulate during a career in pharmacy. Because of the increasing costs and frequent issuing of new editions, the authors of *Appleton & Lange's Review of Pharmacy* have attempted to limit the total number of books but realize that there are many other textbooks containing similar material. To maintain an up-to-date personal library, the reader should obtain at least a general pharmaceutical science book (eg, Ref. 1 or 24), a pharmacology book (Ref. 6 being the classic), a book with a clinical pharmacy orientation, and a book devoted to discussions of drug therapy in managing certain disease states (Refs. 5 and 16). To keep current with new drugs, drug products, and recent developments in drug therapy, it is necessary to have publications that are updated periodically (monthly for Ref. 3 and yearly for Refs. 9 and 25.)

Notice that the last line of each explanation of answers includes a number identifying the reference source used for each question. The first number in the cited reference indicates the reference source used and usually the second number provides the exact page. For example (1:825; 23:84) refers to page 825 in Ref. 1, *Remington: The Science and Practice of Pharmacy,* and page 84 in Ref. 23, Stoklosa's *Pharmaceutical Calculations.* The *USP/DI* has been cited as three sources (18a, 18b, and 18c), reflecting the three volumes that make up this series. Reference 4 (Thompson) has been cited as 4:22.5 in which 22 represents the chapter and 5 the page in that chapter.

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CHAPTER 1

Pharmacology

Since 1940, the first edition of the book cited in the references as reference 6 has been known to successive classes of pharmacy students as simply *Goodman and Gilman.* On page 1 of the current edition, the following statement can be found: "In its entirety, pharmacology embraces the knowledge of the history, source, physical and chemical properties, compounding, biochemical and physiological effects, mechanisms of action, absorption, distribution, biotransformation and excretion, and therapeutic and other uses of drugs. Since a drug is broadly defined as any chemical agent that affects processes of living, the subject of pharmacology is obviously quite extensive."

The test items in this chapter deal with some of these areas of pharmacology. Related questions may be found in chapters on biopharmaceutics and pharmacokinetics and on clinical pharmacy.

Questions

DIRECTIONS (Questions 1 through 180): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

1. Zafirlukast (Accolate) is a drug that can best be classified as a (an)

(A) leukocyte stimulant
(B) carbonic anhydrase inhibitor
(C) monoamine oxidase inhibitor
(D) angiotensin-converting enzyme inhibitor
(E) leukotriene formation inhibitor

2. Which of the following is (are) true of milrinone lactate (Primacor)?

I. may be administered orally or parenterally
II. produces a positive inotropic action
III. produces vasodilation

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

3. Which of the following is (are) true of finasteride (Proscar, Propecia)?

I. pregnancy category X
II. employed in the treatment of BPH
III. used in alopecia treatment

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

4. Latanoprost (Xalatan) can best be described as a (an)

(A) cholinesterase inhibitor
(B) osmotic diuretic
(C) beta-adrenergic blocking agent
(D) prodrug
(E) prostaglandin agonist

5. Which of the following is (are) true of ticlopidine HCl (Ticlid)?

I. inhibits platelet aggregation
II. dissolves blood clots
III. only administered parenterally

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

6. Nicardipine (Cardene) is indicated for the treatment of

I. angina pectoris
II. hypertension
III. ventricular tachycardia

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

7. Alteplase (Activase) is an example of a tissue plasminogen activator. Which of the following describes the characteristics of this drug?

I. administered orally
II. stimulates erythrocyte production
III. produced by recombinant DNA technology

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

8. Which of the following is a gold compound?

I. aurothioglucose (Solganal)
II. goserelin acetate (Zoladex)
III. ergonovine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

9. As an antiarrhythmic drug, tocainide is most similar in action to which one of the following agents?

(A) amiodarone
(B) propranolol
(C) digoxin
(D) verapamil
(E) mexiletine

10. Which of the following antiarrhythmic agents is (are) associated with an adverse effect known as cinchonism?

(A) acebutolol
(B) moricizine
(C) quinidine
(D) lidocaine
(E) disopyramide

11. Which of the following are employed clinically as intranasal steroids?

I. budesonide (Rhinocort)
II. fluticasone propionate (Flonase)
III. nedocromil (Tilade)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

12. Which of the following agents is (are) used as anorexiants?

I. sibutramine (Meridia)
II. mazindol (Sanorex, Mazanor)
III. benzphetamine (Didrex)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

13. Colestipol HCl (Colestid) can best be classified as a (an)

(A) HMG-CoA reductase inhibitor
(B) vasopressor
(C) potassium-sparing diuretic
(D) ACE inhibitor
(E) bile acid sequestrant

14. Which of the following is (are) true of simvastatin (Zocor)?

I. HMG-CoA reductase inhibitor
II. pregnancy category X
III. antiviral

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15. Benzodiazepines appear to act as anxiolytics by

(A) altering the sodium ion influx into the CNS
(B) potentiating the effects of GABA
(C) altering the calcium ion influx into the CNS
(D) interfering with the amine pump
(E) inhibiting the action of monoamine oxidase

16. Which of the following is a COMT inhibitor?

(A) selegiline
(B) carbidopa
(C) disulfiram
(D) tolcapone
(E) pramipexole

17. Trifluridine is useful in the treatment of epithelial keratitis caused by

(A) herpes simplex
(B) *Pseudomonas aeruginosa*
(C) *Staphylococcus aureus*
(D) *Clostridium difficile*
(E) *Escherichia coli*

18. Which of the following is (are) employed as an antifungal agent?

I. cycloserine
II. mafenide
III. terbinafine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19. Which of the following is (are) true of isotretinoin (Accutane)?

I. in pregnancy category X
II. indicated for the treatment of psoriasis
III. useful for treatment of alopecia

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20. An agent that would be most likely to cause drug-induced bronchospasm is

(A) cromolyn
(B) benazepril
(C) isoproterenol
(D) fluvastatin
(E) sotalol

21. Which of the following is (are) true of dobutamine (Dobutrex)?

I. antidepressant
II. only administered parenterally
III. $beta_1$ agonist

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

22. Which of the following is (are) dopaminergic antiparkinson agents?

I. ropinirole (Requip)
II. pergolide (Permax)
III. procyclidine (Kemadrin)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

23. Which of the following is (are) true of salmeterol (Serevent)?

I. for the treatment of acute asthma attacks
II. available in an aerosol and inhalation powder form
III. $beta_2$ agonist

(A) I only
(B) III only
(C) I and II only

(D) II and III only
(E) I, II, and III

24. Which of the following drugs is (are) H_1-histamine receptor antagonists?

I. diphenhydramine
II. hydroxyzine
III. famotidine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25. Which of the following is (are) considered to be prokinetic agents?

I. lansoprazole
II. diphenoxylate
III. metoclopramide

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

26. Effects expected as a result of inhaling the smoke of cannabis (marijuana) include

I. decreased pulse rate
II. perceptual changes
III. vascular congestion of the eye

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

27. Of the following glucocorticoids, which one has the greatest anti-inflammatory potency when administered systemically?

(A) hydrocortisone (Cortef)
(B) prednisone (Meticorten)
(C) triamcinolone (Aristocort)
(D) betamethasone (Celestone)
(E) cortisone (Cortone)

28. Benzoyl peroxide is commonly employed in the treatment of

(A) psoriasis
(B) pinworms
(C) seborrheic dermatitis
(D) trichomonal infections
(E) acne

29. Timentin is a product that contains ticarcillin disodium and clavulanate potassium. Clavulanate potassium

(A) inhibits beta-lactamase enzymes
(B) prevents the urinary excretion of ticarcillin disodium
(C) prevents first-pass metabolism of ticarcillin disodium
(D) is a buffer
(E) is an antifungal agent

30. Which of the following hormones is released from the posterior pituitary gland?

I. growth hormone
II. follicle-stimulating hormone (FSH)
III. oxytocin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

31. During ovulation, peak plasma concentration(s) of which of the following hormone(s) will be reached?

I. luteinizing hormone (LH)
II. follicle-stimulating hormone (FSH)
III. progesterone

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

32. Liotrix is a thyroid preparation that contains

I. desiccated thyroid
II. levothyroxine sodium
III. liothyronine sodium

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

33. Propylthiouracil is used for the same therapeutic indication as

(A) methoxsalen
(B) danazol
(C) azathioprine
(D) omeprazole
(E) methimazole

34. Most antipsychotic drugs can be said to have which of the following actions?

(A) cholinergic
(B) dopaminergic
(C) COMT inhibition
(D) dopamine inhibition
(E) $alpha_1$-adrenergic agonist

35. Which of the following agents is (are) indicated for the treatment of convulsive disorders

I. clonidine
II. tiagabine
III. topiramate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

36. Which of the following antianxiety agents causes the least sedation?

(A) diazepam (Valium)
(B) buspirone (BuSpar)
(C) chlordiazepoxide (Librium)
(D) meprobamate (Miltown, Equanil)
(E) oxazepam (Serax)

37. Which of the following drugs is (are) classified as protease inhibitors?

I. cidofovir
II. acyclovir
III. nelfinavir

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

38. Which of the following is (are) classified as aminopenicillins?

I. bacampicillin
II. amoxicillin
III. ampicillin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

39. Which of the following antimicrobial products is (are) prodrugs?

I. cefpodoxime proxetil
II. dirithromycin
III. clindamycin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

40. Which one of the following agents can be administered with ampicillin and other penicillins to achieve higher blood levels of the penicillin?

(A) clavulanic acid
(B) penicillamine (Cuprimine)
(C) probenecid (Benemid)

(D) colchicine
(E) sulbactam

41. Three hundred milligrams of phenoxymethyl penicillin is equivalent to approximately how many units of penicillin activity?

(A) 480,000
(B) 300,000
(C) 1600
(D) 270,000
(E) 960,000

42. Which one of the following agents is most similar in action to cloxacillin?

(A) amoxicillin (Amoxil)
(B) bacampicillin (Spectrobid)
(C) penicillin V potassium (Pen Vee K)
(D) nafcillin (Unipen, Nallpen)
(E) ticarcillin (Ticar)

43. Which of the following agents is (are) classified as antiseptics or germicides?

I. chlorhexidine gluconate (Hibiclens)
II. glutaraldehyde (Cidex)
III. benzalkonium chloride (Zephiran)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

44. Diflunisal (Dolobid) is most likely to be prescribed for the treatment of

(A) Wilson's disease
(B) rheumatoid arthritis
(C) cysteinuria
(D) psoriasis
(E) Hansen's disease

45. Which of the products listed below are vaccines?

I. Sandimmune
II. Prograf
III. LYMErix

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

46. Sumatriptan (Imitrex) is most commonly employed in the treatment of

(A) partial seizures
(B) arthritic pain
(C) arrhythmias
(D) psoriasis
(E) migraine headaches

47. Which of the following morphine derivatives is most likely to cause dependence?

(A) diacetylmorphine
(B) ethylmorphine
(C) methylmorphine
(D) hydrocodone
(E) oxycodone

48. Sulfonamides exert their antimicrobial effect by competitively inhibiting the action of

(A) monoamine oxidase
(B) *p*-aminobenzoic acid
(C) pyrimidine
(D) beta lactamase
(E) DNA polymerase

49. Sulfones such as dapsone are employed commonly in the treatment of

(A) urinary tract infections
(B) psoriasis
(C) urinary incontinence
(D) atrial flutter
(E) leprosy

50. Clonidine may best be described as a (an)

(A) alpha-adrenergic blocker
(B) beta-adrenergic blocker
(C) MAO inhibitor
(D) alpha-adrenergic agonist
(E) beta-adrenergic agonist

51. Minoxidil is an antihypertensive agent that works by

(A) potentiating GABA activity
(B) directly dilating peripheral blood vessels
(C) blocking alpha-adrenergic receptors
(D) inhibiting COMT
(E) blocking beta-adrenergic receptors

52. Agent(s) indicated for the treatment of depression include(s)

I. bupropion (Wellbutrin)
II. venlafaxine (Effexor)
III. citalopram (Celexa)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

53. A common adverse effect associated with the chronic use of magnesium antacids is

(A) nausea and vomiting
(B) gastrointestinal bleeding
(C) flatulence
(D) diarrhea
(E) constipation

54. Reduced clotting ability of the blood is associated with the administration of

I. clopidogrel (Plavix)
II. abciximab (ReoPro)
III. filgrastim (Neupogen)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

55. Carbidopa can best be classified as a drug that

(A) reverses symptoms of Parkinson's disease
(B) exerts an anticholinergic action
(C) is a dopaminergic agent
(D) is a neuromuscular blocking agent
(E) is a dopa-decarboxylase inhibitor

56. Selegeline (Eldepryl) can best be described as a (an)

(A) MAO inhibitor
(B) anticholinergic
(C) COMT inhibitor
(D) anticonvulsant
(E) $alpha_1$ agonist

57. Which of the following is (are) true of fentanyl?

I. available as a transdermal system
II. used as a local anesthetic
III. may be used as a cough suppressant

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

58. Lactase enzyme is available for the treatment of

(A) lactose intolerance
(B) galactokinase deficiency
(C) cystic fibrosis
(D) phenylketonuria
(E) Crohn's disease

59. Isotretinoin (Accutane) is a drug employed in the treatment of severe recalcitrant cystic acne. Which one of the following is NOT an adverse effect associated with its use?

(A) hypertriglyceridemia
(B) hyperglycemia
(C) pseudotumor cerebri
(D) conjunctivitis
(E) fetal abnormalities

60. Which of the following is (are) true of isotretinoin (Accutane)?

(A) may be used safely in pregnant patients after the first trimester
(B) a derivative of vitamin D
(C) is applied topically to severe acne lesions
(D) contraindicated in patients with diabetes
(E) commonly causes cheilitis

61. Endorphins are

(A) endogenous neurotransmitters
(B) a new class of topical anti-inflammatory agents
(C) neuromuscular blocking agents
(D) biogenic amines believed to cause schizophrenia
(E) endogenous opioid peptides

62. Which of the following statements is (are) true of "crack"?

I. It is a free-base form of cocaine.
II. Its use results in CNS depression.
III. It is generally injected intravenously.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

63. A uricosuric drug is one that

(A) decreases urine flow
(B) promotes excretion of uric acid in the urine
(C) blocks excretion of uric acid in the urine
(D) aids in the tubular reabsorption of uric acid
(E) increases urine flow

64. Alteplase (Activase) is employed clinically as a (an)

(A) xanthine oxidase inhibitor
(B) proteolytic enzyme
(C) monoamine oxidase inhibitor
(D) ulcer adherent complex
(E) tissue plasminogen activator

65. A disadvantage in the use of cimetidine (Tagamet) is its ability to cause

(A) cheilosis
(B) aplastic anemia
(C) inhibition of hepatic enzyme activity
(D) gastric hyperparesis
(E) decreased prolactin secretion

66. A drug that decreases the formation of uric acid is

(A) miglitol
(B) allopurinol
(C) probenecid
(D) ketamine
(E) propylthiouracil

67. Hypoparathyroidism is a disorder that would most logically be treated with

(A) entacapone
(B) prednisone
(C) liothyronine
(D) phytonadione
(E) dihydrotachysterol

68. Drugs employed in reducing elevated serum cholesterol include(s)

I. gemfibrozil (Lopid)
II. cerivastatin (Baycol)
III. pioglitazone (Actos)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

69. The agent most similar in pharmacological action to miglitol (Glyset) is

(A) glipizide
(B) lispro insulin
(C) pioglitazone
(D) repaglinide
(E) acarbose

70. Nerves in the human body that transmit their impulses by releasing acetylcholine are known as _____ nerves.

(A) adrenergic
(B) cholinergic
(C) sympathetic
(D) anticholinergic
(E) neurogenic

71. Patients receiving amiodarone (Cordarone) should be monitored for the development of

(A) pulmonary toxicity
(B) pseudomembranous enterocolitis
(C) ptosis
(D) stasis dermatitis
(E) tinnitus

72. Methadone (Dolophine) is a (an)

I. analgesic drug
II. controlled substance
III. narcotic antagonist

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

73. Which one of the following is an example of a pure narcotic antagonist?

(A) butorphanol (Stadol)
(B) buprenorphine (Buprenex)
(C) nalbuphine HCl (Nubain)
(D) naltrexone (ReVia)
(E) sufentanil (Sufenta)

74. Which of the following agents is (are) used for the treatment of migraine headaches?

I. rizatriptan benzoate
II. methysergide maleate
III. succinylcholine chloride

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

75. Morphine can be expected to produce which of the following pharmacological effects?

I. dilation of the pupils
II. respiratory depression
III. constipation

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

76. Which of the following is an active metabolite of primidone (Mysoline)?

I. acetylcholine
II. phenylethylmalonamide
III. phenobarbital

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

77. Pamidronate sodium (Aredia) is indicated for the treatment of

(A) Crohn's disease
(B) Ménière's syndrome
(C) Paget's disease
(D) Hansen's disease
(E) Parkinson's disease

78. Repaglinide (Prandin) is believed to work by

(A) decreasing the absorption of carbohydrates
(B) decreasing hepatic gluconeogenesis
(C) stimulating the release of insulin from the pancreas
(D) increasing hepatic gluconeogenesis
(E) reducing glucagon secretion from the pancreas

79. Prednisone is an agent that is employed in the treatment of

I. fungal infections
II. Crohn's disease
III. rheumatic disorders

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

80. Which of the following agents is (are) indicated for use in the treatment of emesis?

I. dronabinol (Marinol)
II. granisetron (Kytril)
III. nalbumetone (Relafen)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

81. Amrinone (Inocor) is most similar in action to

(A) nadolol (Corgard)
(B) lidocaine (Xylocaine)
(C) valsartan (Diovan)
(D) disopyramide (Norpace)
(E) digoxin (Lanoxin)

82. In monitoring a patient receiving warfarin for the treatment of acute myocardial infarction, it is important to maintain the INR between

(A) 2–3
(B) 3–5
(C) 5–7
(D) 7–9
(E) 9–14

83. Lactulose (Cephulac, Chronulac)

I. is a laxative
II. decreases blood ammonia levels
III. is an artificial sweetener

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

84. Which of the following can be classified as an osmotic laxative?

(A) milk of magnesia
(B) senna
(C) cascara sagrada
(D) docusate sodium
(E) castor oil

85. The dose of liothyronine sodium that is approximately equivalent to 100 μg of levothyroxine sodium (Synthroid) USP is

(A) 120 μg
(B) 0.4 μg
(C) 250 μg
(D) 25 μg
(E) 100 μg

86. Phosphate binding is likely to occur when which of the following antacids are administered?

I. aluminum hydroxide
II. sodium bicarbonate
III. calcium carbonate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

87. Which of the following agents is (are) indicated for the treatment of chronic inflammatory bowel disease?

(A) misoprostol (Cytotec)
(B) ritodrine (Yutopar)
(C) mesalamine (Asacol)
(D) metoclopramide (Reglan)
(E) omeprazole (Prilosec)

88. Patients who are sensitive to aspirin should avoid the use of

I. codeine
II. oxaprozin
III. ibuprofen

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

89. Aspirin is believed to inhibit clotting by its action on which of the following endogenous substances?

(A) endorphin A
(B) xanthine oxidase
(C) fibrinogen
(D) cyclooxygenase
(E) dopa decarboxylase

90. The primary site of action of triamterene (Dyrenium) and spironolactone (Aldactone) is the

(A) glomerulus
(B) descending loop of Henle
(C) ascending loop of Henle
(D) proximal tubule
(E) distal tubule

91. Which of the following beta-adrenergic blocking agents also exhibit alpha$_1$-adrenergic blocking action?

I. timolol (Blocadren)
II. sotalol (Betapace)
III. labetalol (Normodyne, Trandate)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

92. Which one of the following drugs is employed in treating acute attacks of gout?

(A) colchicine
(B) ergonavine maleate (Ergotrate)
(C) buspirone (BuSpar)
(D) alendronate (Fosamax)
(E) allopurinol (Zyloprim)

93. Prolonged activity (8 to 10 hours) is an advantage in the use of which of the following topical decongestants?

I. phenylephrine
II. oxymetazoline
III. xylometazoline

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

94. Auranofin (Ridaura) is employed in the treatment of

(A) rheumatoid arthritis
(B) multiple sclerosis
(C) ulcerative colitis
(D) recalcitrant cystic acne
(E) ear infections

95. Which of the following agents is NOT likely to reduce blood sugar in a patient with type II diabetes mellitus?

I. glucagon
II. pioglitazone
III. repaglinide

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

96. After oral administration, the greatest amount of iron absorption occurs in the

(A) ascending colon
(B) stomach
(C) duodenum

(D) transverse colon
(E) sigmoid colon

97. Iron is required by the body to maintain normal

(A) leukocyte development
(B) ascorbic acid absorption
(C) bone growth
(D) immune function
(E) oxygen transport

98. Prolonged use of organic nitrates (eg, nitroglycerin) is likely to result in the development of

(A) hepatotoxicity
(B) tolerance
(C) aplastic anemia
(D) nephrotoxicity
(E) pseudomembranous enterocolitis

99. Which of the following statements is (are) true of regular insulin?

I. It is a suspension.
II. It may be administered either SC or IV.
III. It is longer acting than lispro insulin.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

100. Fluvastatin (Lescol) is contraindicated for use in patients who are

(A) pregnant
(B) hypersensitive to sulfa drugs
(C) chronic asthmatics
(D) more than 25% over ideal body weight
(E) diabetic

101. Which of the following drugs are available in a transdermal form for the prevention of motion sickness?

(A) metoclopramide
(B) ondansetron
(C) granisetron
(D) clonidine
(E) scopolamine

102. Which one of the following drugs is indicated for the treatment of primary nocturnal enuresis?

(A) ritodrine (Yutopar)
(B) amoxapine (Asendin)
(C) desmopressin acetate (DDAVP)
(D) metolazone (Zaroxolyn)
(E) mannitol (Osmitrol)

103. Which of the following drugs is (are) classified as a selective serotonin reuptake inhibitor (SSRI)?

I. citalopram (Celexa)
II. sertraline (Zoloft)
III. venlafaxine (Effexor)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

104. Which one of the following antimicrobial agents would be MOST useful in the treatment of an infection caused by beta-lactamase–producing staphylococci?

(A) dicloxacillin
(B) cephapirin
(C) cephalexin
(D) amoxicillin
(E) bacampicillin

105. Gastric intrinsic factor is a glycoprotein that is required for the gastrointestinal absorption of

(A) medium chain triglycerides
(B) folic acid
(C) iron
(D) cyanocobalamin
(E) tocopherols

106. Gingival hyperplasia, hirsutism, and ataxia are adverse effects associated with the use of

(A) minoxidil (Loniten)
(B) phenytoin (Dilantin)
(C) ginseng root
(D) chlorpromazine (Thorazine)
(E) ciprofloxacin (Cipro)

107. Latanoprost (Xalatan) is a drug used in the treatment of glaucoma. Which one of the following best describes its pharmacological action?

(A) miotic
(B) decreases the production of aqueous humor
(C) interferes with the enzyme carbonic anhydrase
(D) prostaglandin agonist
(E) mydriatic

108. Which of the following beta-adrenergic blocking agents is $beta_1$-selective?

I. betaxolol (Betoptic)
II. metipranolol HCl (OptiPranolol)
III. timolol (Timoptic)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

109. Which of the following is true of pilocarpine (Isopto Carpine, Pilostat)?

I. similar pharmacologic action to dorzolamide (Trusopt)
II. direct-acting mydriatic
III. ingredient in Ocusert ocular therapeutic system

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

110. Which one of the following is an effect of atropine on the human body?

(A) decreased heart rate
(B) decreased sweating
(C) produces miosis
(D) increased gastrointestinal motility
(E) stimulates gastric secretion

111. Which one of the following statements best describes the mechanism of action of ranitidine (Zantac)?

(A) It interferes with the synthesis of histamine in the body.
(B) It forms an inactive complex with histamine.
(C) It stimulates the metabolism of endogenous histamine.
(D) It blocks the receptor sites on which histamine acts.
(E) It directly inhibits the action of mucin in the stomach.

112. Haloperidol (Haldol) differs from chlorpromazine (Thorazine) in that haloperidol

(A) is not an antipsychotic agent
(B) does not produce extrapyramidal effects
(C) cannot be administered parenterally
(D) does not cause sedation
(E) is not a phenothiazine

113. Tamoxifen (Nolvadex) can best be characterized as a (an)

(A) gonadotropin-releasing hormone analog
(B) estrogen
(C) antiestrogen
(D) progestin
(E) androgen

114. Which of the following is true of permethrin (Nix, Elimite)?

I. It is only used topically.
II. It is used to treat topical fungal infections.

III. It is used to enhance permeation of drugs through the skin.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

115. Advantages of acetaminophen (Tylenol, APAP) over aspirin include all of the following EXCEPT

(A) greater anti-inflammatory action
(B) less gastric irritation
(C) no occult blood loss
(D) no appreciable effect on uric acid excretion
(E) no alteration of bleeding time

116. The use of clozapine (Clozaril) has been associated with the development of

(A) thrombocytopenia
(B) hypocalcemia
(C) meningitis
(D) agranulocytosis
(E) hematuria

117. Didanosine (Videx) can best be described as a (an)

(A) antiprotozoal
(B) reverse transcriptase inhibitor
(C) protease inhibitor
(D) beta-lactamase inhibitor
(E) antifungal

118. Although classified as antibiotics, dactinomycin (Cosmegen) and plicamycin (Mithracin) are used in cancer chemotherapy because they have a (an)

(A) immunosuppressant effect
(B) antiviral effect
(C) antiemetic effect
(D) cytotoxic effect
(E) anabolic effect

119. The anti-inflammatory effect of NSAIDs is due to their ability to

I. inhibit prostaglandin synthesis
II. inhibit the stimulation of the chemoreceptor trigger zone (CTZ)
III. reset the hypothalamic "setpoint"

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

120. The "first-dose" effect is characterized by marked hypotension and syncope on taking the first few doses of medication. This effect is seen with the use of

I. doxazosin (Cardura)
II. enalapril (Vasotec)
III. sotalol (Betapace)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

121. Carbon monoxide exerts its toxic effects primarily by

(A) inhibiting the gag reflex
(B) decreasing the oxygen-carrying capacity of the blood
(C) reacting with amino acids in the body to form ammonia
(D) reacting with body enzymes to produce respiratory acidosis
(E) paralyzing the muscles of the diaphragm

122. The most serious potential consequence of ingestion of a liquid hydrocarbon such as kerosene or gasoline is

(A) inactivation of hepatic enzymes
(B) the corrosive action of the poison on the stomach lining
(C) the paralysis of peristaltic motion of the GI tract
(D) dissolution of the mucus coat of the esophagus
(E) the aspiration of the poison into the respiratory tract

123. Deferoxamine mesylate (Desferal) is considered to be a specific antidote for the treatment of poisoning caused by

(A) anticholinergic agents
(B) heavy metals
(C) benzodiazepines
(D) iron-containing products
(E) alkylating agents

124. Which of the following agents is (are) classified pharmacologically as carbonic anhydrase inhibitors?

I. fluvastatin
II. nitroprusside
III. acetazolamide

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

125. Thiazide diuretics decrease the excretion of

(A) chloride
(B) uric acid
(C) sodium
(D) potassium
(E) creatinine

126. The renal excretion of amphetamines can be diminished by alkalinization of the urine. Which of the following would tend to diminish the excretion rate of amphetamine sulfate?

I. methenamine mandelate
II. acetazolamide
III. sodium bicarbonate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

127. Cyclophosphamide (Cytoxan) is an example of a (an)

(A) antibiotic
(B) estrogen antagonist
(C) antimetabolite
(D) alkylating agent
(E) prostaglandin inhibitor

128. Which of the following drugs may interfere with ethanol metabolism?

I. metronidazole (Flagyl)
II. chlorpropamide (Diabinese)
III. disulfiram (Antabuse)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

129. Which of the following is (are) classified as a monoamine oxidase inhibitor?

I. isocarboxazid (Marplan)
II. phenylzine (Nardil)
III. tranylcypromine (Parnate)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

130. A drug indicated for the treatment of both diarrhea and constipation is

(A) bisacodyl (Dulcolax)
(B) lactulose (Cephulac)
(C) polycarbophil (Mitrolan)
(D) senna (Senokot)
(E) magnesium sulfate

131. Which of the following agents is (are) classified as a leukotriene receptor antagonist?

I. ipratropium bromide
II. zileuton
III. montelukast sodium

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

132. The thiazide derivative diazoxide (Hyperstat)

(A) is a more potent diuretic than hydrochlorothiazide
(B) is not a diuretic
(C) produces about the same diuretic response as an equal dose of hydrochlorothiazide
(D) is used in the treatment of shock
(E) must be used with a potassium supplement

133. Which of the following is (are) classified as a broad-spectrum antifungal agent?

I. fluorouracil
II. mebendazole
III. miconazole

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

134. Which of the following drugs is (are) sulfonamides?

(A) mafenide
(B) tacrolimus
(C) tramadol
(D) busulfan
(E) milrinone

135. Which of the following drugs may be used in the treatment of diabetes insipidus?

(A) chlorpropamide (Diabinese)
(B) lypressin (Diapid)
(C) insulin
(D) glyburide (Micronase)
(E) glucagon

136. In the treatment of cardiac arrhythmias, sotalol (Betapace) is most similar in action to

(A) tocainide
(B) verapamil
(C) amiodarone
(D) digoxin
(E) flecainide

137. The sulfonylureas (eg, Diabinese, Glucotrol) are believed to exert their hypoglycemic effect by

(A) stimulating the release of insulin from the pancreas
(B) inhibiting the breakdown of endogenous insulin
(C) decreasing the absorption of dietary glucose
(D) decreasing the sensitivity of insulin receptors
(E) decreasing the desire for sugar consumption

138. Which of the following is true of finasteride (Propecia, Proscar)?

I. useful in treating BPH
II. used to treat some types of alopecia
III. a corticosteroid

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

139. Vidarabine (Vira-A) is an antiviral agent indicated for the treatment of

(A) rubella
(B) AIDS
(C) influenza
(D) herpes simplex encephalitis
(E) pneumocystis carinii pneumonia (PCP)

140. Dalteparin sodium (Fragmin) acts in the body to

(A) regulate menstrual activity
(B) prevent blood clot formation
(C) inhibit thyroid function
(D) inhibit viral replication
(E) reduce the secretion of acid in the stomach

141. Zidovudine (Retrovir) is indicated for the treatment of patients with

I. hepatitis B infection
II. herpes simplex infections
III. human immunodeficiency virus (HIV) infection

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

142. Which of the following is (are) true of alteplase (Activase)?

(A) derived from bovine tissue
(B) administered intramuscularly
(C) derived from porcine tissue
(D) an anticoagulant
(E) a thrombolytic agent

143. Which of the following bronchodilators act by inhibiting phosphodiesterase?

I. dyphylline (Lufyllin)
II. salmeterol (Serevent)
III. nedocromil sodium (Tilade)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

144. Diclofenac sodium (Voltaren) is most similar in action to

(A) buspirone (BuSpar)
(B) oxaprozin (Daypro)
(C) chlorzoxazone (Paraflex)
(D) dicyclomine (Bentyl)
(E) mecamylamine (Inversine)

145. Cromolyn sodium (Intal, Nasalcrom, Opticrom) is a drug that is

(A) effective in acute asthmatic attacks
(B) a synthetic corticosteroid
(C) a histamine antagonist
(D) a mast cell stabilizer
(E) a leukotriene inhibitor

146. Which of the following calcium channel blockers may be employed parenterally in the treatment of cardiac arrhythmias?

I. verapamil (Isoptin, Calan)
II. isradipine (DynaCirc)
III. amlodipine (Norvasc)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

147. Which one of the following antibiotics is a third-generation cephalosporin?

(A) cefoxitin (Mefoxin)
(B) cefonicid (Monocid)
(C) cephalexin (Keflex)
(D) cefixime (Suprax)
(E) cefaclor (Ceclor)

148. Reflex tachycardia is an adverse effect most likely to be associated with the use of which of the following drugs?

(A) minoxidil (Loniten)
(B) losartan (Cozaar)
(C) moexipril (Univasc)
(D) nadolol (Corgard)
(E) clonidine (Catapres)

149. Which of the following statements is (are) TRUE of buprenorphine (Buprenex)?

I. It is a narcotic agonist–antagonist drug.
II. It is only administered parenterally.
III. It is a phenothiazine derivative.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

150. Which one of the following is NOT a progestin?

(A) norethynodrel
(B) norethindrone
(C) mestranol
(D) levonorgestrel
(E) ethynodiol diacetate

151. Which one of the following beta-adrenergic blocking agents has the greatest lipid solubility?

(A) esmolol (Brevibloc)
(B) atenolol (Tenormin)
(C) pindolol (Visken)
(D) acebutolol (Sectral)
(E) propranolol HCl (Inderal)

152. Danazol (Danocrine) can best be classified as a (an)

(A) anti-inflammatory corticosteroid
(B) estrogen
(C) progestin
(D) neuromuscular blocking agent
(E) androgen

153. Torsemide (Demadex) is most similar in action to

(A) bumetanide (Bumex)
(B) risperidone (Risperdal)
(C) spironolactone (Aldactone)
(D) chlorthalidone (Hygroton)
(E) acetazolamide (Diamox)

154. Potassium depletion is LEAST likely to occur in a patient using

(A) ethacrynic acid (Edecrin)
(B) triamterene (Dyrenium)
(C) torsemide (Demadex)
(D) acetazolamide (Diamox)
(E) chlorthalidone (Hygroton)

155. Acyclovir (Zovirax) is indicated for the treatment of

(A) multiple sclerosis
(B) psoriasis
(C) HIV infection
(D) shingles
(E) mononucleosis

156. Which one of the following barbiturates is likely to be the shortest acting?

(A) amobarbital sodium
(B) methohexital sodium
(C) pentobarbital sodium
(D) mephobarbital
(E) phenobarbital

157. Which of the following agents decreases the production of hydrochloric acid in the stomach?

I. olsalazine
II. calcium carbonate
III. lansoprazole

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

158. Metoclopramide (Reglan) is most similar in action to which of the following drugs?

(A) bisacodyl
(B) orlistat
(C) loperamide
(D) cisapride
(E) dicyclomine

159. Olsalazine sodium (Dipentum) is employed in the treatment of

(A) diabetes mellitus
(B) duodenal ulcers
(C) urinary tract infections
(D) ulcerative colitis
(E) diabetes insipidus

160. An advantage of salmeterol (Serevent) over isoproterenol (Isuprel) in the treatment of bronchial asthma is that salmeterol

(A) is more selective for beta$_2$-adrenergic receptors
(B) has more beta-agonist activity than isoproterenol
(C) has alpha-adrenergic activity
(D) causes less cardiac stimulation
(E) has a more rapid onset of action

161. Ramipril HCl (Altace) can best be classified as a (an)

(A) beta-adrenergic blocking agent
(B) vasodilator
(C) calcium channel blocker
(D) angiotensin-converting enzyme inhibitor
(E) alpha-adrenergic blocking agent

162. Which one of the following statements is TRUE of beclomethasone dipropionate (Beclovent, Vanceril) aerosol?

(A) It should only be used in the treatment of an acute asthmatic attack.
(B) It should not be used in a patient who is currently using a theophylline product.
(C) Beclomethasone is not systemically absorbed by this route.
(D) If used in conjunction with a bronchodilator administered by inhalation, the bronchodilator should be used first.
(E) The aerosol form is also useful in the treatment of status asthmaticus.

163. Which of the following is true of naratriptan (Amerge)?

I. It is a 5-HT$_1$-receptor antagonist.
II. It may be administered orally or by inhalation.
III. It must be used regularly to prevent migraine headaches.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

164. Which of the following cancer chemotherapeutic agents is (are) classified as an antimetabolite?

I. mercaptopurine (Purinethol)
II. fluorouracil (Adrucil)
III. cytarabine (Cytosar-U)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

165. Which one of the following antihistamines would be LEAST likely to cause sedation?

(A) azatadine (Optimine)
(B) dimenhydrinate (Dramamine)
(C) clemastine (Tavist)
(D) loratidine (Claritin)
(E) tripelennamine (PBZ)

166. The pharmacological properties of which one of the following agents is similar to amphetamine?

(A) methdilazine
(B) lithium carbonate

(C) methylphenidate
(D) haloperidol
(E) methoxsalen

167. Which of the following agents are classified as macrolides?

I. amikacin
II. polymyxin B
III. azithromycin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

168. Stavudine (Zerit) is an antiviral agent employed in the treatment of

(A) HIV infection
(B) influenza A virus
(C) lupus erythematosus
(D) herpes zoster
(E) *Mycobacterium avium* complex

169. Beta carotene is considered to be a precursor for

(A) betaseron
(B) beta interferon
(C) tocopherol
(D) vitamin A
(E) carteolol

170. Simvastatin (Zocor) acts by

(A) inhibiting xanthine oxidase
(B) inhibiting HMG-CoA reductase
(C) inhibiting acetylcholinesterase
(D) acting as a bile sequestrant
(E) interfering with fat absorption from the GI

171. Which of the following statements is (are) true of fentanyl?

I. It is a narcotic agonist analgesic.
II. It is available as a transmucosal system.
III. It is available as a transdermal system.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

172. Which of the following agents is (are) an anabolic steroid?

I. oxandrolone
II. stanozolol
III. fluorometholone

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

173. Amrinone (Inocor) is a drug that produces

(A) bronchodilation
(B) antidepressant action
(C) positive inotropism
(D) narcotic antagonism
(E) enhanced protein utilization

174. Which of the following statements is (are) true of potassium?

I. It is a divalent cation.
II. It facilitates the utilization of glucose by cells.
III. It is the principal intracellular ion.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

175. Finasteride (Proscar, Propecia) can best be described as a (an)

(A) androgen inhibitor
(B) estrogen inhibitor
(C) androgen
(D) estrogen
(E) progestin analog

176. Which of the following agents have cortical stimulant action?

I. buspirone
II. pemoline
III. methamphetamine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

177. Lactulose is used to treat

I. constipation
II. portal-systemic encephalopathy
III. renal tubular necrosis

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

178. The primary function of simethicone in antacid products is to act as a (an)

(A) suspending agent
(B) adsorbent
(C) buffer
(D) antiflatulent
(E) flavoring agent

179. Which of the following is (are) true of pentamidine isethionate (Pentam, NebuPent, Pentacarinat)?

I. may be administered by inhalation
II. may be administered parenterally
III. used to treat RSV infections

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

180. Which of the following statements is (are) true of metronidazole (Flagyl)?

I. It is indicated for the treatment of migraine headaches.
II. It is used to treat superficial fungal infections.
III. It has antiprotozoal activity.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

Answers and Explanations

1. **(E)** Zafirlukast (Accolate), zileuton (Zyflo), and montelukast sodium (Singulair) are examples of leukotriene receptor antagonists. Leukotriene production in the body has been associated with the development of asthma symptoms such as airway edema. By interfering with leukotriene receptors, these drugs can be used for prophylaxis and long-term treatment of asthma. They are not useful for the treatment of acute asthmatic attacks. *(3)*

2. **(D)** Milrinone lactate (Primacor) and amrinone lactate (Inocor) are classified as inotropic agents. They are used only parenterally for the short-term treatment of congestive heart failure (CHF). They produce a positive inotropic effect (ie, they increase the force of cardiac contraction) and they produce vasodilation. *(3)*

3. **(E)** Finasteride (Proscar, Propecia) is an agent that is administered orally for the treatment of benign prostatic hyperplasia (BPH). It is also used in the treatment of alopecia (hair loss) in men, particularly in male patients who have male-pattern hair loss. Finasteride acts to inhibit the formation of 5α-dihydrotestosterone, a potent androgen. It is classified as a pregnancy category X drug. Women who are or may become pregnant should avoid contact with crushed finasteride tablets and with semen from patients using the drug. *(3)*

4. **(E)** Latanoprost (Xalatan) is a prostaglandin F_{2_α} analog that is used as an ophthalmic solution to reduce intraocular pressure by increasing the outflow of aqueous humor from the eye. Altered pigmentation of the iris may occur in 7 to 22% of patients using the drug over a 3- to 12-month period. The drug may be used in combination with other glaucoma drugs. *(5:1475)*

5. **(A)** Ticlopidine (Ticlid) is an inhibitor of platelet aggregation that is administered orally, with food, in doses of 250 mg twice daily. Patients using this drug should have a complete blood count (CBC) with differential performed every two weeks for three months to detect neutropenia (decreased number of white blood cells). The drug's antiplatelet effects are not maximal until at least 8 to 11 days of therapy have been completed. *(5:342)*

6. **(C)** Nicardipine (Cardene) is a calcium channel-blocking agent employed in the treatment of angina pectoris and hypertension. It is also indicated for the treatment of congestive heart failure. *(3)*

7. **(B)** Alteplase (Activase) and reteplase (Retavase) are tissue plasminogen activators prepared by recombinant DNA technology. They are administered intravenously in order to lyse thrombi in patients with acute myocardial infarction. *(3)*

8. **(A)** Gold compounds such as aurothioglucose (Solganal), auranofin (Ridaura), and gold sodium thiomalate (Myochrysine) are used to suppress or prevent, but not cure, arthritis and synovitis. Aurothioglucose and gold sodium thiomalate are administered intramuscularly while auranofin is only administered orally. All gold compounds may cause serious adverse effects, including dermatitis, renal damage, and blood dyscrasias. *(5:1436)*

9. **(E)** Tocainide (Tonocard) is most similar to mexiletine (Mexitil). Both are classified as Group IB antiarrhythmic drugs. These are agents that slightly depress phase 0 and may shorten the duration of the action potential. *(3)*

10. **(C)** Quinidine is an antiarrhythmic agent that derived from the bark of the cinchona tree. As does quinine, quinidine may cause an array of adverse effects collectively referred to as cinchonism. *(3)*

11. **(C)** Budesonide (Rhinocort) and fluticasone propionate (Flonase) are corticosteroids that are employed clinically for the treatment of seasonal and perennial allergic rhinitis. Nedocromil (Tilade) is an inhalational product that is used for maintenance therapy in the management of bronchial asthma. *(3)*

12. **(E)** Sibutramine (Meridia), mazindol (Sanorex, Mazanor), and benzphetamine (Didrex) are central nervous system stimulants used as anorexiants, ie, they are used to reduce appetite. *(3)*

13. **(E)** Colestipol (Colestid) is an anion exchange resin that binds bile acids in the intestine, causing them to be removed in the feces. This causes further breakdown of cholesterol to bile acids, as well as a decrease in low-density lipoproteins (LDL) and serum cholesterol levels. *(5:361)*

14. **(C)** Simvastatin (Zocor) is an HMG-CoA reductase inhibitor. It is employed as an adjunct to diet in treating hypercholesterolemia. It is classified in pregnancy category X. *(3)*

15. **(B)** Benzodiazepines are believed to act by potentiating the effects of gamma-aminobutyric acid (GABA), an inhibitory amino acid. *(3)*

16. **(D)** Tolcapone (Tasmar) is a COMT inhibitor used in the treatment of Parkinson's disease. Its use has been associated with the potential for the development of hepatic failure. It should, therefore, not be used in patients who have any evidence of liver disease. Baseline liver enzyme studies should be performed before therapy is begun and at two-week intervals during the first year of therapy. Such studies should be continued every four weeks during the 12 to 18 months of therapy and every eight weeks thereafter. *(3)*

17. **(A)** Epithelial keratitis is an ophthalmic disorder caused by the action of herpes simplex virus. Trifluridine (Viroptic) blocks herpes simplex virus reproduction and thereby helps to control this condition. *(3)*

18. **(B)** Terbinafine (Lamisil) is an antifungal agent used in treating onychomycosis of the fingernail or toenail caused by dermatophytes. Mafenide is for the treatment of burns and cycloserine is an antitubercular drug. *(3)*

19. **(A)** Isotretinoin (Accutane) is a vitamin A derivative that appears to be useful in the treatment of acne because of its ability to reduce the secretion of sebum. It is classified in pregnancy category X. Female patients should be advised to use an effective contraceptive technique for at least one month prior to starting isotretinoin and for at least one month after discontinuing it. Such patients must also have had a negative serum pregnancy test within two weeks of starting the drug. *(5:1495)*

20. **(E)** Sotalol (Betapace) is a nonselective beta-adrenergic blocking agent. Such drugs should be avoided in patients with bronchospastic disorders because they may cause bronchoconstriction. *(3)*

21. **(D)** Dobutamine (Dobutrex) is a parenterally administered agent that is chemically related to dopamine. It acts by stimulating primarily $beta_1$-adrenergic receptors to produce an inotropic effect. It is commonly employed in the treatment of shock syndrome. Unlike dopamine, dobutamine does not cause the endogenous release of norepinephrine. *(5:398)*

22. **(C)** Ropinirole (Requip) and pergolide (Permax) are dopaminergic agents that enhance dopamine activity and provide palliative treatment of Parkinson's disease. Procyclidine is an anticholinergic drug used to treat Parkinson's disease. *(3)*

23. **(D)** Salmeterol (Serevent) is an agonist acting primarily on $beta_2$-adrenergic receptors to produce bronchodilation. It is the longest-acting sympathomimetic bronchodilating agent with a duration of approximately 12 hours. It is available as an aerosol (Serevent) and as a powder for inhalation (Serevent Diskus). Because of its rather slow onset of action it is used only for maintenance and prophylaxis. It is not used for treating acute asthma attacks. *(3)*

24. **(C)** Diphenhydramine and hydroxyzine are H_1-receptor antagonists. They antagonize actions of histamine such as vasodilation. Famotidine is an H_2-receptor antagonist that is used to reduce gastric acid secretion. *(3)*

25. **(B)** Metoclopramide (Reglan) is a prokinetic agent that increases the motility of the upper GI tract without increasing the production of secretions. It appears to act by increasing the sensitivity of GI tissues to the action of acetylcholine. *(5:593)*

26. **(D)** Inhalation of the smoke of cannabis generally results in increased pulse rate, perceptual changes, and vascular congestion of the eye. *(3)*

27. **(D)** Betamethasone is about 25 times as potent as hydrocortisone, 5 to 6 times as potent as prednisone, 4 to 6 times as potent as triamcinolone, and about 30 times as potent as cortisone. *(3)*

28. **(E)** Benzoyl peroxide is an oxidizing agent found in many OTC products that are used in the treatment of acne. It is believed to exert an antibacterial effect, thereby reducing the level of *Propionibacterium acnes* on the skin surface. *(3)*

29. **(A)** Clavulanate potassium is an agent capable of inactivating beta-lactamase enzymes that are often found in microorganisms resistant to penicillins. The addition of clavulanate potassium to ticarcillin disodium extends the spectrum of antimicrobial coverage of this penicillin to include beta-lactamase–producing organisms. *(3)*

30. **(B)** Oxytocin is an endogenous hormone produced by the posterior pituitary gland. It is a uterine stimulant that promotes uterine contractions, particularly during labor. The other hormones listed are released by the anterior pituitary gland. *(3)*

31. **(C)** During the menstrual cycle, levels of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) vary widely. At the time of ovulation, the concentration of each of these hormones reaches a peak, coinciding with the release of the ovum and the complete development of a mature endometrial wall. *(3)*

32. **(D)** Liotrix consists of a uniform mixture of synthetic levothyroxine sodium (T4) and liothyronine sodium (T3) in a ratio of 4:1 by weight. It is used in products such as Euthroid and Thyrolar as a thyroid hormone supplement. *(5:1258)*

33. **(E)** Propylthiouracil and methimazole (Tapazole) are antithyroid agents that inhibit synthesis of thyroid hormone and thus are useful in the treatment of hyperthyroidism. *(3)*

34. **(D)** Most antipsychotic agents are believed to act by antagonizing dopamine receptors. They may also cause some blockade of cholinergic, $alpha_1$-adrenergic, and histamine receptors. *(3)*

35. **(D)** Tiagabine (Gabitril) and topiramate (Topamax) are anticonvulsants utilized for the treatment of partial seizures. *(3)*

36. **(B)** Buspirone (BuSpar) is an antianxiety agent that, unlike the benzodiazepines, barbiturates, and carbamates, does not produce significant sedative, muscle relaxant, or anticonvulsant effects. *(3)*

37. **(B)** Nelfinavir (Viracept) is the only protease inhibitor. Cidofovir is an inhibitor of DNA polymerase that is used for the treatment of CMV retinitis. Acyclovir (Zovirax) also acts by interfering with DNA polymerase and is used for the treatment of herpes simplex and herpes zoster infections. *(3)*

38. **(E)** All of these are aminopenicillins. They are easily recognized by the "... am ..." in their name. *(3)*

39. **(C)** Cefpodoxime proxetil (Vantin) and dirithromycin (Dynabac) are prodrugs, ie, they are pharmacologically inactive until they are enzymatically converted to their active forms in the body. *(3)*

40. **(C)** Probenecid is a uricosuric and renal tubular blocking agent. It is capable of inhibiting the tubular secretion of penicillins and cephalosporins, thereby increasing the plasma levels of these drugs and prolonging their action in the body. *(3)*

41. **(A)** The strength of phenoxymethyl penicillin is usually measured in milligrams or units. Each milligram of the pure drug is equivalent to 1600 units of activity. Thus, 300 mg of phenoxymethyl penicillin is approximately equivalent to 480,000 units of activity. *(3)*

42. **(D)** Nafcillin and cloxacillin are both beta-lactamase–resistant penicillins. They are employed primarily in treating infections caused by beta-lactamase–producing staphylococci. *(3)*

43. **(E)** Chlorhexidine gluconate (Hibiclens, Betasept), glutaraldehyde (Cidex), and benzalkonium chloride (Zephiran) are antiseptic agents used either as surgical scrubs or for the disinfection of surgical and dental equipment. *(3)*

44. **(B)** Diflunisal (Dolobid) is a salicylate that is employed in the treatment of mild to moderate pain, rheumatoid arthritis, and osteoarthritis. *(5:1452)*

45. **(B)** LYMErix is a vaccine that is used to prevent Lyme disease, a tick-borne infection. Cyclosporine (Sandimmune) and tacrolimus (Prograf) are immunosuppressive agents employed in preventing rejection of transplanted organs. *(3)*

46. **(E)** Sumatriptan (Imitrex) and other "triptans" such as naratriptan (Amerge), rizatriptan (Maxalt), and zolmitriptan (Zomig) are primarily used for the treatment of migraine headaches. *(3)*

47. **(A)** Diacetylmorphine is another name for heroin. Because of its great ability to cause dependence, diacetylmorphine may not be legally prescribed in the United States. *(3)*

48. **(B)** Sulfonamides exert their antimicrobial action by competitively antagonizing *p*-aminobenzoic acid (PABA). Sulfonamide resistance may occur if an organism produces excessive amounts of PABA or if PABA-containing products are used concurrently with a sulfonamide drug. *(3)*

49. **(E)** Dapsone is a sulfone that is bactericidal and bacteriostatic against *Mycobacterium leprae,* the organism believed to be the cause of leprosy (Hansen's disease). *(3)*

50. **(D)** Clonidine is a central alpha-adrenergic stimulant. Its primary action is to stimulate alpha$_2$-adrenergic receptors to reduce sympathetic outflow from the CNS, thereby reducing peripheral vascular resistance and reducing heart rate and blood pressure. *(3)*

51. **(B)** Minoxidil is a direct-acting peripheral vasodilator. Because of its potential for producing a number of serious adverse effects, minoxidil is not a first-choice antihypertensive agent. Its ability to produce excess hair growth (hirsutism, hypertrichosis) has led to its topical use for the treatment of alopecia as the product Rogaine. *(5:142–3)*

52. **(E)** Bupropion (Wellbutrin), venlafaxine (Effexor), and citalopram (Celexa) are each antidepressants. *(3)*

53. **(D)** Magnesium-containing antacids (eg, magnesium hydroxide) may cause diarrhea because of their saline cathartic action on the GI tract. They may also cause hypermagnesemia in renal failure patients. *(3)*

54. **(C)** Clopidogrel (Plavix) and abciximab (ReoPro) are platelet aggregation inhibitors. Filgrastim (Neupogen) is a human granulocyte colony-stimulating factor. *(3)*

55. **(E)** Carbidopa is a dopa-decarboxylase inhibitor that prevents peripheral decarboxylation of levodopa in the body. This reduces the adverse effects associated with peripheral dopa decarboxylation and reduces the dose of levodopa required to control a patient with Parkinson's disease. Carbidopa is available alone (Lodosyn) or in combination with levodopa (Sinemet). *(3)*

56. **(A)** Selegeline (Eldepryl) is an MAO-B inhibitor that is used in the adjunctive treatment of Parkinson's disease. *(5:1006)*

57. **(A)** Fentanyl is a potent narcotic agonist analgesic used IM or IV to promote analgesia during anesthesia. It is also available in a transmucosal (Fentanyl Oralet, Actiq) and transdermal (Duragesic) dosage form. *(3)*

58. **(A)** Lactase enzyme is effective in treating symptoms of lactose intolerance. These symptoms are most evident shortly after consuming a lactose-containing food and may include bloating and diarrhea. Lactase enzyme is available as a liquid (Lactaid), caplets (Lactaid), capsules (Lactrase), or as chewable tablets (Dairy Ease). It is also added to some commercial dairy products. *(3)*

59. **(B)** Hyperglycemia is not a problem commonly associated with the use of isotretinoin (Accutane). Cheilitis (cracked margins of the lips), conjunctivitis, and dry mouth occur in a large proportion of patients receiving this drug. Hypertriglyceridemia, pseudotumor cerebri have also been reported. Isotretinoin is classified in pregnancy category X and will, therefore, potentially cause fetal abnormalities. *(3)*

60. **(E)** The use of isotretinoin (Accutane), a vitamin A derivative, is associated with an incidence of cheilitis (cracking around the margin of the lips) greater than 90%. The drug is administered orally and must not be used in pregnant women because it carries a high risk of causing fetal deformities. *(3)*

61. **(E)** Endorphins are endogenous (naturally found in the body) opioid peptides that are released in response to stress. *(3)*

62. **(A)** Crack is a free-base form of cocaine. It is generally smoked and rapidly absorbed through the respiratory membranes. Within seconds, it reaches the brain and produces central nervous system stimulation and euphoria. Dependence may occur with only a single dose of the drug. *(3)*

63. **(B)** A uricosuric drug is one that promotes the excretion of uric acid in the urine. Uricosuric agents such as probenecid (Benemid) and sulfinpyrazone (Anturane) inhibit tubular reabsorption of urate and promote urate excretion. They are used to treat hyperuricemia associated with gout or gouty arthritis. *(3)*

64. **(E)** Alteplase (Activase) is a tissue plasminogen activator produced by recombinant DNA technology. It is used in the management of acute myocardial infarction, acute ischemic stroke, and pulmonary embolism. Once injected into the circulation, alteplase binds to fibrin in a thrombus and converts the entrapped plasminogen to plasmin. This produces local fibrinolysis and assists in reopening a blocked blood vessel. *(5:219)*

65. **(C)** Cimetidine (Tagamet) is an H_2-histamine receptor antagonist used to decrease gastric acid secretion in patients with peptic ulcer disease. It has been shown to inhibit the hepatic metabolism of drugs metabolized via the cytochrome P-450 pathway, thereby delaying metabolism and increasing serum levels. Cimetidine may affect the metabolism of drugs such as theophylline, some benzodiazepines, phenytoin, and warfarin. *(3)*

66. **(B)** Allopurinol (Zyloprim) is a xanthine oxidase inhibitor that does not exert a uricosuric effect but does prevent the conversion of hypoxanthine to uric acid. It is employed in the treatment of gout as well as in the management of patients receiving therapy for leukemia and other malignancies that increase uric acid formation. *(5:1463)*

67. **(E)** Dihydrotachysterol is a synthetic product of tachysterol, a substance similar to vitamin D. It is used in combination with calcium and parathyroid hormone in the treatment of hypoparathyroidism. *(3)*

68. **(C)** Gemfibrozil (Lopid) is a fibric acid derivative that reduces serum triglycerides and very low-density lipoprotein (VLDL) and increases HDL cholesterol by inhibiting peripheral lipolysis and descreasing the hepatic extraction of free fatty acids. Cerivastatin (Baycol) is an HMG-CoA reductase inhibitor that is employed as a cholesterol-lowering agent used to reduce elevated total and LDL cholesterol levels in patients with primary hypercholesterolemia when response to diet and other nondrug approaches have not been successful. Its use is associated with hepatic dysfunction and danger to the developing fetus. *(3)*

69. **(E)** Acarbose (Precose) and miglitol (Glyset) are both alpha-glucosidase inhibitors. Since they act to reduce the GI absorption of carbohydrates, they are best taken three times a day with the first bite of each main meal. *(3)*

70. **(B)** The autonomic nervous system consists of two major branches: the sympathetic (adrenergic) branch and the parasympathetic (cholinergic) branch. Each branch utilizes different neurotransmitters. For example, the sympathetic branch utilizes norepinephrine, whereas the parasympathetic branch utilizes acetylcholine. *(3)*

71. **(A)** Amiodarone (Cordarone) is an antiarrhythmic agent used in treating ventricular arrhythmias. It may cause a number of serious adverse effects, the most serious being pulmonary toxicity. Baseline chest x-rays and pulmonary function studies should be performed before therapy begins. Studies should be repeated at 3- to 6-month intervals. *(5:250)*

72. **(C)** Methadone (Dolophine) is a narcotic agonist analgesic with actions similar to those of morphine. It is twice as potent when used parenterally than when used orally. It is employed in the treatment of severe pain and in maintenance treatment of narcotic addiction. *(5:1098)*

73. **(D)** A pure narcotic antagonist is one that reverses the effects of opioids without producing agonist action of its own. Naltrexone (ReVia) is an example of a pure narcotic antagonist. Other drugs listed have agonist and some antagonist activity. *(3)*

74. **(C)** Rizatriptan benzoate (Maxalt), a serotonin $5HT_1$-receptor agonist and methysergide (Sansert), a semisynthetic ergot derivative, are used in treating migraine headaches. *(3)*

75. **(D)** Constipation is a common effect because morphine decreases peristaltic activity in the GI tract. Constriction of the pupils, CNS and respiratory depression, and nausea and vomiting are all effects also associated with morphine use. *(3)*

76. **(D)** Primidone (Mysoline) is an anticonvulsant drug used in a variety of convulsive disorders. Primidone and its two active metabolites, phenobarbital and phenylethylmalonamide (PEMA), have anticonvulsant activity. *(5:967)*

77. **(C)** Pamidronate (Aredia) is an agent used in treating Paget's disease of the bone, a condition characterized by abnormal bone resorption and the development of fractures. The use of the drug seems to decrease the dissolution of hydroxyapatite crystals, the building blocks of bone tissue. *(3)*

78. **(C)** Repaglinide (Prandin) acts by stimulating the release of insulin from the pancreas. *(3)*

79. **(D)** The naturally occurring adrenal cortical steroids exert both salt-retaining (mineralocorticoid) and anti-inflammatory (glucocorticoid) activity. The synthetic steroids prednisone and prednisolone exert similar actions on the body. The use of these agents is often associated with fluid and sodium retention. *(3)*

80. **(C)** Dronabinol (Marinol) is a marijuana derivative and granisetron (Kytril) is a selective serotonin receptor antagonist used for the prevention of nausea and vomiting associated with cancer chemotherapy. *(5:593)*

81. **(E)** Amrinone (Inocor), like digoxin, is a drug that produces a positive inotropic effect. In addition, amrinone also produces vasodilation. The drug is used for the short-term management of congestive heart failure in patients who have not responded adequately to digoxin, diuretics, or vasodilators. Use of the drug has been associated with the development of thrombocytopenia, arrhythmias, and GI upset. It is administered by IV bolus or infusion. *(3)*

82. **(A)** The International Normalization Ratio (INR) is a measure of the degree of anticoagulation of the patient. Ideally, for a patient who has experienced a myocardial infarction, the INR should be maintained at about 2 to 3. Higher levels do not seem to improve the therapeutic outcome and are likely to increase the chance of bleeding. *(3)*

83. **(C)** Lactulose (Cephulac, Chronulac), a synthetic disaccharide, is an analog of lactose. Unlike lactose, which is hydrolyzed enzymatically to its monosaccharide components, oral doses of lactulose pass to the colon virtually unchanged. In the colon, bacteria chemically convert the lactulose to low-molecular-weight acids and carbon dioxide. The acids produce an osmotic effect that draws water into the colon and makes the stools more watery. They also permit ammonia in the body to be converted to ammonium ion in the acidic colon and allow it to be eliminated in the stool. *(5:611, 624)*

84. **(A)** Milk of magnesia contains magnesium hydroxide as its active ingredient. This acts osmotically to produce a laxative effect. *(3)*

85. **(D)** Liothyronine sodium (Cytomel) is a synthetic form of the natural thyroid hormone T3. Approximately 25 μg of liothyronine sodium is equivalent to 100 μg of levothyroxine sodium (T4). *(3)*

86. **(A)** Aluminum hydroxide reacts with phosphate ion in the intestine to form insoluble aluminum phosphate which is eliminated in the feces. This may be of value in treating hyperphosphatemia in chronic renal failure. *(3)*

87. **(C)** Mesalamine (Asacol) or 5-aminosalicylic acid (5-ASA) is a breakdown product of sulfasalazine that is believed to be useful in treating chronic ulcerative colitis. *(3)*

88. **(D)** Ibuprofen (Motrin) and oxaprozin (Daypro) are nonsteroidal anti-inflammatory drugs (NSAIDs) and should be avoided in patients who are sensitive to aspirin because of possible cross-sensitivity reactions. *(3)*

89. **(D)** Single aspirin doses are known to inhibit platelet aggregation. This is believed to occur by the acetylation of platelet cyclooxygenase by aspirin. This in turn prevents the synthesis of thromboxane A_2, a prostaglandin that is a potent vasoconstrictor and an inducer of platelet aggregation. *(3)*

90. **(E)** Both triamterene (Dyrenium) and spironolactone (Aldactone) inhibit sodium reabsorption in the distal tubule. Spironolactone is an aldosterone antagonist that prevents the formation of a protein important for sodium transport in the distal tubule. Triamterene inhibits sodium reabsorption induced by aldosterone and inhibits basal sodium reabsorption. Triamterene is not an aldosterone antagonist. *(3)*

91. **(B)** Labetalol (Normodyne, Trandate) is a nonselective beta-adrenergic blocking agent primarily used for the management of hypertension. In addition to its beta-blocking ac-

tion, labetalol is also able to block alpha$_1$-adrenergic receptors. This lowers standing blood pressure and may result in hypotension and syncope. *(5:139)*

92. **(A)** Colchicine is a substance that may be employed orally or parenterally to relieve the pain of acute gout. It appears to act by reducing the inflammatory response to deposited urate crystals and by diminishing phagocytosis. Although it relieves pain in cases of acute gout, colchicine is not an analgesic or a uricosuric agent. Vomiting, diarrhea, abdominal pain, and nausea have all been reported with the use of colchicine. Bone marrow suppression and thrombocytopenia have also been associated with colchicine use. *(3)*

93. **(D)** Oxymetazoline (Afrin, Duration) and xylometazoline (Otrivin), when used as topical nasal decongestants, produce an effect that may persist for 8 to 12 hours. This is in sharp contrast to other topical nasal decongestant drugs such as phenylephrine, naphazoline, and tetrahydrozoline, which require dosing at 3- to 4-hour intervals. *(3)*

94. **(A)** The use of gold compounds such as auranofin (Ridaura), gold sodium thiomalate (Myochrysine), and aurothioglucose (Solganal) has been associated with a wide variety of adverse effects, including blood dyscrasias, dermatitis, and renal disorders. Patients using such compounds must be monitored constantly for adverse effects. *(3)*

95. **(A)** Glucagon is a polypeptide secreted by the pancreas. It acts to enhance gluconeogenesis and glycogenolysis, thereby causing higher levels of glucose in the blood. Glucagon is used to treat severe hypoglycemia. It is generally administered intramuscularly or intravenously. Pioglitazone (Actos) and repaglinide (Prandin) are oral antidiabetic agents. *(3)*

96. **(C)** Iron is primarily absorbed in the duodenum and the jejunum by an active transport mechanism. The ferrous salt form is absorbed approximately three times more readily than the ferric form. The presence of food, particularly dairy products, eggs, coffee, and tea, in the GI tract may decrease the absorption of iron significantly, although the concurrent administration of vitamin C maintains iron in the ferrous state, thereby enhancing its absorption from the GI tract. *(5:1532)*

97. **(E)** Iron is an essential component of hemoglobin, myoglobin, and several enzymes. Approximately two-thirds of total body iron is in the circulating red blood cells as part of hemoglobin, the most important carrier of oxygen in the body. *(3)*

98. **(B)** The development of tolerance to the action of nitroglycerin and other nitrates may occur with repeated use. Sensitivity to the action of nitroglycerin is generally restored after several hours of withdrawal from the drug. *(3)*

99. **(D)** Regular insulin is secreted by the beta cells of the pancreas. In its unmodified form, regular insulin is clear, has a short (0.5 to 1 hr) onset of action, and a relatively short (6 to 8 hr) duration of action. Lispro insulin solution has a more rapid onset and shorter duration of action than regular insulin. Because regular insulin is a clear product, it can be administered either SC or IV. *(3)*

100. **(A)** Fluvastatin (Lescol) is a cholesterol-lowering agent contraindicated for use during pregnancy because of its great potential for causing fetal harm. The drug is in FDA pregnancy category X. *(3)*

101. **(E)** Scopolamine is available in a transdermal patch dosage form (Transderm Scop) for prevention of nausea and vomiting associated with motion sickness in adults. It is applied to the skin behind the ear at least 4 hours before the antiemetic effect is required. The drug is then released from the transdermal product for 3 days. *(5:595)*

102. **(C)** Desmopressin acetate (DDAVP) is the synthetic analog of naturally occurring human antidiuretic hormone (ADH) produced

by the posterior pituitary gland. It is administered intranasally for the treatment of primary nocturnal enuresis. A single dose of the drug will produce an antidiuretic effect lasting from 8 to 20 hours. *(3)*

103. **(C)** Citalopram (Celexa) and sertraline (Zoloft) are classified as SSRIs. Venlafaxine (Effexor) is not an SSRI or a tricyclic antidepressant. It acts to inhibit neuronal uptake of serotonin and norepinephrine. *(3)*

104. **(A)** Dicloxacillin (Dynapen, Pathocil) is a beta-lactamase–resistant penicillin and would be suitable for treating an infection caused by beta-lactamase–producing staphylococci. Other penicillins that would also be suitable include oxacillin (Prostaphlin, Bactocill), cloxacillin (Cloxapen, Tegopen), and nafcillin (Nafcil, Unipen). All of these products are available for oral use. *(3)*

105. **(D)** Cyanocobalamin, or vitamin B_{12}, is essential for proper growth, cell reproduction, formation of blood components, and many other functions. In order for cyanocobalamin to be absorbed properly from the GI tract, it must combine with a glycoprotein called intrinsic factor. In the absence of proper levels of intrinsic factor, cyanocobalamin is administered parenterally or intranasally. *(3)*

106. **(B)** Phenytoin (Dilantin) is an anticonvulsant used in controlling grand mal and psychomotor seizures as well as other convulsive disorders. Adverse effects commonly associated with phenytoin use include nystagmus, gingival hyperplasia, ataxia, and many other neurologic, dermatologic, and hematologic disorders. Because of the high frequency of adverse effects associated with the use of this drug, patients must be monitored closely during therapy. *(5:967)*

107. **(D)** Latanoprost (Xalatan) is a prostaglandin $F_{2\alpha}$ analog that reduces intraocular pressure by increasing the outflow of aqueous humor. *(3)*

108. **(A)** Betaxolol (Betoptic) is a beta-adrenergic blocking agent used ophthalmically to reduce intraocular pressure, particularly in patients with chronic open-angle glaucoma. Unlike other ophthalmic beta-blockers, the action of betaxolol is more specific for $beta_1$-adrenergic receptors than for $beta_2$-receptors, making it less likely to affect respiratory function. *(3)*

109. **(B)** Pilocarpine (Isopto Carpine, Pilostat) is a direct-acting miotic agent used to decrease elevated intraocular pressure. By causing miosis (constriction of the pupil), greater outflow of aqueous humor is promoted and intraocular pressure falls. Carbachol (Isopto Carbachol) is another direct-acting miotic used in situations in which pilocarpine is ineffective or causes adverse effects. Dorzolamide (Trusopt) acts by inhibiting the action of carbonic anhydrase. *(5:1472)*

110. **(B)** Atropine is a belladonna alkaloid capable of causing a wide range of effects in the human body. Increased heart rate, diminished sweating, reduction of gastric secretion and tone, and mydriasis (dilation of the pupil of the eye) are commonly associated with its administration. *(3)*

111. **(D)** Ranitidine (Zantac) and other histamine H_2-receptor antagonists competitively block H_2-receptor sites, particularly those found in gastric parietal cells. These agents do not block histamine release, antibody production, or antigen–antibody reactions and they do not bind histamine. *(3)*

112. **(E)** Haloperidol (Haldol) is an antipsychotic agent available in oral and parenteral forms. It has pharmacologic actions similar to the phenothiazines (sedation, extrapyramidal effects, etc.). Chemically, haloperidol is a butyrophenone. *(5:1051)*

113. **(C)** Tamoxifen (Nolvadex) is an agent that has potent antiestrogenic effects because of its ability to compete with estrogen for binding sites in target tissues such as the breast. It is used in the treatment of metastatic breast cancer in women, particularly in patients with tumors that are estrogen-receptor–posi-

tive. It is also used to reduce the incidence of breast cancer in high-risk women. *(3)*

114. **(A)** Permethrin (Nix, Elimite) is a topical scabicide and pediculocide. It acts by disrupting the nerve cell membranes of parasites, resulting in their paralysis. *(3)*

115. **(A)** Acetaminophen (Tylenol, APAP) is an agent with analgesic and antipyretic actions similar to aspirin. Unlike aspirin, acetaminophen does not significantly inhibit peripheral prostaglandin synthesis, which may account for its relative lack of anti-inflammatory activity. Acetaminophen does not inhibit platelet function, affect prothrombin time, or produce GI distress. *(3)*

116. **(D)** Clozapine (Clozaril) is an antipsychotic agent indicated for use in patients who do not respond to standard antipsychotic therapy (phenothiazines, etc.). Use of clozapine has been associated with the development of agranulocytosis, a potentially life-threatening blood disorder. Patients being treated with clozapine must have a baseline white blood cell (WBC) and differential count performed before initiation of treatment, as well as a WBC count every week during treatment and for 4 weeks after discontinuing therapy. *(5:1129)*

117. **(B)** Didanosine (Videx) is a reverse transcriptase inhibitor that is active against the human immunodeficiency virus (HIV). Its use has been associated with the development of peripheral neuropathy and pancreatitis. *(3)*

118. **(D)** Dactinomycin (Cosmegen) and plicamycin (Mithracin) are antineoplastic agents classified as antibiotics because they are derived from a microbial source. These agents appear to act in a cytotoxic fashion by interfering with DNA and/or RNA synthesis. Their use is associated with the development of nausea and vomiting as well as with bone marrow depression. *(3)*

119. **(A)** The anti-inflammatory and analgesic action of NSAIDs is believed to result from inhibition of prostaglandin synthesis. *(3)*

120. **(A)** Doxazosin (Cardura) is an alpha$_1$-adrenergic blocking agent used in the treatment of hypertension. By causing dilation of arterioles and veins, the drug causes the lowering of both supine and standing blood pressures. The "first-dose" effect is the development of marked hypotension and syncope (fainting) on administration of the first few doses of the drug. Administering low initial doses of the drug at bedtime can minimize this effect. Dosage may be increased gradually until the drug is better tolerated. *(3)*

121. **(B)** Carbon monoxide is a colorless and odorless product of the incomplete combustion of hydrocarbons. When it is inhaled and carried to the blood, it reacts with hemoglobin to form carboxyhemoglobin. This reaction dramatically reduces the oxygen-carrying capacity of the blood and, unless corrected quickly, results in the death of the individual. *(3)*

122. **(E)** Aspiration of a liquid hydrocarbon such as gasoline or kerosene may result in severe inflammation of pulmonary tissues, interference with gas exchange, pneumonitis, and possible death. Emesis or gastric lavage is avoided in such patients to avoid aspiration. Catharsis using magnesium or sodium sulfate may be attempted. Supportive therapy is recommended for such patients unless antimicrobial agents are required to treat respiratory infection. *(3)*

123. **(D)** Deferoxamine mesylate (Desferal) is a chelating agent that has a high affinity for ferric iron and a relatively low affinity for calcium. It is usually administered parenterally in the treatment of acute iron poisoning. *(5:83)*

124. **(B)** Acetazolamide (Diamox) is a carbonic anhydrase inhibitor used clinically in the treatment of chronic open-angle glaucoma as well as secondary glaucoma. It is also used for treatment of edema caused by congestive heart failure or drug use, or associated with certain forms of epilepsy. Because acetazolamide increases the excretion of sodium, potassium, bicarbonate, and water, many patients develop alkaline urine. *(3)*

125. **(A)** Thiazide diuretics such as hydrochlorothiazide (Esidrix, HydroDIURIL) increase the renal excretion of sodium, chloride, and potassium while decreasing the excretion of calcium and uric acid. *(3)*

126. **(D)** Acetazolamide is a carbonic anhydrase inhibitor that increases the excretion of sodium, potassium, bicarbonate, and water, thereby alkalinizing the urine. Sodium bicarbonate directly alkalinizes the urine. *(3)*

127. **(D)** Cyclophosphamide (Cytoxan) is an alkylating agent related to the nitrogen mustards. Patients using this agent should be advised to take the drug on an empty stomach. Since hemorrhagic cystitis may occur with the use of this drug, patients should be advised to drink lots of fluids. *(3)*

128. **(E)** All of these drugs are aldehyde dehydrogenase inhibitors. They cause intolerance to alcohol so that consumption of even a small amount may produce a broad array of unpleasant effects. These include flushing, throbbing headaches, nausea, sweating, and palpitations. Disulfiram is used in the management of selected chronic alcoholics. The drug should only be used with the full knowledge and understanding of the patient. *(3)*

129. **(E)** Each of these agents are MAO inhibitors. Patients using them should avoid tyramine-containing foods as well as cold and allergy products. *(3)*

130. **(C)** Polycarbophil (Mitrolan) is a synthetic hydrophilic compound that is capable of absorbing large amounts of water. It is indicated for use as a bulk laxative in the treatment of constipation. It is also employed in the treatment of diarrhea, in which it absorbs excess free fecal water and helps create formed stools. *(5:605)*

131. **(D)** Zileuton (Zyflo) and montelukast sodium (Singulair) are leukotriene receptor antagonists. Since leukotrienes are associated with causing asthmatic symptoms, the use of these drugs reduces the likelihood of asthma attacks. *(3)*

132. **(B)** Diazoxide (Hyperstat) is a nondiuretic antihypertensive agent structurally related to the thiazides. It is used in the emergency reduction of elevated blood pressure. Because diazoxide is rapidly and extensively bound to serum protein, it must be administered by rapid IV injection (bolus). Repeated administration of the drug may cause sodium and water retention and the need for adjuvant diuretic therapy. An oral form of diazoxide (Proglycem) is used in the management of hypoglycemia. *(3)*

133. **(B)** Miconazole (Micatin, Monistat) is a broad-spectrum antifungal agent effective against yeast infections *(Candida albicans)* as well as dermatophyte infections (tinea cruris, tinea corporis). *(5:1861)*

134. **(A)** Mafenide (Sulfamylon) is a bacteriostatic agent that is active against many gram-positive and gram-negative organisms. Topical products containing mafenide are applied to 2nd- and 3rd-degree burns in order to reduce the chance of infection and increase the speed of healing. *(3)*

135. **(B)** Lypressin (Diapid) is a synthetic vasopressin analog possessing antidiuretic activity without producing a pressor or oxytocic effect. It is used clinically in the management of symptoms of diabetes insipidus. Lypressin is administered as a nasal spray. *(3)*

136. **(C)** Sotalol (Betapace) and amiodarone (Cordarone) are both Group III antiarrhythmic agents. This means that they both act to prolong the repolarization phase (phase 3). *(3)*

137. **(A)** The sulfonylurea hypoglycemic agents appear to reduce blood glucose levels by stimulating the release of insulin from the beta cells of the pancreas. They are only effective in patients who have some capacity for endogenously producing insulin. *(5:1225)*

138. **(C)** Finasteride (Propecia, Proscar) is an androgen hormone inhibitor used to treat benign prostatic hyperplasia (BPH) as well as male-pattern hair loss (alopecia). *(3)*

139. **(D)** Vidarabine (Vira-A) is an antiviral agent that possesses activity against herpes simplex virus. It is administered by slow IV infusion for the treatment of herpes simplex encephalitis and is used ophthalmically for the treatment of herpes simplex infections of the eye. *(3)*

140. **(B)** Dalteparin sodium (Fragmin) is a low-molecular-weight heparin derivative used in preventing or treating thromboembolic complications following surgery or ischemic complications of unstable angina and MI. *(3)*

141. **(B)** Zidovudine (Retrovir) inhibits replication of some retroviruses, including HIV. It is used orally in managing patients with HIV infection who have evidence of impaired immunity. The intravenous form is used for some adult patients with symptomatic HIV infection who have a confirmed presence of pneumocystis carinii pneumonia (PCP). *(5:1938)*

142. **(E)** Alteplase (Activase) is a tissue plasminogen activator produced by recombinant DNA technology. It is used intravenously in the management of acute myocardial infarction (AMI) patients in order to lyse thrombi obstructing coronary arteries. It is administered as soon as possible after the onset of AMI. *(3)*

143. **(A)** Dyphylline is a theophylline derivative. These agents act by inhibiting the enzyme phosphodiesterase, thereby increasing cyclic-AMP levels and producing bronchodilation. Salmeterol is a beta$_2$-adrenergic agonist, and nedocromil sodium is an inhaled agent that inhibits mediator release from mast cells. *(3)*

144. **(B)** Diclofenac sodium (Voltaren) and oxaprozin (Daypro) are both nonsteroidal anti-inflammatory drugs (NSAIDs). *(3)*

145. **(D)** Cromolyn sodium (Intal, Nasalcrom, Opticrom) is a drug with anti-asthmatic, anti-allergy, and mast cell stabilizing activity. It has no bronchodilator or anti-inflammatory activity. Cromolyn appears to inhibit degranulation of sensitized and nonsensitized mast cells that may occur after exposure to certain antigens. Cromolyn products are used prophylactically to treat bronchial asthma, allergic rhinitis, and mastocytosis. Cromolyn should not be used in treating acute asthmatic attacks. *(5:449)*

146. **(A)** Verapamil (Calan, Isoptin) is a calcium channel-blocking agent used orally and parenterally in the treatment of cardiac arrhythmias. The other calcium channel-blocking agents listed are used in the treatment of angina pectoris and/or essential hypertension. Oral verapamil is also used for these indications. *(5:239)*

147. **(D)** Cefixime (Suprax) is a third-generation cephalosporin. Third-generation cephalosporins generally have greater gram-negative activity, less gram-positive activity, greater penetration of the central nervous system, and higher cost than cephalosporins in first- or second-generation groups. *(3)*

148. **(A)** Reflex tachycardia is commonly seen with the use of peripheral vasodilators such as minoxidil (Loniten) and hydralazine (Apresoline). The drop in blood pressure produced by the use of these agents causes increased renin secretion, heart rate, and output as well as sodium and water retention. This may worsen both angina and congestive heart failure. These adverse effects observed with the use of peripheral vasodilators may be managed by the concurrent administration of a beta-adrenergic blocking agent and/or a diuretic. *(3)*

149. **(C)** Buprenorphine (Buprenex) is an opioid narcotic agonist–antagonist. As an analgesic, it is about 30 times as potent as morphine. It is administered intramuscularly or intravenously for the relief of moderate to severe pain. *(5:1019)*

150. **(C)** Mestranol is an estrogen commonly employed in several oral contraceptive products (eg, Norinyl, Ortho-Novum). *(3)*

151. **(E)** Propranolol (Inderal) is a nonspecific beta-adrenergic blocking agent that exhibits a high degree of lipid solubility. As a result, it is more likely than other beta blockers to enter the CNS and produce CNS adverse effects. *(3)*

152. **(E)** Danazol (Danocrine) is a synthetic androgen that suppresses the pituitary–ovarian axis by inhibiting the production of pituitary gonadotropins. It is used clinically in the treatment of endometriosis, in which it causes the normal and ectopic endometrial tissue to become inactive and atrophic. Danazol is also employed in the prevention of attacks related to hereditary angioedema. *(5:1350)*

153. **(A)** Torsemide (Demadex) and bumetanide (Bumex) are both loop diuretics. *(3)*

154. **(B)** Triamterene (Dyrenium) is one of three potassium-sparing diuretics currently on the market. The others include spironolactone (Aldactone) and amiloride (Midamor). These drugs are primarily used to enhance the action and counteract the potassium-depleting effect of thiazides and loop diuretics. *(3)*

155. **(D)** Acyclovir (Zovirax) is an antiviral agent used in the treatment of infections caused by herpes simplex virus types 1 and 2 (HSV-1 and HSV-2) and varicella-zoster virus. Shingles is a painful and potentially debilitating disorder caused by varicella-zoster virus. *(3)*

156. **(B)** Methohexital sodium (Brevital Sodium) is a highly lipid-soluble barbiturate. It can, therefore, rapidly cross the blood–brain barrier and produce a rapid onset of action and a short duration. Methohexital is employed for the induction and maintenance of anesthesia. *(3)*

157. **(B)** Lansoprazole (Prevacid) is a proton pump inhibitor that dramatically reduces the secretion of hydrochloric acid in the stomach. *(3)*

158. **(D)** Metoclopramide (Reglan) and cisapride (Propulsid) increase the motility of the upper GI tract without stimulating gastric, biliary, or pancreatic secretions. They are most commonly employed in the treatment of diabetic gastroparesis. *(3)*

159. **(D)** Olsalazine sodium (Dipentum) is a salicylate compound that is converted to 5-aminosalicylic acid (5-ASA) in the colon. This exerts an anti-inflammatory effect useful in treating ulcerative colitis. *(5:577)*

160. **(A)** Salmeterol (Serevent)) and isoproterenol (Isuprel) are sympathomimetic bronchodilators that affect predominantly $beta_2$-adrenergic receptors. Salmeterol is believed, however, to have less $beta_1$-activity than isoproterenol. This would make it less likely to stimulate the heart. *(3)*

161. **(D)** Ramipril (Altace) is an angiotensin-converting enzyme (ACE) inhibitor indicated for the treatment of hypertension. When administered orally, antihypertensive action generally occurs within 1 to 2 hours. The drug's action persists for 24 hours. This permits single daily dosing. *(3)*

162. **(D)** Beclomethasone dipropionate (Beclovent, Vanceril) is a synthetic corticosteroid used by inhalation to control bronchial asthma. It is generally reserved for patients in whom bronchodilators and other nonsteroidal medications have not been totally successful in controlling asthmatic attacks. When used with a bronchodilator administered by inhalation, the beclomethasone dipropionate should be administered several minutes after the bronchodilator in order to enhance the penetration of the beclomethasone into the bronchial tree. *(3)*

163. **(A)** Naratriptan (Amerge) is a $5\text{-}HT_1$-receptor antagonist used to treat acute migraine headaches. It is not used prophylactically. *(3)*

164. **(E)** Antimetabolites are a diverse group of compounds that interfere with normal metabolic processes and thereby disrupt nucleic acid synthesis and normal cell function. *(3)*

165. **(D)** Loratidine (Claritin), cetirizine (Zyrtec), astemizole (Hismanal), and fexofenadine (Al-

legra) are peripherally selective antihistamines that produce a low degree of sedation. The other agents are much more likely to produce sedation as an adverse effect. *(3)*

166. **(C)** Methylphenidate (Ritalin) is an amphetamine-like cortical stimulant employed in treating attention deficit disorders as well as narcolepsy. Nervousness and insomnia are common adverse effects associated with methylphenidate use. *(5:1047)*

167. **(B)** Azithromycin (Zithromax) is a macrolide antimicrobial agent related to erythromycin, clarithromycin (Biaxin), and dirithromycin (Dynabac). *(3)*

168. **(A)** Stavudine (Zerit) is an antiviral agent used in treating patients with HIV. Its use has been associated with the development of peripheral neuropathy. *(3)*

169. **(D)** Beta carotene is also known as provitamin A. It is a precursor that is converted to vitamin A in the body. *(3)*

170. **(B)** Simvastatin (Zocor) is an HMG-CoA reductase inhibitor. It and similar agents such as fluvastatin, lovastatin, cerivastatin, atorvastatin, and pravastatin inhibit HMG-CoA reductase, an enzyme that catalyzes an early step in the synthesis of cholesterol in the body. *(3)*

171. **(E)** Fentanyl is a narcotic agonist analgesic that is significantly more potent than morphine. It may be administered parenterally (IM or IV) for induction or as an adjunct to general anesthesia. It may also be used transdermally (Duragesic) to manage chronic pain for up to 72 hours. It is also available as a transmucosal system (Fentanyl Oralet, Actiq) and for use as a preanesthetic medication or as an adjunct to anesthesia. *(3)*

172. **(C)** Anabolic steroids are related to androgens. Their use results in enhanced tissue building. They are used in the treatment of certain types of anemia and in treating metastatic breast cancer in women. *(3)*

173. **(C)** Amrinone (Inocor) is an agent that produces a positive inotropic effect as well as vasodilation. It is used to treat congestive heart failure (CHF) in patients who have not responded adequately to digitalis glycosides, diuretics, or vasodilators. *(5:165)*

174. **(D)** Potassium is the principal intracellular cation of a number of body tissues. It is essential for proper transmission of nerve impulses; contraction of cardiac, skeletal, and smooth muscles; and in the transport of glucose across cell membranes. *(3)*

175. **(A)** Finasteride (Proscar, Propecia) is an androgen hormone inhibitor employed in the treatment of benign prostatic hyperplasia (BPH). Because prostatic development is dependent on androgen activity, finasteride can effectively reduce prostate gland size. Finasteride is also used to treat alopecia. *(3)*

176. **(D)** Pemoline (Cylert) and methamphetamine (Desoxyn) stimulate the central nervous system and increase alertness and a heightened awareness of surroundings. High doses may produce hyperactivity, autonomic effects on the heart, and muscle tremor. *(3)*

177. **(C)** Lactulose is a synthetic disaccharide that is broken down by gut bacteria to low-molecular-weight acids and carbon dioxide. These cause an osmotic laxative effect. The acidity produced also causes ammonia to be converted to ammonium ion. Ammonium ion cannot be reabsorbed so it is eliminated from the body. This effect may be useful in patients with portal-systemic encephalopathy to prevent ammonia accumulation in the body. *(5:611)*

178. **(D)** Simethicone is a mixture of inert silicon polymers. It is employed as an ingredient in antacid products because of its defoaming action in the GI tract. It acts to reduce the surface tension of gas bubbles, thereby causing them to break and release their entrapped gases. *(3)*

179. **(C)** Pentamidine isethionate (Pentam, NebuPent, Pentacarinat) is an agent that has activity against *Pneumocystis carinii,* the cause of pneumocystis carinii pneumonia (PCP). It is administered by inhalation to prevent PCP in high-risk, HIV patients. It is administered parenterally to treat PCP. *(3)*

180. **(B)** Metronidazole (Flagyl) is an agent that is primarily used because of its antiprotozoal activity, particularly in the treatment of trichomoniasis. It is also employed as an antibacterial in treating certain anaerobic bacterial infections. Patients using metronidazole should avoid alcoholic beverages to avoid disulfiram-like effects when the combination is used. *(3)*

CHAPTER 2

Pharmaceutical Calculations

While the number of prescriptions requiring compounding has diminished during the past decade, the importance of pharmaceutical calculations has not declined. There is a continued necessity to compound some prescriptions and medical orders, especially for pharmacists preparing parenteral admixtures in both institutional and community settings. In addition, competence in mathematics is essential in order to comprehend the scientific literature.

Most textbooks dealing with pharmaceutical calculations present the reader with many problems to solve. We have attempted to present this topic with a sampling of pharmaceutical calculations that are relevant to current pharmacy practice. Following the lead of the *USP/NF*, the metric system is the basis for this chapter. Any problems from previous editions that involved the apothecary system have been dropped. Obviously, units that are commonly referred to as "household measures" have been retained.

Questions

DIRECTIONS (Questions 1 through 65): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

1. Micro, nano, atto, and mega are prefixes associated with which of the following measuring systems?

I. avoirdupois
II. metric
III. Systeme International

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

2. One hundred (100) micrograms equals

I. 100,000 nanograms
II. 0.1 milligrams
III. 0.001 grams

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

3. A patient's serum cholesterol value is reported as 4 mM/L. This concentration expressed in terms of mg/dL will be (mol. wt. cholesterol = 386)

(A) 0.154 mg/dL
(B) 1.54 mg/dL
(C) 154 mg/dL
(D) 596 mg/dL
(E) 1540 mg/dL

4. What is the minimum amount of a potent drug that may be weighed on a prescription balance with a sensitivity requirement of 6 mg if at least 98% accuracy is required?

(A) 6 mg
(B) 120 mg
(C) 180 mg
(D) 200 mg
(E) 300 mg

5. The upper therapeutic drug concentration for vancomycin is considered to be 40 μg/mL. Express this value in terms of mg/dL.

(A) 0.04 mg/dL
(B) 0.44 mg/dL
(C) 4 mg/dL
(D) 40 mg/dL
(E) 400 mg/dL

6. Calculate the dose of a drug to be administered to a patient if the dosing regimen is listed as 2 mg/kg/day. The patient weighs 175 lb.

(A) 78 mg
(B) 160 mg
(C) 140 mg
(D) 350 mg
(E) 770 mg

7. The adult dose of a drug is 250 mg. What would be the approximate dose for a 6-year-old child weighing 60 lb? (Use Young's Rule.)

(A) 60 mg
(B) 85 mg
(C) 100 mg
(D) 125 mg
(E) 180 mg

8. A package insert lists a drug dose for a neonate as being 10 mcg/kg/day. The age range for a neonate is considered to be

(A) birth to 1 month
(B) 1 month to 6 months
(C) 1 month to 1 year
(D) birth to 1 week
(E) 1 year through 5 years

9. The child's dose of a drug is reported as 1.2 mg/kg body weight. What is the appropriate dose for a child weighing 60 lb?

(A) 6 mg
(B) 9 mg
(C) 32 mg
(D) 72 mg
(E) 126 mg

10. The infusion rate of theophylline established for a neonate is 0.08 mg/kg/hr. How many mg of drug are needed for a 12-hr infusion bottle if the body weight is 16 lb?

(A) 0.58 mg
(B) 14 mg
(C) 30 mg
(D) 150 mg
(E) 7 mg

11. How many mg of codeine phosphate are being consumed daily by a patient taking the following prescription as directed?

Rx
Codeine Phosphate 200 mg
Dimetapp Elix q.s. 120 mL

Sig: ʒ i t.i.d. p.c. & h.s.

(A) 6.25 mg
(B) 8.25 mg
(C) 19 mg
(D) 25 mg
(E) 33 mg

12. How many mg of codeine base is in each dose of the cough product used in Question 11? (Mol. wts: codeine = 299; codeine phosphate = 406)

(A) 6 mg
(B) 8 mg
(C) 11 mg
(D) 16 mg
(E) 24 mg

13. The directions intended for the patient on a prescription read "1 tbsp ac and hs for 10 days." What is the minimum volume the pharmacist should dispense?

(A) 160 mL
(B) 200 mL
(C) 400 mL
(D) 600 mL
(E) 800 mL

14. The USP contains nomograms for estimating body surface area (BSA) for both children and adults. Which of the following measurements must be known in order to use this nomogram?

(A) age and height
(B) age and weight
(C) height and creatinine clearance
(D) height and weight
(E) weight and sex

15. The adult dose of a drug is 200 mg. What is an appropriate dose for an 8-year-old child whose BSA is calculated to be .6 m^2?

(A) 25 mg
(B) 40 mg
(C) 50 mg
(D) 70 mg
(E) 80 mg

16. Blood pressure measurements were made for 1 week on five patients with the following averages:

Patient	1	2	3	4	5
B.P.	140/70	160/84	180/88	190/90	150/70

What is the median systolic pressure?

(A) 80
(B) 83
(C) 84
(D) 160
(E) 164

17. Using the above data, determine the approximate average diastolic blood pressure value.

(A) 80
(B) 84
(C) 100
(D) 115
(E) 160

18. After 1 month of therapy, all of the patients listed in Question 16 had a systolic blood pressure reduction of 10 mm with a standard deviation (SD) of 5 mm. What percentage of patients had a reduction between 5 and 15 mm?

(A) 20%
(B) 40%
(C) 50%
(D) 70%
(E) 90%

19. Lanoxin Pediatric Elixir contains 0.05 mg of digoxin per mL. How many micrograms (mcg) are there in 3 mL of the elixir?

(A) 0.0015
(B) 0.015
(C) 0.15
(D) 1.5
(E) 150

20. A pharmacist adds 1 pint of Alcohol USP to 1 L of a mouthwash formula. What is the new percentage of alcohol present if the original mouthwash was labeled as 12% V/V ethanol?

(A) 30%
(B) 38%
(C) 45%
(D) 57%
(E) 59%

21. A prescription calls for the dispensing of a 4% Pilocar solution with the directions of "gtt i OU TID." How many mg of pilocarpine hydrochloride is being used per day? Assume that the dropper is calibrated to deliver 20 drops to the mL.

(A) 4 mg
(B) 6 mg
(C) 12 mg
(D) 24 mg
(E) 60 mg

22. The adult intravenous (IV) dose of zidovudine is 2 mg/kg q 4 h six times daily. How many mg will a 180-lb patient receive daily?

(A) 12 mg
(B) 164 mg
(C) 650 mg
(D) 980 mg
(E) 2160 mg

23. A pharmacist dilutes 100 mL of Clorox with sufficient water to make one quart of solution. Express the concentration of sodium hypochlorite in the final dilution as a W/V ratio. (Commercial Clorox contains 5.25% W/V sodium hypochlorite.)

(A) 1/10
(B) 1/90
(C) 1/100
(D) 1/180
(E) 1/200

Questions 24 and 25 relate to the following hospital formula for T-A-C Solution.

Cocaine HCl	4%
Tetracaine HCl 2%	0.5 mL
Epinephrine HCl	1/2000
Sodium Chloride injection	qs 4 mL

24. How many mg of cocaine HCl is in the final solution?

(A) 400 mg
(B) 4 mg
(C) 20 mg
(D) 8 mg
(E) 160 mg

25. How many mL of Adrenalin HCl Solution (0.1%) may be used to prepare the solution?

(A) 0.002 mL
(B) 0.04 mL
(C) 1 mL
(D) 2 mL
(E) 5 mL

Questions 26 and 27 relate to the following hospital order.

Parenteral Admixture Order

For: Alex Sanders Room: M 704

Cefazolin sodium 400 mg in 100 mL N/S

Infuse over 20 minutes q 6 hr ATC for 3 days

Available in the pharmacy are cefazolin sodium 1-gram vials with reconstitution directions of 2.5 mL. SWFI will give 3.0 mL of solution.

26. How many mL of the reconstituted solution are required for each day of therapy?

(A) 1.2 mL
(B) 4.8 mL
(C) 3 mL
(D) 6 mL
(E) 12 mL

27. What infusion rate in mL/min should the nurse establish for each bottle?

(A) 0.15 mL/min
(B) 0.28 mL/min
(C) 1.1 mL/min
(D) 2 mL/min
(E) 5 mL/min

28. An ICU medical order reads "KCl 40 mEq in 1 liter N/S. Infuse at 0.5 mEq/min." How many minutes will this bottle last on the patient?

(A) 20
(B) 80
(C) 500
(D) 1000
(E) 2000

29. The attending physician changes the flow rate of the above solution (KCl 40 mEq/1 L N/S) to 2 mEq per hour. What will be the approximate flow rate in mL/minute?

(A) .8
(B) 1.5
(C) 8
(D) 10
(E) 50

30. An administration set delivers 60 drops to the mL. How many drops per minute are needed to obtain 20 units of heparin per minute if the IV admixture contains 15,000 units per 250 mL of normal saline?

(A) 20
(B) 40
(C) 60
(D) 80
(E) 120

31. Dopamine (Intropin) 200 mg in 500 mL of normal saline at 5 μg/kg/min is ordered for a 155-lb patient. What is the final concentration of solution in (μ/mL?

(A) 0.4 μg/mL
(B) 2.5 μg/mL
(C) 40 μg/mL
(D) 400 μg/mL
(E) 25 μg/mL

32. Referring to Question 31, at what rate (mL/min) should the solution be infused to deliver the desired dose of 5 μg/kg/min?

(A) 0.35 mL/min
(B) 0.40 mL/min
(C) 0.88 mL/min
(D) 2.0 mL/min
(E) 5.0 mL/min

33. A 250-mL infusion bottle contains 5.86 g of potassium chloride (KCl). How many milliequivalents (mEq) of KCl are present? (Mol. wt. KCl = 74.6)

(A) 12.7 mEq
(B) 20 mEq
(C) 78.5 mEq
(D) 150 mEq
(E) 157 mEq

34. A solution contains 1.5 mEq of calcium per 100 mL. Express the solution's strength of calcium in terms of mg/L. (The atomic weight of calcium is 40.)

(A) 30 mg/L
(B) 60 mg/L
(C) 150 mg/L
(D) 300 mg/L
(E) 600 mg/L

35. Calcium chloride ($CaCl_2 \cdot 2H_2O$) has a formula weight of 147. What weight of the chemical is needed to obtain 40 mEq of calcium? (Ca = 40.1; Cl = 35.5; H_2O = 18)

(A) 0.80 g
(B) 2.22 g
(C) 1.47 g
(D) 2.94 g
(E) 5.88 g

36. A floor nurse requests a 50-mL minibottle to contain heparin injection 100 units/mL. The number of mL of heparin injection 10,000 units/mL needed for this order will be

(A) 0.1 mL
(B) 0.5 mL
(C) 1 mL
(D) 2.5 mL
(E) 5 mL

37. The estimated creatinine clearance rate for a 120-lb male patient is 40 mL/min. What maintenance dose should be administered if the normal dose was calculated to be 80 mg? (Assume only renal elimination.)

(A) 60 mg
(B) 20 mg
(C) 120 mg
(D) 160 mg
(E) 240 mg

38. A nursing floor requests one pint of 50% Isopropyl alcohol as a rubbing compound. How many mL of Isopropyl Rubbing Alcohol (70% V/V) will be needed for compounding this order?

(A) 170
(B) 342
(C) 480
(D) 672
(E) 684

39. A physician requests 1 lb of bacitracin ointment containing 200 U of bacitracin per gram. How many grams of bacitracin ointment (500 U/g) must be used to make this ointment?

(A) 182 g
(B) 200 g
(C) 227 g
(D) 362 g
(E) 400 g

Questions 40 through 43 relate to the following formula for a psoriasis lotion.

Coal tar solution	5 mL
Salicylic acid	
Urea	aa 5%
Triamcinolone acetonide	0.25 g
Alcohol USP	20 mL
Propylene glycol	qs 120 mL

40. What weight of salicylic acid is needed to prepare 1 pt of the formula listed?

(A) 11.8 g
(B) 12 g
(C) 23.7 g
(D) 24 g
(E) 25 g

41. What percent V/V concentration of alcohol would be listed on the label?

(A) 8%
(B) 15.8%
(C) 16.7%
(D) 19%
(E) 20%

42. How many mL of triamcinolone acetonide aqueous injection (40 mg/mL) could be used to prepare 240 mL of the formula?

(A) 6.3 mL
(B) 12.5 mL
(C) 1.2 mL
(D) 10 mL
(E) 15 mL

43. Propylene glycol was purchased at a cost of $24.00 per pound. What is the cost of 100 mL of the liquid? (Specific gravity = 1.04)

(A) $2.60
(B) $2.64
(C) $2.75
(D) $5.50
(E) $13.00

44. A pharmacist adds 2 mL of tobramycin injection (40 mg/mL) to 4 mL of tobramycin ophthalmic solution 0.3%. The concentration of tobramycin in the final mixture will be _____ g/mL.

(A) 0.012
(B) 0.015
(C) 0.03
(D) 0.052
(E) 0.092

45. A hospital clinic requests 2 lb of 2% hydrocortisone ointment. How many grams of 5% hydrocortisone ointment could be diluted with white petrolatum to prepare this order?

(A) 18.2 g
(B) 27.5 g
(C) 45.4 g
(D) 363 g
(E) 545 g

46. How many mL of glycerin would be needed to prepare 1 lb of an ointment containing 5% W/W glycerin? (The density of glycerin is 1.25 g/mL.)

(A) 1.2 mL
(B) 18.2 mL
(C) 22.7 mL
(D) 24 mL
(E) 28.4 mL

47. A total parenteral nutrition (TPN) order requires 500 mL of $D_{30}W$. How many mL of $D_{50}W$ should be used if the $D_{30}W$ is not available?

(A) 125 mL
(B) 300 mL
(C) 375 mL
(D) 400 mL
(E) 200 mL

48. How many grams of 1% hydrocortisone cream must be mixed with 0.5% hydrocortisone cream if one wishes to prepare 60 grams of an 0.8% W/W preparation?

(A) 6 g
(B) 12 g
(C) 24 g
(D) 36 g
(E) 48 g

49. How many grams of pure hydrocortisone powder must be mixed with 60 g of 0.5% hydrocortisone cream if one wishes to prepare a 2.0% W/W preparation?

(A) 0.90 g
(B) 0.92 g
(C) 0.30 g
(D) 1.2 g
(E) 1.53 g

50. How much sodium chloride is needed to adjust the following prescription to isotonicity? (The E value for sodium thiosulfate is 0.31.)

Rx	
Sodium thiosulfate	1.2%
Sodium chloride	qs
Purified water	qs 100 mL

(A) 0.37 g
(B) 0.45 g
(C) 0.53 g
(D) 0.31 g
(E) 0.90 g

51. How much additional sodium chloride should be added to the following prescription to maintain isotonicity? (Zincfrin is an isotonic solution.)

Rx	
Zincfrin	15 mL
Sodium chloride	q.s.
Sterile Water for Injection	60 mL

(A) 0.135 g
(B) 0.4 g
(C) 0.54 g
(D) 0.9 g
(E) None (because Sterile Water for Injection is already isotonic)

52. How many mg of sodium chloride are needed to adjust 30 mL of a 4% cocaine HCl solution to isotonicity. The freezing point depression of a 1% solution of cocaine HCl is .09 degrees.

(A) 62
(B) 83
(C) 108
(D) 120
(E) 270

53. Estimate the milliosmolarity (mOsm/L) for normal saline. (Na = 23; Cl = 35.5)

(A) 150 mOsm/L
(B) 300 mOsm/L
(C) 350 mOsm/L
(D) 400 mOsm/L
(E) 600 mOsm/L

54. How many milliosmoles are present in a solution prepared by dissolving 1000 mg of sodium chloride in 100 mL D_5W? (Na = 23; Cl = 35.5; hydrous dextrose = 198)

(A) 30
(B) 60
(C) 150
(D) 300
(E) 600

55. How many grams of glacial acetic acid (99.9% W/W) must be added to 1 gallon of purified water to prepare an irrigation solution containing 0.25% W/V acetic acid?

(A) 1.2 g
(B) 9.5 g
(C) 12 g
(D) 20 g
(E) 95 g

56. How much elemental iron is present in every 300 mg of ferrous sulfate ($FeSO_4 \cdot 7H_2O$)? [Atomic weights: iron = 55.9; S = 32; O = 16; H = 1. Iron has valences of +2 and +3.]

(A) 30 mg
(B) 60 mg
(C) 110 mg
(D) 120 mg
(E) 164 mg

57. The USP states that 1 g of a chemical is soluble in 10 mL of alcohol. What is the percentage strength of a saturated solution of this chemical if alcohol has a sp. gr. of 0.80?

(A) 10.0% W/V
(B) 10.0% W/W
(C) 11.1% W/V
(D) 11.1% W/W
(E) 12.5% W/V

58. What is the decay constant (k) of the radioisotope ^{32}P if its half-life is 14.3 days? (Assume that radiopharmaceuticals follow first-order kinetics.)

(A) 0.048/day
(B) 0.07/day
(C) 0.097/day
(D) 0.1/day
(E) 0.15/day

59. A radiopharmacist prepares a solution of ^{99m}Tc (40 mCi/mL) at 6:00 AM. If the solution is intended for administration at 12:00 noon at a dose of 20 mCi, how many mL of the original solution are needed? (The half-life of the radioisotope is 6 hours.)

(A) 0.5 mL
(B) 1.0 mL
(C) 1.5 mL
(D) 2.0 mL
(E) 5.0 mL

60. What concentration of the original ^{99m}Tc solution described in Question 59 will remain 24 hours after its original preparation?

(A) 15 mCi
(B) 10 mCi
(C) 7.5 mCi
(D) 5.0 mCi
(E) 2.5 mCi

Questions 61 and 62 are related to the following formula for Citrate of Magnesia.

Rx	
Magnesium carbonate	15 grams
Citric acid (anhydrous)	27.4 grams
Syrup	60 mL
Purified water	qs 350 mL

61. How many grams of magnesium is present in every 350 mL dose? (Mg = 24.3; Carbonate = 60)

(A) 2.5
(B) 4.32
(C) 6.08
(D) 6.7
(E) 8.6

62. What percent W/V of hydrated citric acid could be listed in a formula if the anhydrous citric acid is not available? The hydrated form of citric acid contains 10% water. (Molecular weight citric acid, anhydrous = 192 g/mole; water = 18 g/mole)

(A) 7.0
(B) 7.8
(C) 8.7
(D) 24.7
(E) 30.4

63. A nursing home patient is experiencing diarrhea from his enteral nutritional solution, which has an osmolarity of 520 mOsm/L. How many mL of purified water are needed to reduce 500 mL of this solution to an osmolarity of 300 mOsm/L?

(A) 290 mL
(B) 310 mL
(C) 360 mL
(D) 500 mL
(E) 870 mL

64. The level of iron impurities in a water sample is 2 mg per liter. Express this concentration in terms of ppm.

(A) 0.2 ppm
(B) 2 ppm
(C) 20 ppm
(D) 200 ppm
(E) 2000 ppm

65. The concentration of mercury in a water sample is reported as 5 ppm. Express this concentration as a percentage.

(A) 0.00005%
(B) 0.0005%
(C) 0.005%
(D) 0.05%
(E) 0.5%

Answers and Explanations

1. **(D)** The metric system is used exclusively in most nations in the world except the United States. The prefixes in the metric system are based on increasing or decreasing magnitudes of 10, 100, or 1000. Converting from one set of quantities to another simply requires the movement of decimal points. For example, converting 1 kg to g requires moving the decimal point three places to the right. The metric system has been expanded into the Systeme International (SI) measuring system that encompasses all types of measures. The major prefixes in the order of magnitude include:

Prefix	Magnitude	Example
mega	1,000,000 ×	megagram
kilo	1000 ×	kilogram
—	1 ×	gram
centi	0.01 ×	centigram
milli	0.001 ×	milligram
micro	1×10^{-6} ×	microgram
nano	1×10^{-9} ×	nanogram
pico	1×10^{-12} ×	picogram
femto	1×10^{-15} ×	femtogram
atto	1×10^{-18} ×	attogram

(23:46)

2. **(C)** In this example, consider one microgram as equaling 1000 nanograms; thus, 100 mcg = 100,000 ng.

   Since 1 milligram equals 1000 mcg, 100 mcg equals 0.1 mg. If 1 mg equals .001 gram, 0.1 mg or 100 mcg equals 0.0001 g. It may be clearer if one solves this conversion using dimensional analysis.

$$100 \text{ mcg} \times \frac{1 \text{ mg}}{1000 \text{ mcg}} \times \frac{1 \text{ g}}{1000 \text{ mg}} = 0.0001 \text{ g}$$

(1:66; 23:46)

3. **(C)** An increasing number of laboratory test values and drug doses are being reported in terms of millimoles (mM). Weight quantities expressed in molar amounts allow a more realistic evaluation of the actual number of drug molecules present, for example, when comparing salts of a drug. In this problem, the mM/L concentration is converted by recognizing that 1 mole of cholesterol weighs 386 g and 4 mmoles equals 0.004 moles.

$$386 \times .004 \text{ moles} = 1.544 \text{ g or } 1540 \text{ mg/L}$$
$$1540 \text{ mg/L} = 154 \text{ mg/dL}$$

4. **(E)** The minimum weight that can be measured on any balance can be determined if the balance's sensitivity requirement (SR) and the acceptable percentage of error has been established. The equation is

$$\text{SR} = (\text{minimum weighable amount}) \times (\text{acceptable error})$$

   In this problem, the SR was given as 6 mg and an accuracy of at least 98% or an error of not more than 2% is permissible.

$$6 \text{ mg} = (x \text{ mg})\ (2\%)$$
$$6 \text{ mg} = (x \text{ mg})\ (0.02)$$
$$x = 300 \text{ mg}$$

(23:35)

5. **(C)** Because 1000 µg = 1 mg and 100 mL = 1 dL, 40 µg/mL = 0.04 mg/mL = 4 mg/dL

   Or, by dimensional analysis,

$$\frac{40 \text{ µg}}{1 \text{ mL}} \times \frac{1 \text{ mg}}{1000 \text{ µg}} \times \frac{100 \text{ mL}}{1 \text{ dL}} = 4 \text{ mg/dL}$$

   Note that when dimensional analysis is used, all of the units cancel except those appropriate for the final answer. *(23:47–48)*

6. (B) Because 1 kg = 2.2 lb

$$175 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} \times \frac{2 \text{ mg}}{\text{kg}} = 160 \text{ mg}$$

(23:67)

7. (B) Young's Rule relates a child's dose to the child's age.

$$\text{Child's dose} = \frac{\text{Age (yr)}}{(\text{Age [yr]} + 12)} \times \text{Adult dose}$$

$$\text{Child's dose} = \frac{6}{(6 + 12)} \times 250 \text{ mg}$$

Dose = 83.3 or 85 mg

Although well intended, rules like Young's (child's age), Cowling's (age at next birthday divided by 24), Clark's (weight divided by average weight of an adult [150 lb]) are only rough estimates. Pharmacists should check the literature for individual drug dosing for children. In some instances, the child's dose will be similar to that for the adult. *(1:82; 23:65–66)*

8. (A) Neonates have an age span from birth to 1 month of age. Infants are 1 month to 1 year, early childhood is 1 through 5 years, and late childhood is 6 through 12 years. *(23:65)*

9. (C)

$$60 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} \times \frac{1.2 \text{ mg}}{\text{kg}} = 32 \text{ mg}$$

(23:82)

10. (E) The body weight will be

$$16 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} = 7.27 \text{ kg}$$

$$\frac{0.08 \text{ mg}}{\text{kg}} \times 7.27 \text{ kg} = 0.58 \text{ mg per hour} \times 12 \text{ hr}$$
$$= 7 \text{ mg in 12 hours}$$

The low dosing of theophylline is correct because the metabolism pathway in young babies has yet to develop sufficiently. *(19:17; 23:67)*

11. (E) In today's health practice, the symbol "**ʒ** i" is used to represent a 1-teaspoon dose. The symbol's original meaning as a drachm (weight) or fluidrachm (volume) quantities is archaic and should not be used. Because a standard teaspoon is considered to be 5 mL, the patient in this prescription is receiving four daily doses for a total of 20 mL.

$$\frac{200 \text{ mg codeine}}{120 \text{ mL of Rx}} = \frac{x \text{ mg codeine}}{20 \text{ mL of Rx}}$$

$$x = 33 \text{ mg} \qquad \textit{(23:61–64; 225)}$$

12. (A) The weight of codeine phosphate present in each dose is

$$\frac{200 \text{ mg}}{120 \text{ mL}} = \frac{x \text{ mg}}{5 \text{ mL}}$$

x = 8.3 mg per teaspoon

The relationship between codeine and codeine phosphate is easily seen when viewed as a chemical reaction.

$$\begin{matrix} (x \text{ mg}) \\ \text{codeine} \\ + \text{ phosphoric acid} \\ (\text{mol. wt.} = 299) \end{matrix} \rightarrow \begin{matrix} (8.3 \text{ mg}) \\ \text{codeine phosphate} \\ (\text{mol. wt.} = 406) \end{matrix}$$

x = 6 mg codeine base

(1:1199; 23:305)

13. (D) One tablespoonful (tbsp) delivers 15 mL of liquid. In this prescription, the patient is receiving four doses per day for 10 days. Therefore,

$$15 \text{ mL} \times 4 \text{ doses} \times 10 \text{ days} = 600 \text{ mL total}$$

(23:61–64)

14. (D) The nomogram in the USP consists of three parallel vertical lines. The left line is calibrated with height measurements in both centimeters and inches, whereas the right line lists weights in kilograms and pounds. Using data based on the patient's measurements, a line is drawn between the two outside parallel lines. The intercept on the middle line, which is calibrated in square meters of body surface area, allows the estimation of the patient's BSA. *(23:68–71)*

15. (D) In this problem one of two methods could be used, Young's Rule or a body surface area (BSA) calculation. Since the BSA is usually more accurate, it is the preferred

method. The average adult BSA is estimated to be 1.73 m^2. A child's dose can be estimated by

$$\frac{\text{BSA (child)}}{\text{BSA (adult)}} \times \text{Adult dose} = \text{Child's dose}$$

In this question,

$$\frac{0.6\ m^2}{1.73\ m^2} \times 200\ mg = 69 \text{ or } 70\ mg$$

(1:82; 23:68)

16. (D) The median value in a series of numbers is that value in the middle (ie, the number of values lower than the median value is equal to the number of values higher than the median value). The median may not be the same as the average value, which is obtained by adding all of the values together and dividing by the number of values. *(23:260)*

17. (A) The mean value in a series of numbers is obtained by adding all of the values then dividing by the actual number of values. In this example, the diastolic readings were 70 + 84 + 88 + 90 + 70 = 402 divided by 5 = 80.4.

18. (D) A standard deviation is calculated mathematically for experimental data. It shows the dispersion of numbers around the mean (average value). One SD will include approximately 67 to 70% of all values, whereas 2 SDs will include approximately 97 to 98%. *(1:97; 23:261)*

19. (E) 1 mg = 1000 µg. Therefore, 0.15 mg of digoxin contained in 3 mL of the elixir would be equivalent to 150 µg of drug. *(23:49)*

20. (B) Alcohol USP contains 95% V/V ethanol. Therefore,

$$473\ mL \times 95\% = 449\ mL \text{ of ethanol}$$
$$1000\ mL \times 12\% = \underline{120\ mL}$$
$$\text{total} = 569\ mL \text{ of ethanol}$$

$$\frac{569\ mL}{1473\ mL} = 38\%\ V/V$$

(4:7.13; 23:129)

21. (C) The patient is placing 1 drop in each eye three times a day, thus a total of 6 drops. This equates to 0.3 mL since the dropper calibration was 20 drops to a mL.

$$\frac{20 \text{ drops}}{1\ mL} = \frac{6 \text{ drops}}{x\ mL}$$

$$x = 0.3\ mL$$

Since a 4% Pilocar solution contains 4000 mg of drug per 100 mL.

$$\frac{4000\ mg}{100\ mL} = \frac{x\ mg}{0.3\ mL}$$

$$x = 12\ mg$$

(23:62)

22. (D) First, convert the weight in pounds to kilograms.

$$180\ lb \times \frac{1\ kg}{2.2\ lb} = 82\ kg$$

Second, determine the total daily dose.

$$82\ kg \times 2\ mg \times 6 \text{ doses} = 980\ mg$$

(23:67)

23. (D) One hundred mL of Clorox will contain 5.25 g of sodium hypochlorite. The final dilution will be one quart, which is 946 mL. The ratio strength will be

$$\frac{5.25g}{946\ mL} = \frac{1}{x}$$

x = 180, or 1:180 W/V of sodium hypochlorite

In actual practice, Clorox is recommended as a disinfectant for HIV-contaminated equipment when used in a 1:10 dilution. However, this designation refers to 1 mL of *Clorox* in every 10 mL of final dilution. *(23:106)*

24. (E) Four milliliters of a 4% cocaine HCl solution will contain 0.16 g, or 160 mg, of cocaine HCl, or, by proportions:

$$\frac{4000\ mg}{100\ mL} = \frac{x\ mg}{4\ mL}$$

$$x = 160\ mg$$ *(23:98)*

25. **(D)** Use the equation of

$$(Q_1)(C_1) = (Q_2)(C_2)$$

$$(4 \text{ mL})\left(\frac{1}{2000}\right) = (x \text{ mL})\left(\frac{1}{1000}\right)$$

$$\frac{4}{2000} = \frac{x}{1000}$$

$$x = 2 \text{ mL} \qquad \textit{(20:246; 23:120)}$$

26. **(B)** The dosing regimen for this patient consists of 400 mg of cefazolin every 6 hours. When the pharmacist reconstitutes the 1000-mg vials, the strength will be 1000 mg/3 mL of solution.

$$\frac{1000 \text{ mg}}{3 \text{ mL}} = \frac{1600 \text{ mg}}{x \text{ mL}}$$

$$x = 4.8 \text{ mL} \qquad \textit{(23:172)}$$

27. **(E)** The original order requested that the solution be infused over a 20-minute time span. Therefore, 100 mL divided by 20 minutes equals 5 mL/minute. *(23:180)*

28. **(B)** Determine the total time for the infusion by using the relationship of

$$\frac{40 \text{ mEq}}{x} = \frac{0.5 \text{ mEq}}{1 \text{ minute}}$$

$$0.5x = 40 \text{ minutes}$$

$$x = 80 \text{ minutes} \qquad \textit{(4:32.13)}$$

29. **(A)** First determine the mL per hour flow rate to obtain 2 mEq per hour.

$$\frac{2 \text{ mEq}}{x \text{ mL}} = \frac{40 \text{ mEq}}{1000 \text{ mL}}$$

$$x = 50 \text{ mL per hour}$$

Now determine the equivalent flow per minute

$$\frac{50 \text{ mL}}{60 \text{ min}} = \frac{x \text{ mL}}{1 \text{ minute}}$$

$$x = 0.83 \text{ mL per minute} \qquad \textit{(4:32.7)}$$

30. **(A)** Step 1: Determine the drug concentration present in every milliliter.

$$\frac{15{,}000 \text{ U}}{250 \text{ mL}} = \frac{x \text{ U}}{1 \text{ mL}}$$

$$x = 60 \text{ U/mL}$$

Step 2: Determine the mL needed to obtain the concentration requested.

$$\frac{60 \text{ U}}{1 \text{ mL}} = \frac{20 \text{ U}}{x \text{ mL}}$$

$$x = 0.33 \text{ mL}$$

Step 3: Calculate the number of drops needed, based on the administration set being used, to obtain the required volume.

$$\frac{60 \text{ drops}}{1 \text{ mL}} = \frac{x \text{ drops}}{0.33 \text{ mL}}$$

$$x = 19.8 \text{ or } 20 \text{ drops} \qquad \textit{(23:82)}$$

31. **(D)** 200 mg dopamine in 500 mL = 0.4 mg/mL. Because 1 mg = 1000 µg, 0.4 mg = 400 µg; therefore, the final concentration of dopamine will be 400 µg/mL. *(23:174)*

32. **(C)**

$$155 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} \times \frac{5 \text{ µg}}{\text{kg} \times 1 \text{ min}} = 352 \text{ µg/min}$$

Because the solution concentration is 400 µg/mL, divide the dosage rate by the concentration:

$$\frac{352 \text{ µg/min}}{400 \text{ µg/mL}} = 0.88 \text{ mL/min}$$

(23:180)

33. **(C)** 1 equivalent weight of KCl = 74.6 g, therefore, 1 milliequivalent (mEq) = 74.6 mg

$$\frac{1 \text{ mEq}}{74.6 \text{ mg}} = \frac{x \text{ mEq}}{5860 \text{ mg}}$$

$$x = 78.5 \text{ mEq}$$

Or the problem may be solved by using the equation

$$\text{mg of chemical} = \frac{\text{(mEq) (mol. wt.)}}{\text{(valence)}}$$

$$5860 \text{ mg} = \frac{(x)\ (74.6)}{(1)}$$

$$x = 78.5 \text{ mg} \qquad \textit{(23:159)}$$

34. **(D)** Because the valence of calcium is +2, 1 mEq equals 40 mg divided by 2 = 20 mg. Therefore, 1.5 mEq = 30 mg. If there are 30 mg/dL of solution, there will be 300 mg/L.

Or, by using the equation

$$\text{mg of chemical} = \frac{\text{(mEq) (mol. wt.)}}{\text{(valence)}}$$

$$x \text{ mg} = \frac{(1.5 \text{ mEq})\ (40)}{(2)}$$

$$x = 30 \text{ mg/dL or } 300 \text{ mg/L}$$

(23:158–59)

35. **(D)** One equivalent of calcium chloride = 147 (mol. wt.) divided by 2 (valence of calcium) = 73.5 g and 1 mEq = 73.5 mg. Therefore, 40 mEq = 40 × 73.5 mg = 2940 mg, which is 2.94 g.

Or, the problem can be solved by the equation

$$\text{mg of chemical} = \frac{\text{(mEq) (mol. wt.)}}{\text{(valence)}}$$

$$x \text{ mg} = \frac{(40 \text{ mEq})\ (147)}{(2)}$$

$$x = 2940 \text{ mg, or } 2.94 \text{ g}$$

It must be remembered that 40 mEq of calcium combines with 40 mEq of chloride to form 40 mEq of calcium chloride.

The answer 0.80 is obtained if one multiplies the 40 mEq desired by the atomic weight of calcium and then divides by the +2 valence. The use of the atomic weight of calcium is incorrect because the official hydrated calcium chloride is being weighed to obtain the correct amount of calcium. The right answer can be obtained by adding this step:

$$\frac{0.80 \text{ g (Ca)}}{40 \text{ (atomic wt. Ca)}} = \frac{x \text{ g (hydrated calcium chloride)}}{147 \text{ (formula wt. hydrated salt)}}$$

$x = 2.94$ g hydrated calcium chloride

The answer of 2.22 g is incorrect because it assumes that anhydrous calcium chloride (molecular weight of 111) was used. However, the problem specified that the official form, which contains two waters of hydration, was available.

The answer of 5.88 g is obtained if one ignores the +2 valence of calcium. *(1:91; 23:157)*

36. **(B)** 50 mL × 100 U/mL = 5000 U total

$$\frac{10{,}000 \text{ U}}{1 \text{ mL}} = \frac{5{,}000 \text{ U}}{x \text{ mL}}$$

$$x = 0.5 \text{ mL} \qquad \textit{(23:192)}$$

37. **(B)** Because the normal creatinine clearance rate is 100 to 120 mL per minute, this patient's renal function may be estimated to be

40 mL divided by 100 or 120 mL = 25 to 33% of normal (moderate impairment)

80 mg × 25 or 33% = 20 to 26 mg

In actual practice, the dosing interval would be increased. *(23:211)*

38. **(B)** This problem may be solved by alligation or by simply using the relationship

$$[Q_1]\ [C_1] = [Q_2]\ [C_2]$$

$$[480 \text{ mL}]\ [50\%] = [x \text{ mL}]\ [70\%]$$

$$x = 342 \text{ mL} \qquad \textit{(4:7.9)}$$

39. **(A)** One avoirdupois pound contains 454 g. The total number of bacitracin units required is

$$454 \text{ g} \times 200 \text{ U/g} = 90{,}800 \text{ units}$$

$$\frac{500 \text{ U}}{1 \text{ g}} = \frac{90{,}800 \text{ U}}{x \text{ g}}$$

$$x = 182 \text{ g} \qquad \textit{(23:188–90)}$$

40. **(C)** $\frac{5 \text{ g salicylic acid}}{100 \text{ mL of lotion}} = \frac{x \text{ g}}{473 \text{ mL of lotion}}$

$x = 23.7$ g *(23:101)*

41. **(B)** When concentrations of alcohol are listed on labels, the percent V/V is based on absolute alcohol (100% ethanol), although this form of alcohol is seldom used during manufacturing or compounding. Alcohol USP was specified for the formula. Its strength is 95% V/V.

$20 \text{ mL} \times 95\% = 19 \text{ mL}$

$\frac{19 \text{ mL}}{120 \text{ mL}} = 15.8\% \text{ V/V}$

(23:277)

42. **(B)** $\frac{0.25 \text{ g}}{120 \text{ mL}} = \frac{x \text{ g}}{240 \text{ mL}}$

$x = 500$ mg pure triamcinolone

$\frac{40 \text{ mg}}{1 \text{ mL}} = \frac{500 \text{ mg}}{x \text{ mL}}$

$x = 12.5$ mL of the injection solution *(23:120)*

43. **(D)** The mL in 1 lb of propylene glycol can be calculated as

$SG = \frac{W}{V}$

$1.04 = \frac{454 \text{ g}}{x \text{ mL}}$

$x = 436$ mL of propylene glycol in 1 lb

$\frac{\$24.00}{436 \text{ mL}} = \frac{\$\, x}{100 \text{ mL}}$

$x = \$5.50$ *(1:74; 23:88)*

44. **(B)** Total amount of pure tobramycin will be:

In ophthalmic solution $4 \text{ mL} \times 0.3\% = 0.012$ g
In injection $2 \text{ mL} \times 40 \text{ mg/mL} = .08$ g
total in solution of 6 mL = 0.092 g

$\frac{0.092 \text{ g}}{6 \text{ mL}} = 0.0153 \text{ g/mL}$

(4:7.12)

45. **(D)** Two pounds would contain $454 \times 2 = 908$ g of ointment. The final preparation would contain $908 \text{ g} \times 2\% = 18.18$ g of pure hydrocortisone. Because the available hydrocortisone ointment is 5% strength, one would need

$\frac{5 \text{ g}}{100 \text{ g}} = \frac{18.6 \text{ g}}{x \text{ g}}$

$x = 363.2$ g of the 5% ointment

Or, using the equation $(Q_1)(C_1) = (Q_2)(C_2)$

(908 g) (2% W/W) = (x g) (5% W/W)

$x = 363.2$ g *(23:131)*

46. **(B)** A density or SG of 1.25 indicates that 1 mL of the liquid weighs 1.25 g.

Because 1 lb of the ointment contains 5% W/W glycerin,

$454 \text{ g} \times 5\% \text{ W/W} = 22.7$ g of glycerin

$\text{Density} = \frac{W}{V}$

$1.25 = \frac{22.7 \text{ g}}{x \text{ mL}}$

$x = 18.2$ mL *(1:74; 23:88)*

47. **(B)** 500 mL of $D_{30}W$ will contain 150 g of dextrose while $D_{50}W$ contains 50 g of dextrose per 100 mL.

$\frac{50 \text{ g dextrose}}{100 \text{ mL of solution}} = \frac{150 \text{ g dextrose}}{x \text{ mL of solution}}$

$x = 300$ mL

Or, this problem may be solved by using the equation:

$(Q_1)(C_1) = (Q_2)(C_2)$

(x mL) (50%) = (500 mL) (30%)

$x = 300$ mL *(23:133)*

48. (D) This problem can be solved by the alligation alternate or simple parts method

1%		0.3 parts
	0.8%	
0.5%		0.2 parts

Thus, the final solution will contain 0.2 parts of the 0.5% hydrocortisone cream for every 0.3 parts of 1% HC cream for a total of 0.5 parts.

(One may refer to the above parts as 2 parts to every 3 parts for a total of 5 parts.)

$$1\%\ \text{HC cream} = \frac{.3\ \text{parts}}{.5\ \text{parts}} \times 60\ \text{g} = 36\ \text{g}$$

$$0.5\%\ \text{HC cream} = \frac{.2\ \text{parts}}{.5\ \text{parts}} \times 60\ \text{g} = 24\ \text{g}$$

(23:130–34)

49. (B) Because the amount of 0.5% hydrocortisone cream is exactly 60 g, the final weight of the cream will be greater when hydrocortisone powder is added. Therefore, the problem may be solved by the alligation alternate method or by simple algebra.

100% HC		1.5 parts
	2%	
0.5% HC		98 parts

$$\frac{60\ \text{g of } 0.5\%}{98\ \text{parts}} = \frac{x\ \text{g of } 100\%}{1.5\ \text{parts}}$$

$$x = 0.92\ \text{grams}$$

Or, by algebra, let x = weight of 100% HC powder, then

$$(x\ \text{g})\ (100\%) + (60\ \text{g})\ (0.5\%) = (60\ \text{g} + x\ \text{g})\ (2\%)$$

$$x + 0.3 + 6 = 1.2 + .02\,x$$

$$x = 0.92\ \text{g} \qquad \textit{(23:130)}$$

50. (C) Step 1. Determine the amount of sodium thiosulfate in the Rx.

$$100\ \text{mL} \times 1.2\% = 1.2\ \text{g, or } 1200\ \text{mg}$$

Step 2. Multiply the amount of chemical by its "E" value

$$1200\ \text{mg} \times 0.31 = 372\ \text{mg}$$
(equivalent amount of NaCl)

Step 3. Determine amount of NaCl needed as if no other chemical was present.

$$100\ \text{mL} \times 0.9\% = 900\ \text{mg}$$

Step 4. Subtract contribution by chemical (Step 2) from the amount of NaCl (Step 3)

$$900\ \text{mg} - 372\ \text{mg} = 528\ \text{mg},$$

(the amount of NaCl needed to render the solution isotonic)

(1:620–21)

51. (B) Only 45 mL of the prescription must be adjusted to isotonicity because the 15 mL of Zincfrin is already isotonic. An isotonic solution of sodium chloride contains 0.9% sodium chloride:

$$45\ \text{mL} \times 0.009 = 0.4\ \text{g}$$

(1:620–21)

52. (B) The freezing point depression method for determining isotonicity calculations is more accurate than the sodium chloride equivalent method. It is based upon the premise that isotonic solutions have a reduction in freezing points of 0.52 degrees Celsius. This problem now becomes

Step 1: What is the change in the freezing point of a 4% cocaine HCl solution if a 1% solution has a depression of .09 degrees?

$$\frac{1\%}{0.09} = \frac{4\%}{x}$$

$$x = 0.36\ \text{degrees}$$

Step 2: Determine the amount of sodium chloride needed for a total freezing point depression of 0.52 degrees.

Remember that a 0.9% concentration of sodium chloride is isotonic and must have a freezing point depression of 0.52 degrees and that 4% cocaine HCl gave a depression of

0.36 degrees. Thus, the further reduction needed will be 0.52 – 0.36 = 0.16.

$$\frac{0.9\%\ \text{NaCl}}{0.52\ \text{deg}} = \frac{x\ \%\ \text{NaCl}}{0.16}$$

$$x = 0.277\%\ \text{NaCl}$$

Step 3: Since 30 mL of solution is required, 30 mL × .277% = .083 g or 83 mg of sodium chloride. *(4:10.2)*

53. (B) One liter of normal saline contains 0.9% NaCl, or 9 g. To calculate the milliosmolarity of the solution

Step 1. Determine the moles present.

$$\frac{\text{Wt. of chemical}}{\text{Mol. wt.}} = \frac{0.9\ \text{g}}{58.5}$$

$$= 0.154\ \text{moles or } 154\ \text{millimoles}$$

Step 2. Multiply the millimoles by the "i" value. The "i" value is the theoretical number of ions or particles formed by one molecule of chemical assuming complete ionization.

$$154\ \text{millimoles} \times 2 = 308\ \text{milliosmoles/L}$$

(1:615; 23:162)

54. (B) Unlike the previous problem, this question asks for mOsm/100 mL and there are two chemicals present. It is best to calculate the mOsm of each separately, then add the amounts.

$$\text{NaCl}\ \frac{1000\ \text{mg}}{58.5}$$

$$= 17.1\ \text{mM} \times \text{i value of } 2 = 34.2\ \text{mOsm}$$

$$\text{Dextrose}\ \frac{5000\ \text{mg}}{198} = 25.3\ \text{mM} \times \text{i} = 25.3\ \text{mOsm}$$

Total will be: 34.2 mOsm + 25.3 mOsm

$$= 59.5\ \text{mOsm}$$

(1:615; 23:162)

55. (B) One gallon contains 3785 mL.

$$3785\ \text{mL} \times 0.25\% = 9.46 \text{ or } 9.5\ \text{g}$$

Because the volume contributed by the acetic acid is insignificant when compared to 3785 mL, it does not enter into the calculation of the final volume. *(23:101)*

56. (B) The formula weight of ferrous sulfate is 278. The amount of iron present in 300 mg of the chemical will be

$$\frac{\text{Atomic wt. Fe}}{\text{Form. wt. salt}} = \frac{55.9}{278} = \frac{x\ \text{mg}}{300\ \text{mg}}$$

$$x = 60.4\ \text{mg}$$

Choices A or D would be obtained if the correct answer was either doubled or halved to reflect the +2 valence of iron. The valence of iron has no significance in this type of problem because only one atom of iron is present in each molecule of ferrous sulfate.

Choice C assumes that the ferrous sulfate is anhydrous with a molecular weight of 152. This is incorrect, because the 300-mg weight is based on a chemical formula containing 7 waters of hydration.

Choice E is the amount of anhydrous ferrous sulfate present in each 300 mg. The question asks for iron (Fe) only. *(23:306)*

57. (D) A saturated solution of the chemical consists of 1 g of chemical plus 10 mL of alcohol. The exact volume of this solution is unknown because the volume occupied by 1 g of the chemical when dissolved cannot be determined. Therefore, the concentration of the saturated solution must be calculated as a percent W/W, not a percent W/V. The weight of alcohol present will be 8 g, because its specific gravity is 0.80.

$$\frac{\text{solute}}{\text{solute} + \text{solvent}}\ \frac{1\ \text{g}}{1\ \text{g} + 8\ \text{g}} = \frac{1\ \text{g}}{9\ \text{g}} = 11.1\%\ \text{W/W}$$

(23:101)

58. (A) First-order half-lives relate to kinetic constant rate values by the equation

$$t_{1/2} = \frac{0.693}{k}$$

$$14.3\ \text{days} = \frac{0.693}{k}$$

$$k = 0.048/\text{day, or } 4.8\%\ \text{per day}$$

(23:218)

59. **(B)** Because the time interval between preparation and administration is 6 h, and the half-life of the radiopharmaceutical is 6 h, approximately one-half of the original strength has decayed. Therefore, 1 mL of the solution now assaying at 20 mCi/mL is needed. *(23:219)*

60. **(E)** The loss in first-order kinetics is a constant fraction of the immediate past concentration. In this example, the half-life of 6 h allows a quick comparison of the amount of radioactivity remaining.

Original Activity	40 mCi/mL
After 6 h	20 mCi/mL
After 12 h	10 mCi/mL
After 18 h	5 mCi/mL
After 24 h	2.5 mCi/mL

(13:308; 23:218–19)

61. **(B)** Magnesium carbonate has the structure of $MgCO_3$ therefore,

$$\frac{\text{Magnesium}}{\text{Mg carbonate}} = \frac{24.3}{84.3} \times 15\text{ g} = 4.32\text{ g}$$

(4:34.4)

62. **(C)** Since the written formula is based upon a total volume of 350 mL, reduce the amounts for a percentage formula based upon 100%.

$$\frac{27.4\text{ g (anhyd. citric acid)}}{350\text{ mL}} = \frac{x\text{ g anhyd. citric acid}}{100\text{ mL}}$$

$x = 7.83$ grams anhyd. citric acid

Since the hydrated form of citric acid contains 10% impurities (water!), an adjustment may be made by

$$[Q_1]\,[C_1] = [Q_2]\,[C_2]$$

[7.83 g anhy. citric acid] [100%] = [x g hydrous] [90%]

$x = 8.7$ grams of hydrated citric acid

(23:307)

63. **(C)** One of the most convenient methods of solving this problem is using the equation

$$(Q_1)\,(C_1) = (Q_2)\,(C_2)$$

(500 mL) (520 mOsm/L) = (x mL) (300 mOsm/L)

$$300\,x = 260{,}000$$

$x = 867$ mL of final product

Therefore, the amount of water diluent needed = 867 mL − 500 mL = 367 mL. *(1:615; 23:162)*

64. **(B)** Since the concentration expression parts per million is usually based upon one gram of chemical in 1,000,000 mL of solution, conversion of 2 mg/L will involve

$$\frac{2\text{ mg}}{\text{L}} = \frac{.002\text{ grams}}{1000\text{ mL}} = \frac{x\text{ g}}{1{,}000{,}000\text{ mL}}$$

$$1000\,x = 2000$$

$$x = 2\text{ ppm}$$

(23:109)

65. **(B)** Mercury is a solid chemical. Thus, the 5 ppm concentration indicates 5 g of mercury per 1,000,000 mL of solution. Therefore, the grams present in 100 mL will be

$$\frac{5\text{ g mercury}}{1{,}000{,}000\text{ mL}} = \frac{x\text{ g}}{100\text{ mL}}$$

$$1{,}000{,}000\,x = 500$$

$$x = .0005\%$$

(23:109)

CHAPTER 3

Pharmacy

When one peruses the definitions of pharmacy as presented by various state boards of pharmacy, one notices an expansion from the traditional definition of "the art of preparing and dispensing drugs" to "the art or practice of preparing, preserving, compounding, and dispensing drugs plus administering drugs and discovering new drugs through research." With the expanding role of the pharmacist in health care, many states include wording allowing the pharmacist to diagnose and prescribe, usually under set protocols.

Today, pharmacy encompasses all aspects of drug preparation and dispensing, as well as evaluation of therapeutic effects in patients. The term "pharmaceutical care" is being used to stress the duty of the pharmacist to ensure that drug therapy produces maximum beneficial outcomes. This chapter includes basic material with which the practicing pharmacist should be familiar in order to dispense drug products successfully and to serve as the resource person to other health professionals and the general public. This includes knowledge of the manufacture and characteristics of the dosage form, trade names and generic names, drug strengths and commercial dosage forms, packaging, dispensing advice, recognition of significant drug interactions, and the selection of over-the-counter products. Actually, this chapter is intended to include topics and information not specifically designated in the other book chapters. Subsequent chapters stress the pharmacokinetics and therapeutic actions of drugs in the body, the selection of specific drugs to treat various diseases, and the evaluation of therapeutic outcomes.

Questions

DIRECTIONS (Questions 1 through 203): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

1. Official standards for individual drugs and chemicals formulated into dosage forms are published in

(A) *USP/NF*
(B) *USP DI* Volume I
(C) *USP DI* Volume II
(D) *USP DI* Volume III
(E) *PDR*

2. The agency in the United States responsible for selecting appropriate nonproprietary names for drugs is the

(A) AMA
(B) APhA
(C) FDA
(D) USAN
(E) USP

3. Descriptions of the Federal Controlled Substances Act, Approved Drug Products with Therapeutic Equivalence Evaluations, and *USP/NF* dispensing requirements may be found in the

(A) *USP DI* Volume I
(B) *USP DI* Volume II
(C) *USP DI* Volume III
(D) *Facts and Comparisons*
(E) *PDR*

4. Prescription drug descriptions expressed in layperson's terms and useful as handouts for patients may be photocopied from the

(A) *USP DI* Volume I
(B) *USP DI* Volume II
(C) *USP DI* Volume III
(D) *Facts and Comparisons*
(E) *Remington's Pharmaceutical Sciences*

5. According to the *USP*, the instruction "protect from light" in a monograph indicates storage in a

(A) dark place
(B) amber glass bottle
(C) light-resistant container
(D) hermetic container
(E) tight glass container

6. According to *USP* standards, a refrigerator can be used to store pharmaceuticals that specify storage in a

I. freezer
II. cool place
III. cold place

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

7. The expiration date on a pharmaceutical container states "Expires July 2005." This statement means that by that expiration date, the product may have lost

(A) up to 5% of its activity
(B) up to 10% of its activity
(C) up to 20% of its activity
(D) up to 50% of its activity
(E) sufficient activity to be outside *USP* monograph requirements

8. If a bottle of tablets has an expiration date of "July 2002," the pharmacist may continue to dispense the product

(A) up to 1 year after the expiration date
(B) only through July 1, 2002
(C) only through July 15, 2002
(D) only through July 31, 2002
(E) if the pharmacist informs the patient to discard unused tablets in 6 months

9. A pharmacist has reconstituted a powder dosage form to form a solution. Which of the following statement(s) concerning a Beyond-Use Date is (are) appropriate when determining an expiration date for this product?

I. The beyond-use date is identical to the manufacturer's expiration date.
II. The beyond-use date is never more than 10 days for reconstituted products.
III. The beyond-use date for nonsolid dosage forms shall not be greater than one year from the date of dispensing.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

10. Which one of the following practices would NOT be classified as "alternative medicine" in the United States?

(A) allopathy
(B) chiropractic
(C) naturopathy
(D) nutraceutical
(E) reflexology

11. An alternative medical practice that stresses the use of extremely small doses of drugs is known as

(A) folk medicine
(B) holistic medicine
(C) homeopathic medicine
(D) orthomolecular medicine
(E) faith healing

12. Solubility of a substance may be expressed in several ways. When a quantitative statement of solubility is given in the *USP*, it is generally expressed as

(A) g of solute soluble in 1 mL of solvent
(B) g of solute soluble in 100 mL of solvent
(C) mL of solvent required to dissolve 1 g of solute
(D) mL of solvent required to dissolve 100 g of solute
(E) mL of solvent required to prepare 100 mL of saturated solution

13. Which of the following alkaloids exhibits good water solubility?

I. morphine HCl
II. cocaine
III. atropine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

14. Which of the following forms of the basic drug haloperidol will have good water solubility?

I. hydrochloride
II. lactate
III. decanoate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15. Which one of the following chemicals is NOT suitable as a drug excipient?

(A) methyl paraben
(B) starch
(C) glycerin
(D) benzocaine
(E) lactose

16. Which of the following chemicals may be included in a drug solution as a chelating agent?

(A) ascorbic acid
(B) hydroquinone
(C) edetate
(D) sodium bisulfite
(E) fluorescein sodium

17. Which of the following ions may be effectively chelated by EDTA?

I. sodium
II. lithium
III. lead

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

18. Although most drugs in pharmaceutical dosage forms are expected to decompose following first-order kinetics, an exception are drugs formulated in

(A) capsules
(B) oral solutions
(C) oral suspensions
(D) tablets
(E) suppositories

19. An early sign of a decomposing epinephrine solution is the presence of a

(A) brown precipitate
(B) pink color
(C) white precipitate
(D) crystal
(E) red color

20. On exposure to air, aminophylline solutions may develop

(A) crystals of theophylline
(B) a gas
(C) a precipitate of aminophylline
(D) a precipitate of ethylenediamine
(E) a straw color

21. The process of grinding a substance to a very fine powder is termed

(A) levigation
(B) sublimation
(C) trituration
(D) pulverization by intervention
(E) maceration

22. The term "impalpable" refers to a substance that is

(A) bad tasting
(B) not perceptible to the touch
(C) greasy
(D) nongreasy
(E) tasteless

23. Which one of the following general characteristics is NOT true for alkaloids?

(A) contain nitrogen in the molecule
(B) have good alcohol solubility
(C) have pKa's less than 7
(D) often exhibit stereoisomerism
(E) have poor water solubility

24. The term "chiral" is related to a drug's

(A) chelating ability
(B) eutectic properties
(C) stereoisomerism
(D) partition coefficient
(E) water solubility

25. Different crystalline forms (polymorphs) of the same drug exhibit different

I. metabolism rates
II. melting points
III. solubilities

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

26. Benzalkonium chloride is a germicidal surfactant that is rendered inactive in the presence of

(A) organic acids
(B) gram-negative organisms
(C) cationic surfactants
(D) soaps
(E) inorganic salts

27. The shrinkage that occurs when alcohol and purified water are mixed is primarily due to

(A) attractive van der Waals forces
(B) covalent bonding
(C) hydrogen bonding
(D) ionic bonding
(E) temperature changes

28. An example of a nonionic surfactant would be

(A) ammonium laurate
(B) cetylpyridinium chloride
(C) dioctyl sodium sulfosuccinate
(D) sorbitan monopalmitate
(E) triethanolamine stearate

29. According to the Poiseuille equation, the factor that has the relatively greatest influence on the rate of flow of liquid through a capillary tube is the

(A) length of the tube
(B) viscosity of the liquid
(C) pressure differential on the tube
(D) radius of the tube
(E) temperature of the liquid

30. Patients following low-sodium diets may resort to the use of sodium-free salt substitutes such as NoSalt. The major ingredient in these products is

(A) ammonium chloride
(B) calcium chloride
(C) potassium chloride
(D) potassium iodide
(E) none of these

31. Potassium supplements are administered in all of the following manners EXCEPT

(A) IV infusion
(B) IV bolus
(C) elixirs, po
(D) effervescent tablets
(E) slow-release tablets, po

32. Which of the following statements concerning fluorouracil is NOT true?

(A) Its chemical structure is a modified pyrimidine similar to uracil and idoxuridine.
(B) It is effective only when administered by injection.
(C) Anorexia and nausea and vomiting are very common side effects.
(D) The drug interferes with the synthesis of ribonucleic acid.
(E) Leukopenia is a major clinical toxic effect.

33. The product inserts for many drug products contain cautionary statements. Which one of the following sequences lists the three types of cautions in the order of least serious to most serious?

(A) contraindication, precaution, warning
(B) precaution, warning, contraindication
(C) warning, contraindication, precaution
(D) warning, precaution, contraindication
(E) contraindication, warning, precaution

34. A comparison of individual amino acids present in commercial amino acids injection solutions may be found in

I. *Facts and Comparisons*
II. *Trissel's Handbook on Injectable Drugs*
III. *Remington's Pharmaceutical Sciences*

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(D) I, II, and III

35. The containers used to package drugs may consist of several components and/or be composed of several materials. The release of an ingredient from packaging components into the actual product is best described by the term

(A) adsorption
(B) absorption
(C) leaching
(D) permeation
(E) porosity

36. Hypodermic needle sizes are expressed by gauge numbers. The gauge number refers to the

(A) bevel size
(B) external diameter of the cannula
(C) internal diameter of the cannula
(D) length of the needle
(E) size of the lumen opening

37. "Winged" needles are most closely associated with which type of injections?

(A) intradermal
(B) intramuscular
(C) intrathecal
(D) intravenous
(E) subcutaneous

38. Insulin preparations are usually administered by

(A) intradermal injection
(B) intramuscular injection
(C) intravenous bolus
(D) intravenous infusion
(E) subcutaneous injection

39. Which one of the following needles is most suited for the administration of insulin solutions?

(A) 16G 5/8″
(B) 21G 1/2″
(C) 21G 5/8″
(D) 25G 5/8″
(E) 25G 1″

40. The term "venoclysis" is most closely associated with

(A) intravenous injections
(B) intrathecal injections
(C) intravenous infusions
(D) intrapleural withdrawals
(E) peritoneal dialysis

41. The designation "minibottles" refers to

(A) partially filled parenteral bottles with 50- to 150-mL volumes
(B) any parenteral bottle with a capacity of less than 1 L
(C) 10 to 30 mL glass vials
(D) prescription bottles with capacities of 4 oz or less
(E) vials with a capacity of less than 10 mL

42. The term "piggyback" is most commonly associated with

(A) intermittent therapy
(B) intrathecal injections
(C) intravenous bolus
(D) slow intravenous infusions
(E) total parenteral nutrition

43. Which of the following acronyms refer to parenteral nutrition?

I. TPN
II. TNA
III. PMN

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

44. What is the approximate maximum volume of fluid that should be administered daily by intravenous infusion to a stabilized patient?

(A) 1 L
(B) 4 L
(C) 8 L
(D) 12 L
(E) 16 L

45. Although isotonicity is desirable for almost all parenterals, it is particularly critical for

(A) intra-articular injections
(B) intradermal injections
(C) intramuscular injections
(D) intravenous injections
(E) subcutaneous injections

46. Which one of the following designations is most appropriate for a medical order requiring an intravenous bolus injection?

(A) per IV
(B) IVP
(C) IVPB
(D) po
(E) KVO

47. The quantities of all ingredients present in parenteral solutions must be specified on the label EXCEPT for

I. antimicrobial preservatives
II. isotonicity adjustors
III. pH adjustors

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

48. Which one of the following commonly available large-volume dextrose solutions for intravenous use is isotonic?

(A) 2.5%
(B) 5.0%
(C) 10%
(D) 20%
(E) 50%

49. A suspension is NOT a suitable dosage form for

(A) intra-articular injections
(B) intradermal injections
(C) intramuscular injections
(D) intravenous injections
(E) subcutaneous injections

50. Which of the following injectables is (are) isotonic with human red blood cells?

I. D_5W
II. D_5W/NS
III. $D_5W/.45NS$

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

51. Even distribution of a drug into the blood after an IV bolus injection can be expected

(A) instantaneously
(B) within 4 minutes
(C) in 5 to 10 minutes
(D) within 30 minutes
(E) only after a few hours

52. The usual expiration date that should be placed on a parenteral admixture prepared in a hospital pharmacy is

(A) 1 hour
(B) 24 hours
(C) 48 hours
(D) 72 hours
(E) 1 week

53. Which of the following types of injection routes should be limited to volumes of 1 mL or less?

I. intramuscular into gluteus maximus
II. intramuscular into deltoid
III. subcutaneous

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

54. The osmotic pressure of a 0.1 molar dextrose solution will be approximately how many times that of a 0.1 molar sodium chloride solution?

(A) 0.5
(B) 1
(C) 2
(D) 3
(E) 4

55. Parenteral solutions that are isotonic with human red blood cells have an osmolality of approximately how many mOsm/L?

(A) 20
(B) 40
(C) 50
(D) 150
(E) 300

56. An IM injection site suitable for a small child (< 3 years of age) is the

(A) gluteus maximus
(B) gluteus minimal
(C) gluteus ultima
(D) ventrogluteal
(E) vastus lateralis

57. A health worker will inject the smallest volume of drug solution when using which one of the following routes of administration?

(A) intravenous
(B) intramuscular
(C) intrathecal
(D) intradermal
(E) subcutaneous

58. Which one of the following parenteral solutions is considered to most closely approximate the extracellular fluid of the human body?

(A) dextrose 2½% and sodium chloride 0.45% injection
(B) lactated Ringer's injection
(C) Ringer's injection
(D) sodium chloride injection
(E) sodium lactate injection

59. The parenteral system known as "ADD-Vantage" is best described as being a

(A) disposable needle and syringe
(B) premixed minibag of drug solution
(C) two-compartment container
(D) vial attached to a minibag of diluent
(E) burette type of administration set

60. Which of the following parenteral routes of administration is (are) considered suitable for heparin sodium injection *USP*?

I. continuous IV infusion
II. subcutaneous
III. intramuscular

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

61. The IV fluid systems that use glass bottles may be divided into two types according to the

(A) presence or absence of a vacuum in the bottle
(B) presence or absence of an airway tube in the bottle

(C) use of amber versus clear glass
(D) size (volume) of the available solutions
(E) presence or absence of pressure in the bottle

62. Which of the following facts concerning insulin is (are) true?

I. degradation occurs only in the liver
II. product is available without a prescription
III. drug has a short plasma half-life

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

63. Which of the following vitamins possesses antioxidant properties?

I. ascorbic acid
II. ergocalciferol
III. pantothenic acid

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

64. Which one of the following parenteral antibiotics is the most stable in an aqueous solution?

(A) gentamicin sulfate
(B) methicillin sodium
(C) oxacillin sodium
(D) tetracycline hydrochloride
(E) vancomycin hydrochloride

65. Methylparaben is an ester of

(A) benzoic acid
(B) *p*-hydroxybenzoic acid
(C) para-aminosalicylic acid
(D) propionic acid
(E) benzyl alcohol

66. Which of the descriptions of Pharmacy Bulk Packages is (are) true?

I. units intended for preparation of sterile parenterals
II. do not have an antimicrobial preservative
III. may be used for direct infusion of drugs into patients

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

67. Parenteral containers of potassium chloride concentrate must be packaged

(A) as single-dose units only
(B) in vials not greater than 20 mL capacity
(C) in vials with a capacity of 10 mL or less
(D) with a black flip-off button
(E) with a red flip-off button

68. What is the usual maximum volume allowed as a parenteral package for Bacteriostatic Water for Injection?

(A) 10 mL
(B) 20 mL
(C) 30 mL
(D) 50 mL
(E) 60 mL

69. Biologicals can be used to obtain either active or passive immunity. Which one of the following pairs is NOT correct?

(A) antiserum, passive immunity
(B) antitoxin, passive immunity
(C) human immune serum, active immunity
(D) toxoid, active immunity
(E) vaccine, active immunity

70. Which one of the following is a vaccine used for active immunization against measles (rubeola)?

(A) Attenuvax
(B) Fluogen
(C) Recombivax HB
(D) Havrix
(E) Sabin

71. The route of administration for tuberculin, *USP* is

(A) intradermal
(B) subcutaneous
(C) intramuscular
(D) intra-arterial
(E) interarticular

72. The intermediate tuberculin skin test (intermediate strength PPD) contains

(A) 2 tuberculin units
(B) 5 tuberculin units
(C) 25 tuberculin units
(D) 250 tuberculin units
(E) 500 tuberculin units

73. Tuberculin syringes are

I. only suitable for administration of TB vaccine
II. prefilled syringes
III. 1 mL units with 0.05 mL accuracy

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

74. Immune serum globulin (gamma globulin) is usually administered by what type of injection?

(A) intradermal
(B) intramuscular
(C) intravenous
(D) subcutaneous
(E) any of the usual methods of injection

75. All of the following are used for the prophylaxis or treatment of diseases EXCEPT

(A) antitoxins
(B) antivenins
(C) globulins
(D) serums
(E) serum albumin

76. The usual storage condition specified for biologicals is

(A) below 2° C
(B) 2–8° C
(C) a cool place
(D) 8–15° C
(E) room temperature

77. All of the following descriptions of toxoids are true EXCEPT

(A) detoxified toxins
(B) antigens
(C) produce permanent immunity
(D) are often available in a precipitated or adsorbed form
(E) produce artificial active immunity

78. The DTP series of injections is intended for administration to

(A) infants
(B) children
(C) children 6 years and older
(D) children and adults
(E) only after puberty

79. All of the following are viral infections EXCEPT

(A) influenza
(B) measles
(C) mumps
(D) hepatitis
(E) typhoid fever

80. All of the following are bacterial infections EXCEPT

(A) cholera
(B) plague

(C) rabies
(D) pertussis
(E) tuberculosis

81. Which of the following preparations will induce passive rather than active immunity?

(A) tetanus toxoid
(B) botulism antitoxin
(C) typhoid vaccine
(D) mumps virus vaccine, attenuated
(E) cholera vaccine

82. Which one of the following chemicals is used as a topical antiseptic?

(A) aluminum acetate
(B) calcium hydroxide
(C) chlorhexidine gluconate
(D) coal
(E) hydroquinone

83. Which of the following is considered effective in the treatment of accidental drug poisoning?

I. activated charcoal
II. ipecac syrup
III. "universal antidote"

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

84. Which one of the following compounds is NOT adsorbed by activated charcoal?

(A) acetaminophen
(B) cyanide
(C) phenothiazines
(D) salicylates
(E) tricyclic antidepressants

85. A cough syrup is labeled as containing 20% alcohol by volume. Which of the following statements is (are) true?

I. Each 100 mL of syrup contains exactly 20 mL Alcohol *USP*.
II. There is the equivalent of 20 mL of absolute alcohol present in every 100 mL of syrup.
III. The strength of this product may be expressed as 40 proof.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

86. Which of the following chemicals is (are) included in topical formulas as sunscreens?

I. benzophenones
II. cinnamates
III. methyl salicylate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

87. A fair-skinned client claims that he normally begins to sunburn in approximately 30 minutes when exposed to the midday sun. What maximum length of protection could he expect using a sun lotion with an SPF of 12?

(A) 1 hour
(B) 2 to 3 hours
(C) 4 to 6 hours
(D) 10 to 12 hours
(E) 24 hours

88. Colostomy pouches are classified by

I. an open versus closed design
II. size of stoma
III. whether for a male or female

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

89. For which one of the following categories of chemicals is denaturation a major stability problem?

(A) amino acids
(B) benzodiazepines
(C) catecholamines
(D) cephalosporins
(E) proteins

90. Which of the following statements concerning medicinal oxygen therapy is (are) true?

I. Medical oxygen has a prescription-only status.
II. The usual flow rate for the relief of hypoxemia is 2 liters/minute.
III. Compressed oxygen in tanks is the only form available for home use.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

91. Which of the following are used to prepare "targeted drug delivery systems"?

I. liposomes
II. nanoparticles
III. transdermal patches

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

92. Techniques used in the development of "biotechnological drugs" include

I. gene splicing
II. preparation of monoclonal antibodies
III. lyophilization

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

93. Most of the recently developed biotechnological drugs are formulated into which dosage form?

(A) inhalation solutions
(B) parenteral
(C) capsules
(D) tablets
(E) topicals

94. Which one of the following drugs is NOT prepared by recombinant DNA technology?

(A) epoetin
(B) erythropoietin
(C) Humulin
(D) interferon
(E) urokinase

95. Which of the following home diagnostic tests incorporates monoclonal antibodies into the testing procedure?

I. fecal occult blood
II. ovulation prediction
III. pregnancy determination

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

96. The Norplant implant system is

I. inserted under the skin
II. effective for only 1 year
III. classified as a targeted delivery system

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

97. Uses for surfactants in pharmaceutical products include

I. percutaneous absorption enhancers
II. cleansing agents
III. therapeutic activity

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

98. The HLB system is most applicable for the classification of which surfactants?

(A) anionic
(B) ampholytic
(C) cationic
(D) nonionic
(E) either anionic or cationic

99. Vehicles for nasal medications should possess all of the following properties EXCEPT

(A) an acid pH
(B) isotonicity
(C) high buffer capacity
(D) ability to resist growth of microorganisms
(E) all of the above are important properties; no exceptions

100. Which one of the following chemicals is NOT suitable for use as an antioxidant?

(A) ascorbyl palmitate
(B) ascorbic acid
(C) butylated hydroxytoluene
(D) chlorobutanol
(E) vitamin E

101. While most iron salts are administered orally, one commercially available parenteral product is

(A) Chel-Iron
(B) Feosol
(C) Simron
(D) InFeD
(E) Troph-Iron

102. Which one of the following chemicals is an effective and safe drug in the treatment of either diarrhea or constipation?

(A) activated charcoal
(B) bismuth salts
(C) kaolin
(D) attapulgite
(E) polycarbophil

103. Simethicone is most likely to be included in what type of OTC product?

(A) antacid
(B) cough product
(C) decongestant
(D) laxative
(E) weight control

104. Insoluble bismuth salts are used as adsorbents and also possess useful astringent and protective properties. A commercial product containing a bismuth compound is

(A) Dulcolax
(B) Donnagel
(C) Kaopectate
(D) Pepto-Bismol
(E) Rheaban

105. Which of the following antidiarrheal products contains the adsorbent clay attapulgite?

I. Donnagel
II. Kaopectate suspension
III. Parepectolin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

106. A sympathomimetic often present in OTC appetite suppressants is

(A) caffeine
(B) ephedrine
(C) phenylephrine
(D) phenylpropanolamine
(E) pseudoephedrine

107. Which of the following internal analgesic products contain ketoprofen?

I. Actron
II. Aleve
III. Nuprin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

108. Which of the following drugs have label warnings against their use during pregnancy, especially during the last trimester?

I. acetaminophen
II. aspirin
III. ibuprofen

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

109. Under which of the following trade names is an antiflatulent formula sold?

(A) Amphojel
(B) Citrucel
(C) Mylicon
(D) Stress Formula
(E) Pert Plus

110. Which one of the following OTC internal analgesics contains magnesium salicylate?

(A) Bromo Seltzer
(B) Doan's Original
(C) Ecotrin
(D) Pamprin
(E) Sinarest

111. Advantages of dextromethorphan as a cough suppressant include all of the following EXCEPT

(A) as effective as codeine on a weight/weight basis
(B) does not cause respiratory depression
(C) is nonaddicting
(D) doses of 10 to 15 mg suppress coughing for at least 4 hours
(E) maximum daily adult dose is 30 mg

112. When dispensing Emetrol, which of the following consultations is (are) appropriate?

I. Indicated for both nausea and vomiting due to an upset stomach.
II. Take 15 to 30 mL every 15 minutes for not more than five doses.
III. If desired, dilute with water to ease administration.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

113. Disadvantages of calcium carbonate as an antacid include all of the following EXCEPT

(A) some patients may develop hypercalcemia
(B) capacity for acid neutralization is poor
(C) may cause constipation
(D) may induce gastric hypersecretion
(E) prolonged use may induce renal calculi and decreased renal function

114. Which of the following products contain calcium carbonate as the active ingredient?

I. Basaljel capsules
II. Rolaids chewable tablets
III. Titralac chewable tablets

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

115. Which one of the following antacid products is a chemical combination of aluminum and magnesium hydroxides?

(A) Gelusil
(B) Maalox
(C) Mylanta
(D) Riopan
(E) Tums

116. Masking the bitter taste of drugs may be accomplished by using which of the following tablet coatings?

I. enteric
II. film
III. sugar

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

117. Advantages to the manufacturer for tablet film coating when compared to sugar coating include

I. shorter production times
II. less gross weight
III. lower incidence in coat chipping

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

118. Which one of the following statements concerning bisacodyl is NOT true?

(A) Laxative action occurs within 6 hours after oral administration.
(B) Action of the suppositories occurs within 1 hour of insertion.
(C) Suppositories may cause rectal irritation with continued administration.
(D) Tablets should be swallowed whole.
(E) Tablets should be administered with milk to avoid gastric irritation.

119. Which of the following is NOT used primarily as a diluent in tablet formulations?

(A) magnesium stearate
(B) dicalcium phosphate
(C) lactose
(D) mannitol
(E) starch

120. Which of the following is NOT a function of the lubricant in a tablet formulation?

(A) improves flow properties of granules
(B) reduces powder adhesion onto the dies and punches
(C) improves tablet wetting in the stomach
(D) reduces punch and die wear
(E) facilitates tablet ejection from the die

121. Aspartame is included in some drug products as a

(A) nutrient
(B) vitamin
(C) solubilizer
(D) sweetener
(E) stimulant

122. The active ingredient in Ex-Lax is

(A) bisacodyl
(B) methyl cellulose
(C) phenolphthalein
(D) sennosides
(E) docusate

123. An antihypertensive drug product that is based on circadian rhythm is

(A) Catapres (clonidine)
(B) Covera-HS (verapamil)
(C) Aldomet (methyldopa)
(D) Monopril (fosinopril)
(E) Vasotec (enalapril)

124. Which of the following trademarked dosage forms is enteric coated?

(A) Enduret
(B) Enseal
(C) Extentab
(D) Filmtab
(E) Spansule

125. A sweetener that is widely employed in chewable tablet formulas is

(A) aspartame
(B) glucose
(C) lactose
(D) mannitol
(E) sucrose

126. Mannitol may be included in lyophilized products as a

(A) buffer
(B) bulking agent
(C) preservative
(D) sweetener
(E) tonicity adjuster

127. Benzyl alcohol is present in some parenteral solutions as a (an)

(A) antimicrobial preservative
(B) antioxidant
(C) chelating agent
(D) buffering agent
(E) tonicity adjuster

128. Which of the following properties is desirable in a pharmaceutic suspension?

I. caking
II. pseudoplastic flow
III. thixotropy

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

129. Characteristics of inhalation aerosol dosage forms include

I. avoid first-pass effect
II. rapid onset of action
III. can administer large amounts of drug to intended site

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

130. Which of the following ingredients is (are) packaged as OTC MDIs (metered-dose inhalers) for asthmatics?

I. epinephrine
II. ephedrine
III. metaproterenol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

131. An ileostomy differs from a colostomy in which of the following characteristics?

I. The discharge from an ileostomy is more viscous.
II. The stoma is significantly larger.
III. The discharge is more irritating to the skin.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

132. Which one of the following narcotics may NOT be used for medicinal purposes in this country?

(A) diacetylmorphine
(B) ethylmorphine
(C) dihydrocodeinone
(D) methylmorphine
(E) all are permitted

133. Burns are classified according to relative severity. Characteristics of a first-degree burn are

(A) erythema, pain, no blistering
(B) erythema, pain, blistering
(C) blisters, pain, skin will regenerate

(D) no blisters, leathery appearance of skin, skin grafting necessary
(E) blackened skin, danger of deep infection

134. Effective local anesthetics present in OTC burn remedies include

I. benzocaine
II. lidocaine
III. phenol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

135. For effectiveness as a local anesthetic, the level of benzocaine in a topical preparation should be AT LEAST

(A) 0.1%
(B) 1.0%
(C) 2.0%
(D) 5.0%
(E) 25%

136. Which one of the following statements concerning dextranomer (Debrisan by Johnson & Johnson) is NOT correct?

(A) Aids in the removal of wound exudates.
(B) Can be used to treat decubitus ulcers.
(C) Consists of spherical hydrophilic beads.
(D) Is effective in the healing of both secreting and nonsecreting wounds.
(E) Must be physically removed after treatment.

137. Rectal clinical thermometers differ from oral thermometers in

(A) bulb shape
(B) stem length
(C) distance between graduation marks on the stem
(D) standards for accuracy
(E) stem shape

138. A basal thermometer is

(A) a rectal thermometer
(B) used to estimate time of ovulation
(C) used to determine basal metabolic rate
(D) graduated only in Celsius degrees
(E) used vaginally

139. The "French" scale is commonly used in this country for denoting the diameters of

I. urinary catheters
II. enteral feeding tubes
III. syringe needles

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

140. Which one of the following statements concerning allergic reactions to insect bites and stings is NOT true?

(A) Cross-sensitization to bites of different insects (ants, wasps, bees, etc.) can be expected.
(B) Death may occur due to anaphylactic reaction.
(C) The initial systemic reaction will usually occur within 20 minutes of the time of the bite.
(D) The toxicity of the venom is the prime cause of the severe reaction or death.
(E) Subsequent sting episodes usually cause more severe reactions than the earlier stings.

141. Emergency insect sting and bite kits usually contain all of the following except

(A) antiseptic pads
(B) antihistamines
(C) epinephrine HCl injection
(D) tourniquet
(E) tweezers

142. Pamabrom is present in certain OTC products as a (an)

(A) analgesic
(B) diuretic
(C) antirheumatic
(D) sedative
(E) mild stimulant

143. Which one of the following procedures has been recognized by the FDA for the removal of ear cerumen?

(A) carbamide peroxide
(B) diluted acetic acid
(C) cotton tips wetted with warm water
(D) cotton tips wetted with alcohol
(E) vinegar

144. Which one of the following procedures would NOT improve the absorption of a drug into the skin?

(A) Applying the ointment and covering the area with an occlusive bandage or Saran wrap.
(B) Incorporating an oil-soluble drug in polyethylene glycol ointment rather than white ointment.
(C) Applying the medicated ointment on the back of the hand rather than on the palms.
(D) Increasing the concentration of the active drug in the ointment bases.
(E) Using an ointment base in which the active drug has excellent solubility.

145. Benzocaine may be present in some OTC products as

(A) an appetite suppressant
(B) a topical antiseptic
(C) a preservative
(D) a source of nitrogen
(F) an antiasthmatic

146. Melatonin is available is some products as a (an)

(A) amino acid supplement
(B) sleep aid
(C) digestant
(D) noncaloric sweetener
(E) coloring agent

147. The cosmetic lotion, Eucerin Light Moisture-Restorative, contains allantoin, which is present as a (an)

(A) antibacterial agent
(B) antifungal agent
(C) antipruritic
(D) emollient
(E) vulnerary (healing agent)

148. Which one of the following drug products is NOT formulated into a soft gelatin capsule?

(A) cyclosporine
(B) ethchlorvynol
(C) ethosuximide
(D) prochlorperazine
(F) ranitidine

149. Characteristics of rectal drug administration include all of the following EXCEPT

(A) neutral pH of colon fluids lessens possible drug inactivation by stomach acidity
(B) drugs may avoid first-pass hepatic inactivation
(C) drugs intended for systemic activity can be administered
(D) the release and absorption of drugs is predictable
(E) irritating drugs have less effect on the rectum than on the stomach

150. Most commercial vaginal suppositories use a base of

(A) beeswax
(B) cocoa butter
(C) glycerin
(D) glycerinated gelatin
(E) polyethylene glycols

151. Which one of the following diluents is usually used for compressed vaginal tablet formulation?

(A) lactose
(B) starch
(C) sucrose
(D) talc
(E) glucose

152. Which of the following vaginal suppository products have contraceptive properties?

I. Norforms
II. Terazol
III. Semicid

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

153. Starch may be included in tablet formulations as a

I. binder
II. disintegrant
III. lubricant

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

154. Carbomers may be included in a topical product as

(A) antimicrobial preservatives
(B) buffers
(C) penetration enhancers
(D) sweeteners
(E) thickening agents

155. Which one of the following statements concerning tablet dissolution is NOT true?

(A) Disintegration precedes dissolution.
(B) In vitro disintegration is usually a good predictor of dissolution.
(C) Changing a drug's crystalline state may change dissolution rates.
(D) Increasing tablet compression will increase dissolution rates.
(E) Micronization of drug powder will decrease dissolution times.

156. Disintegration tests are required for which of the following types of tablets?

I. sugar coated
II. enteric coated
III. buccal

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

157. The colligative properties of a solution are related to the

(A) total number of solute particles
(B) pH
(C) number of ions
(D) number of un-ionized molecules
(E) the ratio of the number of ions to the number of molecules

158. Colligative properties are useful in determining

(A) tonicity
(B) pH
(C) solubility
(D) sterility
(E) stability

159. For a solution to be isotonic with blood, it should have the same

(A) salt content
(B) pH
(C) fluid pressure
(D) osmotic pressure
(E) specific gravity

160. Mixing a hypertonic solution with red blood cells may cause _____ of the red blood cells.

(A) bursting
(B) chelating
(C) crenation
(D) hemolysis
(E) hydrolysis

161. Sodium chloride equivalents are used to estimate the amount of sodium chloride needed to render a solution isotonic. The sodium chloride equivalent, or "E" value, may be defined as the

(A) amount of sodium chloride that is theoretically equivalent to 1 gram of a specified chemical
(B) amount of a specified chemical theoretically equivalent to 1 gram of sodium chloride
(C) milliequivalents of sodium chloride needed to render a solution isotonic
(D) weight of a specified chemical that will render a solution isotonic
(E) percent sodium chloride needed to make a solution isotonic

162. A second method for adjusting solution to isotonicity is based on

(A) boiling point elevation
(B) blood coagulation time
(C) freezing point depression
(D) milliequivalent calculation
(E) refractive index

163. All aqueous solutions that freeze at –0.52° C are isotonic with red blood cells. They are also isoosmotic with each other. Which of the following apply?

(A) Both statements are true.
(B) Both statements are false.
(C) The first statement is true but the second is false.
(D) The second statement is true but the first is false.
(E) There is no correlation between freezing points and osmotic pressures of solutions.

164. Which one of the following reference sources has the most extensive listings of sodium chloride equivalents and freezing point depression values?

(A) *Merck Manual*
(B) *Merck Index*
(C) *Remington*
(D) *USP/NF*
(E) *USP DI*

165. All of the following have been included in ophthalmic solutions as viscosity builders EXCEPT

(A) hydroxypropylmethylcellulose
(B) polyvinyl alcohol
(C) polyvinylpyrrolidone
(D) methylcellulose
(E) veegum

166. The main reason why methylcellulose and similar agents are included in ophthalmic solutions is to

(A) increase drop size
(B) increase ocular contact time
(C) reduce inflammation of the eye
(D) reduce tearing during instillation of the drops
(E) reduce drop size

167. The presence of *Pseudomonas aeruginosa* would be of particular danger in an ophthalmic solution of

(A) atropine sulfate
(B) fluorescein sodium
(C) pilocarpine hydrochloride
(D) silver nitrate
(E) zinc sulfate

168. A second microorganism that has resulted in ophthalmic infections in patients using contact lens solutions is

(A) *Acanthamoeba*
(B) *Aspergillus*
(C) *Escherichia*

(D) *Heliobacter*
(E) *Trichophyton*

169. The combination of preservatives that appears to be most effective for ophthalmic use consists of

(A) benzalkonium chloride and edetate
(B) benzalkonium chloride and chlorobutanol
(C) chlorobutanol and EDTA
(D) methyl and propyl paraben
(E) phenylmercuric nitrate and phenylethyl alcohol

170. Which of the following ophthalmic solutions may be dispensed on a prescription for epinephrine borate solution?

I. epinal (Alcon)
II. epifrin (Allergan)
III. glaucon (Alcon)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

171. Which of the following ingredients may be present in a soft contact lens product to remove protein build-up?

I. benzalkonium chloride
II. subtilisin
III. papain

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

172. The capacity of the human eye for instilled ophthalmic drops is approximately

(A) 0.01 to 0.05 mL
(B) 0.1 mL
(C) 0.5 mL
(D) 1.0 mL
(E) 2.0 mL

173. The presence of sodium bisulfite in a drug solution implies that the drug

(A) has poor water solubility
(B) is heat labile
(C) is susceptible to oxidation
(D) requires an alkaline media
(E) will sustain growth of microorganisms

174. Which one of the following side effects occurs in some individuals who are sensitive to bisulfites?

(A) difficulty in breathing
(B) a dry cough
(C) diarrhea
(D) dizziness
(E) upset stomach

175. Which one of the following statements concerning Lyme disease and its vaccine is NOT accurate?

(A) Vaccine is marketed as LYMErix.
(B) Vaccine is considered to be approximately 99% effective.
(C) Disease is caused by the spirochete, *B burgdorferi.*
(D) The microorganism is hosted by ticks.
(E) Vaccine is administered by IM injection into the deltoid.

176. Which of the following descriptions is (are) correct concerning the sterilization by membrane filtration of an extemporaneously prepared solution?

I. suitable for heat labile drug solutions
II. convenient for sterilizing small volumes
III. greater assurance of sterility than using autoclaving

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

177. pH is mathematically

(A) the log of the hydroxyl ion concentration
(B) the negative log of the hydroxyl ion concentration
(C) the log of the hydronium ion concentration
(D) the negative log of the hydronium ion concentration
(E) none of the above

178. Data required to determine the pH of a buffer system include

I. molar concentration of the weak acid present
II. the pKa of the weak acid
III. the volume of solution present

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

179. pH is equal to pKa at

(A) pH 1
(B) pH 7
(C) the neutralization point
(D) the end point
(E) the half-neutralization point

180. Units for expressing radioisotope decay include the

I. rad
II. curie
III. becquerel

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

181. The decay of radioactive atoms occurs

(A) at a constant rate
(B) as a first-order reaction
(C) as a zero-order reaction
(D) as a second-order reaction
(E) at constantly increasing rates

182. Which one of the following forms of radiation has the greatest penetrating power?

(A) alpha radiation
(B) beta radiation
(C) gamma radiation
(D) x-rays
(E) ultraviolet radiation

183. Which of the following widely used radioisotopes is considered to be an almost ideal isotope for medical applications and is commercially available as a radioisotope generator?

(A) ^{131}I (iodine)
(B) ^{99m}Tc (technetium)
(C) ^{32}P (phosphorus)
(D) ^{59}Fe (iron)
(E) ^{198}Au (gold)

184. A radioisotope generator is a (an)

(A) pharmaceutic product labeled with a radioactive substance
(B) ion-exchange column on which a nuclide has been adsorbed
(C) ionization chamber
(D) high-energy–yielding radioactive isotope that produces one or more isotopes emitting low-energy radiation
(E) apparatus in which radioactive isotopes are incorporated into biologic molecules

185. A reconstituted drug solution assays at 1.5 mg/mL after 24 hours. What is the first-order reaction rate if the original sloution concentration was 2.0 mg/mL?

(A) 0.2/day
(B) 0.25/day
(C) 0.3/day
(D) 0.33/day
(E) 0.5/day

186. By storing the above reconstituted drug solution in the refrigerator, its half-life is extended to 4 days. What will be the concentration of the drug solution (mg/mL) after 12 days?

(A) 0.25 mg/mL
(B) 0.5 mg/mL
(C) 1.0 mg/mL
(D) 1.2 mg/mL
(E) 1.5 mg/mL

187. When reconstituted, an experimental biotech drug follows first-order kinetics and has a half-life of 24 hours. If the original solution has a concentration of 10,000 units/mL, how many mL should be injected into a rabbit three days after the solution was reconstituted if a dose of 2,000 units is desired?

(A) 1.0 mL
(B) 1.6 mL
(C) 2.0 mL
(D) 3.2 mL
(E) 5.8 mL

Answer questions 188 through 191 by referring to the following table as necessary.

TABLE OF pKa VALUES FOR ACIDS

Acid	pKa
Acetic	4.76
Acetylsalicylic	3.49
Boric	9.24
Lactic	3.86
Salicylic	2.97

188. Which one of the following acids would have the greatest degree of ionization in water?

(A) acetic
(B) boric
(C) hydrochloric
(D) lactic
(E) salicylic

189. Which one of the following acids would be considered the weakest (with the least amount of ionization) in water?

(A) acetic
(B) acetylsalicylic
(C) boric
(D) lactic
(E) salicylic

190. To prepare a buffer system with the greatest buffer capacity at a pH of 4.0, one would use which one of the following acids?

(A) acetic
(B) acetylsalicylic
(C) boric
(D) lactic
(E) salicylic

191. A pharmacist prepares a buffer system by mixing 1 dL of 0.005 molar boric acid with 1 dL of 0.05 molar sodium borate in sufficient water to make one liter. What will be the approximate pH of this solution?

(A) 8.24
(B) 9.24
(C) 10.24
(D) < 8.0
(E) > 10.5

192. Ibuprofen has a pKa of 5.5. If the pH of a patient's urine is 7.5, what would be the ratio of dissociated to undissociated drug?

(A) 2:1
(B) 100:1
(C) 20:1
(D) 1:2
(E) 1:100

193. Drugs with which of the following half-lives are the best candidates for oral sustained-release dosage formulations?

(A) < 1 hour
(B) 1–2 hours
(C) 4–8 hours
(D) 12–16 hours
(E) > 16 hours

194. Which of the following trademarked sustained-release systems are based on encapsulated drug particles that will dissolve at various rates?

I. Sequels
II. Spansules
III. Extentabs

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

195. Drugs that are available as sustained-release dosage forms utilizing ion-exchange resins include

I. Ionamin
II. Contac
III. Fero-Gradumet

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

196. Drug products that utilize the osmotic pressure–controlled drug delivery system include

I. Efidac/24
II. Acutrim
III. Contac

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

197. Characteristics of drugs intended for formulation into sustained-release dosage forms include

I. usually given in doses of 500 mg TID
II. be intended for treatment of chronic conditions
III. have a high therapeutic index

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

198. A common building block for liposomes are the

(A) anionic surfactants plus mineral oil
(B) nonionic surfactants plus mineral oil
(C) phospholipids
(D) polyethylene glycols
(E) straight-chain hydrocarbons combined with phosphoric acid

199. Liposomal dosage forms are suited for which of the following routes of administration?

I. parenteral
II. topical
III. oral

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

200. Which of the following products is (are) combinations of two active ingredients?

I. Augmentin
II. Ziac
III. Zithromax

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

201. The active ingredients in Percodan include

I. aspirin
II. hydrocodone
III. acetaminophen

(A) I only
(B) III only

(C) I and II only
(D) II and III only
(E) I, II, and III

202. Which of the following drugs for asthma is (are) NOT packaged as inhalation units?

I. Accolate
II. Intal
III. Tilade

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

203. Which one of the following products exhibit sustained- or controlled-release activity due to enteric coatings?

(A) Augmentin
(B) ERYC
(C) Glucotrol XL
(D) Oramorph SR
(E) Toprol XL

DIRECTIONS (Questions 204 through 207): For each of the following drug trade names, select the dosage strength(s) that is (are) commercially available for oral administration. Use the response key of

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

204. Inderal

I. 10 mg
II. 20 mg
III. 40 mg

205. Coumadin

I. 5 mg
II. 10 mg
III. 20 mg

206. Prozac

I. 5 mg
II. 10 mg
III. 20 mg

207. Zolof

I. 50 mg
II. 100 mg
III. 250 mg

DIRECTIONS (Questions 208 through 212): SELECT the brand-name product(s) that may be substituted for the numbered brand-name product when filling a hospital medication order. Assume that a formulary system that allows same drug substitution is in effect. Use the response key of

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

208. Trimox

I. Amoxil
II. Polymox
III. Wymox

209. Proventil

I. Atrovent
II. Vanceril
III. Ventolin

210. Cardizem CD 120-mg capsule

I. Dilacor XR
II. Tiazac
III. Verelan

211. Coumadin

I. Hytrin
II. Sofarin
III. Panwarfin

212. Tylox

I. Percocet-5
II. Elocon
III. Vicodin

DIRECTIONS (Questions 213 through 309): Each group of items in this section consists of lettered answers followed by numbered questions. Select the letter answer that is most closely associated with each question. A lettered answer may be selected once, more than once, or not at all.

Questions 213 through 220
MATCH the lettered manufacturer with the associated numbered trade-marked dosage form.

(A) Abbott
(B) GlaxoWellcome
(C) Lilly
(D) Schering
(E) Warner Lambert
(F) Alza
(G) Pfizer
(H) Roche
(I) Schering

213. Filmtab

214. Pulvule

215. Enseal

216. Tabloid

217. Gradumet

218. Reditab

219. Repetab

220. Oros

Questions 221 through 225
MATCH the following lettered drug trade name with the associated numbered generic name.

(A) Amerge
(B) Imitrex
(C) Maxalt
(D) Sansert
(E) Zomig

221. Sumatriptan

222. Methysergide

223. Naratriptan

224. Zolmitriptan

225. Rezatriptan

Questions 226 through 228
MATCH the lettered brand name of anesthetic with the numbered nonproprietary name most closely related to it.

(A) Marcaine
(B) Carbocaine
(C) Novocaine
(D) Xylocaine
(E) Tronothane

226. Lidocaine

227. Bupivacaine

228. Procaine

Questions 229 through 232
MATCH the lettered dosage strength with its most closely corresponding numbered drug brand name.

(A) 10 mg
(B) 20 mg
(C) 50 mg
(D) 100 mg
(E) 250 mg

229. Glucotrol

230. Ultram

231. Sporanox

232. Zithromax

Questions 233 through 238
MATCH the lettered dosage strength with its most closely corresponding numbered drug brand name.

(A) 1 mg
(B) 10 mg
(C) 50 mg
(D) 60 mg
(E) 80 mg

233. Toradol

234. Paxil

235. Prilosec

236. Kytril

237. Claritin

238. Sudafed

Questions 239 through 247
MATCH the lettered generic name most closely corresponding to the numbered drug brand name.

(A) nizatidine
(B) amlodipine
(C) paroxetine
(D) oxaprozin
(E) triamterene
(F) sertraline
(G) pentoxifylline
(H) olanzapine
(I) terbinafine
(J) zaleplon

239. Daypro

240. Axid

241. Dyazide

242. Paxil

243. Zoloft

244. Trental

245. Lamasil

246. Zyprexa

247. Sonata

Questions 248 through 251
MATCH the lettered trade name most closely corresponding to the numbered generic name.

(A) Ziac
(B) Serevent
(C) Tramadol
(D) Tenormin
(E) Toprol

248. Atenolol

249. Metoprolol

250. Bisoprolol

251. Salmeterol

Questions 252 through 256
MATCH the lettered generic name most closely corresponding to the numbered trade name.

(A) nifedipine
(B) enalapril
(C) felodipine
(D) ramipril
(E) misoprostol

252. Plendil

253. Procardia

254. Cytotec

255. Altace

256. Vasotec

Questions 257 through 260
MATCH the lettered drug brand name having the same active therapeutic ingredient as the numbered drug brand name.

(A) Procan SR
(B) Calan
(C) Flovent
(D) Sorbitrate
(E) Vancenase

257. Pronestyl

258. Isordil

259. Flonase

260. Isoptin SR

Questions 261 through 263
MATCH the lettered generic name with the associated numbered trade name.

(A) celecoxib
(B) citalopram
(C) clonazepam
(D) divalproax
(E) fosphenytoin

261. Celebrex

262. Cerebyx

263. Celexa

Questions 264 through 267
MATCH the lettered trade name of each of the following topical decongestant products with the related numbered nonproprietary name.

(A) Benzedrex
(B) Afrin
(C) Privine
(D) Neo-Synephrine Extra
(E) Otrivin

264. Phenylephrine

265. Xylometazoline

266. Oxymetazoline

267. Naphazoline

Questions 268 through 272
MATCH the lettered antacid ingredients with the corresponding numbered commercial antacid product.

(A) aluminum hydroxide
(B) mixture of aluminum and magnesium hydroxides
(C) mixture of aluminum hydroxide, magnesium trisilicate, and sodium bicarbonate
(D) calcium carbonate
(E) sodium bicarbonate

268. Amphojel suspension

269. Gaviscon tablets

270. Mylanta gelcap

271. Maalox suspension

272. ALternaGEL liquid

Questions 273 through 276
MATCH the lettered manufacturer with the associated numbered parenteral syringe system.

(A) Bristol-Myers Squibb
(B) Pfizer
(C) Roche
(D) Parke Davis
(E) Wyeth-Ayerst

273. Bristoject

274. Isoject

275. Tubex

276. Unimatic

Questions 277 through 280
MATCH the lettered manufacturer with the associated numbered parenteral container system.

(A) Abbott
(B) Baxter
(C) Lilly
(D) McGaw
(E) Wyeth

277. Excell

278. Lifecare

279. Viaflex

Questions 280 through 283
MATCH the lettered term concerning hypodermic needles with the associated numbered description.

(A) bevel
(B) cannula
(C) hub
(D) heel of bevel
(E) lumen

280. Extension of needle that fits onto the syringe

281. Portion of needle that is ground for sharpness

282. Shaft portion of the needle

283. The hole in the needle

Questions 284 through 286
Alcohol has many pharmaceutical uses and is available in several concentrations. MATCH the lettered concentration (% V/V) with the associated numbered official product.

(A) 49%
(B) 70%
(C) 92%
(D) 95%
(E) 100%

284. Alcohol

285. Diluted alcohol

286. Rubbing alcohol

Questions 287 through 290
As a pharmacist you may be asked for advice in selecting a suitable product for a skin condition. MATCH the lettered OTC ointment with the most appropriate numbered request.

(A) calamine 10%
(B) hydrogen peroxide 2%
(C) coal tar 2%
(D) ichthammol 10%
(E) salicylic acid 17%

287. To treat inflammation and boils

288. An astringent/protective

289. To treat a wart on the finger

290. To treat a mild case of psoriasis

DIRECTIONS (Questions 291 through 294): It is often desirable to formulate a dosage form so that its pH approximates that of the area to which it is administered. MATCH the lettered pH value that is nearest to the pH usually found in the numbered body areas. Answers may be used once, more than once, or not at all.

(A) 4.0–4.5
(B) 5.5
(C) 6.4
(D) 7.0
(E) 7.4

291. Blood

292. Eye

293. Skin

294. Vagina

Questions 295 through 297
MATCH the lettered formulation design that best describes the mechanism of release for each of the following sustained-release drug delivery systems.

(A) encapsulated dissolution
(B) ion-exchange
(C) matrix diffusion
(D) matrix dissolution
(E) osmotic pump

295. Drug is bound to a resin and released due to changes in pH

296. Drug is compressed into tablets with a slowly soluble polymer

297. Drug particles are microencapsulated and a mixture of the particles is placed into the dosage form

Questions 298 through 301
MATCH the numbered delayed-release or sustained-action principle with the corresponding lettered drug product.

(A) Ornade
(B) Tussionex
(C) Rynatan
(D) Demazin Repetab
(E) Oramorph SR

298. Ion-exchange resin

299. Hydrophilic matrix

300. Tablet with inner core

301. Complexation with tannic acid

Questions 302 through 305
MATCH the numbered herb with its most appropriate lettered therapeutic use.

(A) mild sedative
(B) improve memory
(C) reduce severity of a cold or virus infection
(D) inprove urinary flow
(E) reduce GI spasms

302. Echinacea

303. Ginkgo biloba

304. St John's Wort

305. Saw palmetto

Questions 306 through 309
MATCH the lettered nonproprietary name with the associated numbered vitamin B.

(A) cyanocobalamin
(B) pyridoxine
(C) thiamine
(D) riboflavin
(E) pantothenic acid

306. Vitamin B_1

307. Vitamin B_2

308. Vitamin B_6

309. Vitamin B_{12}

DIRECTIONS (Questions 310 through 316): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

310. Which of the following drugs is NOT available in a suppository dosage form?

(A) acetaminophen
(B) ergotamine
(C) phenazopyridine
(D) prochlorperazine
(E) promethazine

311. Which one of the following is the active ingredient in Infant's Mylicon Drops?

(A) aluminum hydroxide
(B) calcium carbonate
(C) docusate
(D) acetaminophen
(E) simethicone

312. Which one of the following ranges of pH is most suitable for an extemporaneously prepared nasal solution?

(A) <4.0
(B) 4.0 to 5.5
(C) 5.5 to 7.5
(D) 7.5 to 8.0
(E) > 8.0

313. All of the following drugs are available as transdermal patches EXCEPT

(A) scopolamine
(B) estradiol
(C) buprion
(D) fentanyl
(E) testosterone

314. Advantages of transdermal drug delivery systems include

I. avoids first-pass effect
II. improves patient compliance
III. suitable for drugs with relatively short half-lives

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

315. Ginger root has been shown to be effective in

(A) the treatment of nausea or motion sickness
(B) reducing bronchial spasms
(C) treating constipation
(D) treating diarrhea
(E) reducing blood pressure

316. Which one of the following is most appropriate as a primary covering over a small (2 × 2 inch) minor burn?

(A) butter
(B) cotton gauze
(C) absorbent pad
(D) petrolatum gauze
(E) white vaseline

Answers and Explanations

1. **(A)** Official standards in the form of drug monographs are presented in the *United States Pharmacopeia/National Formulary (USP/NF)*. These monographs may describe therapeutically active drugs or other ingredients, known as excipients, that are essential for formulating a stable drug product. *(24:9)*

2. **(D)** The United States Adopted Names (USAN) Council establishes nonproprietary drug names. The Council is jointly sponsored by the AMA, United States Pharmacopoeial Convention, and the APhA. Because the USAN is not an official government agency, the chosen names are not formally recognized until they are published in the Federal Register. *(24:32)*

3. **(C)** Federal drug laws and regulations are described in the *USP Dispensing Information (DI)*, Volume III, which also contains listings of therapeutic equivalent drugs and drugs that are biologically inequivalent. The latter information is from the FDA's "Orange Book." *(18c:VI–52)*

4. **(B)** Volume II of the *USP DI* contains drug monographs written for the layperson. Pharmacists have permission to photocopy individual drug descriptions for distribution to the patient when dispensing the drug. Volume I of the *USP DI* contains drug information for health professionals. It includes more detailed and more scientific information than Volume II. *(18b; 18c)*

5. **(C)** A container that reduces light transmission in the range between 290 and 450 nanometers to the level specified in the *USP* may be considered light resistant and suitable protection from light. The container may be constructed of glass or plastic. Although amber units are most common, other colored or opaque containers may meet the official requirements. *(4:12.6; 18c:VI–5; 24:154)*

6. **(B)** A cold place indicates a temperature not exceeding 8° C (46° F). A refrigerator is a cold place in which the temperature is maintained between 2 and 8° C (36–46° F). A cool place refers to areas maintained between 8 and 15° C. A freezer is defined as a storage area held between –10° and –20°. *(18c:VI–6; 24:146)*

7. **(E)** The expiration date for a pharmaceutical is based on the length of time during which the product continues to meet the specified monograph requirements. Requirements are stated in terms of amount of active ingredient that is present as determined by suitable assay. Most drug products are considered usable until approximately 10% of the drug or drug activity has been lost. However, some monographs specify other ranges. For example, digoxin tablets must assay between 92% and 108% of label claim. *(1:639)*

8. **(D)** When expiration dates are expressed only in terms of month and year, the intended expiration date is the end of the last day of the stated month. *(1:639; 4:4.1)*

9. **(B)** Pharmacists are using beyond-use dating quite often as guidelines when dispensing prescriptions to limit prolonged use of the drug by the patient. This date is usually a shorter time span than the manufacturer's expiration date found on the original pack-

age. The beyond-use date shall be no later than either the expiration date on the manufacturer's container or one year from the date of dispensing, whichever is earlier. For reconstituted products, the beyond-use date will be of a significantly shorter duration and is based on the manufacturer's recommendation in the package insert or on the package. *(4:4.1)*

10. **(A)** Allopathy is the treating of disease by using remedies that produce effects on the body that differ from those produced by the disease. This new set of conditions is incompatible with or antagonistic to the original symptoms of the disease. The term is now used when referring to standard or orthodox medical practice. Naturopathy indicates healing by the exclusive use of natural remedies (heat, light, vegetables, fruits, etc.) but no surgery or drugs. Nutraceutical practice is one in which foods are used to promote healing and health. *(1:840; 27:69)*

11. **(C)** Homeopathy involves the use of substances that produce symptoms similar to the symptoms of the disease (the law of similars). The drugs used, mainly herbals, are administered as very high dilutions, that is, in extremely low doses. Holistic medicine refers to therapies that treat the whole person—both mind and body. *(27:909; 1:840)*

12. **(C)** For example, boric acid solubility in water is expressed as 1:18. This indicates that 1 gram of boric acid added to exactly 18 mL of purified water will result in a saturated solution. When compounding, it is advisable to use excess solvent because saturated solutions are difficult to prepare and may precipitate if there are changes in temperature. *(1:194)*

13. **(A)** Naturally occurring alkaloids, which are weak organic bases, have relatively poor water solubility but are soluble in alcohol. Most pharmaceutical products use the alkaloid salts such as morphine HCl, cocaine HCl, and atropine sulfate to increase the drugs' water solubility. *(1:398)*

14. **(C)** Haloperidol is a butyrophenone derivative and the base form has very poor water solubility (1 g in more than 10,000 mL). The hydrochloride salt is water soluble, as is the lactate salt, which is utilized in preparing the aqueous injection of haloperidol. Haloperidol decanoate is the ester form that is dissolved in an oil vehicle. This injection product is injected intramuscularly and has a half-life of approximately 3 weeks. *(1:1184)*

15. **(D)** Pharmaceutical excipients are selected for specific characteristics that will improve the drug formulation. These include solvents (glycerin), ointment bases (petrolatum), tablet diluents (lactose), antioxidants (sodium bisulfite), and antimicrobial preservatives (the parabens). Because they must be relatively inert therapeutically, the local anesthetic benzocaine would not be suitable. *(24:111)*

16. **(C)** A chelating agent is a compound formed by the combination of an electron donor with a metal ion to form a ring structure. The molecule that forms the ring structure is called a ligand or chelating agent. The metals that may be chelated must have valences of two or more. A major pharmaceutical use for chelating agents is to bind trace metals such as iron and copper that would otherwise catalyze oxidation of active drugs. Edetate (ethylenediamine tetra-acetic acid) is commonly used in parenteral solutions. *(24:83)*

17. **(B)** Edetate calcium disodium (Versenate) is usually administered by intramuscular parenteral injection to reduce blood levels and depot stores of lead in acute and chronic lead poisoning and lead encephalopathy. The chelate formed with lead is stable, water-soluble, and readily excreted by the kidneys. The other choices, lithium and sodium, are monovalent ions and will not complex with EDTA. *(1:935)*

18. **(C)** Drugs in suspensions are likely to follow zero-order kinetics because the limiting factor is the amount of drug actually in solution. The classic example is aspirin suspension. *(12:286)*

19. **(B)** Epinephrine, a catecholamine, is very sensitive to oxidation, which results in biologically inactive products. The first indication of oxidation is the development of a pink color that darkens to form a brown precipitate. *(1:989; 24:83)*

20. **(A)** Aminophylline consists of theophylline, which has been reacted with ethylenediamine to improve its water solubility. On exposure to air, carbon dioxide is absorbed and free theophylline forms. Addition of small amounts of ethylenediamine redissolves these crystals. A note in the monograph for Aminophylline Injection USP states: Do not use the injection if crystals have separated. *(1:972)*

21. **(C)** The term trituration usually refers to reducing the particle size of powders often in a mortar and pestle. However, trituration has also been used to describe the simple mixing of two or more powders in the mortar. Levigation is the process of reducing the particle size of solids by adding a small amount of a liquid or an ointment base to make a paste, which is then rubbed with a spatula on an ointment tile. Sublimation is the conversion of a solid to a vapor without passing through a liquid phase. Pulverization by intervention is a process for reducing particle size by using a second agent that can then be readily removed. For example, camphor is reduced by the intervention of alcohol. Maceration is an extraction process in which the ground drug is soaked in a solvent until the cellular structure is penetrated and the soluble constituents have been dissolved. *(24:166; 1:1612; 1:1521)*

22. **(B)** Powders that are either directly applied to the skin or are incorporated into topical products should be extremely fine or impalpable. Trituration is often needed to reduce particles to an extremely fine size so that the patient will not discern individual particles when the product is rubbed on the skin. Usually a particle size of 50 microns or smaller is desired.

23. **(C)** Most alkaloids have a pKa above 7; therefore, they are weak bases that will form salts with an acid (eg, pilocarpine hydrochloride, morphine sulfate). Stereoisomerism is common in alkaloid structures; large differences in therapeutic activity can be expected among isomers. *(1:398)*

24. **(C)** Chiral relates to the optical activity of a molecule. Stereoisomers of a specific drug may exhibit distinctly different degrees of therapeutic activity. For some drugs the activity or major side effects may be due to only one of the isomers present. *(1:155)*

25. **(D)** Polymorphs differ in their melting points, x-ray diffractions, infrared spectra, and dissolution rates. For example, riboflavin has three polymorphs, each with significantly different solubilities. Theobroma oil (cocoa butter) can exist in four forms, each differing in melting points. Gentle heating of cocoa butter will favor the formation of the stable beta polymorph. This crystalline form is desired because it melts at 34.5° C, which is close to but lower than body temperature. Metabolic rates of a drug's polymorphs will not vary because once the drug has dissolved, the polymorphs no longer exist. *(1:168)*

26. **(D)** Benzalkonium chloride is a cationic surface active agent. In the presence of anionic agents such as soaps, benzalkonium chloride and similar cationic agents are inactivated because the combination of large cations with large anions of soaps form inactive products. *(1:1264)*

27. **(C)** Hydrogen bonding is an attractive force between hydrogen atoms and electronegative atoms such as oxygen, fluorine, and nitrogen. Although weak, hydrogen bonds can bring about the miscibility of certain solvents or the solubility of certain chemicals. Hydrogen bonding is also responsible for the shrinkage phenomenon that occurs when mixing certain liquids. For example, when equal volumes of Alcohol USP and purified water are mixed, there is approximately 3% shrinkage

from the theoretical volume. If one wishes to prepare 100 mL of Diluted Alcohol USP, a solution that contains 49% V/V ethanol plus purified water, equal volumes of each are used. However, one must also remember to use an excess of at least 3% of each ingredient to assure obtaining the required volume. *(12:23, 213)*

28. **(D)** Sorbitan monopalmitate is a sorbitan fatty acid ester, commercially available as Span 40. It is classified as nonionic because the molecules would not have the tendency to migrate to either pole in an electric field. Ammonium laurate, dioctyl sodium sulfosuccinate, and triethanolamine stearate are anionic surfactants. This designation implies that the large active portion of the surfactant molecule would bear a negative charge and, therefore, would migrate to the anode in an electric field. For example, the stearate portion of triethanolamine stearate is considered the active ion. Cetylpyridinium chloride is a cationic surfactant. The active surfactant portion, cetylpyridinium, has a positive charge and migrates to the cathode. *(1:286)*

29. **(D)** The equation may be expressed as

$$V = \frac{r^4 \times t \times \Delta P}{8 \times l \times n}$$

The volume of liquid (V) passing during a unit of time (t) is directly proportional to the radius of the tube (r) and the pressure differential (ΔP) at each end of the tube and inversely proportional to the length of the tube (l) and the viscosity of the liquid (n). Because the radius is raised to the fourth power, doubling the radius would cause a 16-fold change in the flow provided all other factors remained constant. The capillary can be envisioned as a simple glass tube or a human blood vessel. *(1:295; 12:462)*

30. **(C)** Potassium chloride is an obvious substitute for sodium chloride because it has a similar salty taste, is crystalline, and is an electrolyte already present in the body. However, the use of these salt substitutes is contraindicated in patients with severe kidney disease or oliguria. Symptoms such as weakness, nausea, and muscle cramps indicate excessive sodium depletion. Increased sodium intake is warranted. *(10)*

31. **(B)** IV injection of high concentrations of potassium may cause cardiac arrest. Intravenous administration must be by slow infusion to allow dilution of the potassium to occur. When plasma potassium levels are above 2.5 mEq/L, rates up to 10 mEq/h (total of 100 to 200 mEq/day) may be set. In more serious conditions, with plasma levels below 2 mEq/L, rates of 40 mEq/h (total of 400 mEq/day) have been employed. Available injection forms contain 10–80 mEq per vial. IV admixtures are prepared by diluting these solutions to 250–1000 mL. Oral dosage forms include Kay Ciel elixir, Kaon tablets, K-Lor, and K-Lyte packets. Slow-K tablets have a wax matrix from which the KCl slowly dissolves in the GI tract. *(1:930)*

32. **(B)** Topical dosage forms are used. For example, both creams and solutions are available under the trade names of Efudex and Fluoroplex. In fact, however, fluorouracil is usually administered by IV injection. It is not given orally because of irregular absorption from the GI tract. *(3:2881; 6:1249)*

33. **(B)** A "precaution" is intended to advise the physician of possible problems that may occur with the use of a drug. For example, the use of tetracycline may result in overgrowth of nonsusceptible microorganisms. A "warning" signifies a more serious problem with greater potential for harm to a patient. For example, renal impairment may require reduction in the drug dose. A "contraindication" is the most restrictive limitation because it refers to an absolute prohibition against the use of a drug under certain conditions. For example, the use of penicillin derivatives is prohibited in patients known to be sensitive to penicillin. *(24:55)*

34. **(C)** Both *Facts and Comparisons* and the *Handbook on Injectable Drugs* present tables com-

paring the commercial amino acid injections. *(21:26–27; 10)*

35. **(C)** The term "leaching" is used specifically to designate the release of a container ingredient into the product itself. For example, zinc and accelerators may be leached from rubber closures into a parenteral vial. Adsorption would refer to the binding of a substance onto the surface of the container wall. Diffusion is the passage of a substance through a second substance. For example, volatile oil or dye may diffuse from a solution through the walls of a plastic container. Permeation would denote the solution of a substance in the cell wall followed by passage through the wall. Porosity indicates small holes or passages through which a substance could pass. *(24:139–40)*

36. **(B)** Hypodermic needle sizes are expressed by a gauge system based on the external diameter of the cannula: the larger the number, the smaller the diameter of the needle. For example, the 21-gauge needle is smaller in diameter than the 19-gauge needle. Generally, the length of the cannula is also specified. This measurement, expressed in inches, represents the distance from the needle tip to the junction with the hub. *(13:325)*

37. **(D)** The winged (scalp–vein, scalp, or butterfly) needle consists of a stainless steel needle with two flexible plastic winglike projections. The wings serve two purposes: They ease manipulation of the needle during insertion into the vein and then allow the needle to be anchored with tape to the skin. *(13:326)*

38. **(E)** Insulin is usually administered by subcutaneous injection into the arm or thigh. Absorption of the insulin is good, and this route is both convenient and safe for self-administration of the drug. Some studies indicate that the absorption rate from the arm is 50% faster than from the thigh. *(13:110)*

39. **(D)** Insulin solutions have low viscosities, and only small volumes are injected. Therefore, small-bore needles (25G up to 30G) may be used. Short (3/8" to 5/8") needles are adequate for the usual subcutaneous route of insulin administration. *(13:327)*

40. **(C)** The term "venoclysis" is synonymous with intravenous infusion. *(13:115)*

41. **(A)** Partially filled glass containers (minibottles) usually consist of 250-mL bottles containing 50, 100, or 150 mL of either D_5W or NS. To these bottles one can easily add drug solutions, taking advantage of the vacuum present in the minibottle. Plastic bags are also employed for preparing parenteral admixtures. The plastic units do not have a vacuum but are flexible enough to accommodate additional liquids. *(1:1551, 1553)*

42. **(A)** Intermittent therapy refers to administration of parenteral drugs at spaced intervals. One of the most convenient methods for administration is for the pharmacist to prepare a minibottle containing active drug solution such as an antibiotic added to a diluent. This unit is attached to the tubing of a large-volume parenteral (LVP) bottle already hanging on the patient. This "piggyback" concept saves the patient from multiple injections and assures high blood levels of the additive drug because the minibottle solution is infused in a short period of time. *(1:1551–53; 13:145)*

43. **(C)** TPN (total parenteral nutrition) and TNA (total nutritional admixture) refer to solutions administered parenterally to provide calories, amino acids, and other nutrients by parenteral infusion. PMN is an abbreviation sometimes used for phenylmercuric nitrate, an antimicrobial preservative. *(4:33.1)*

44. **(B)** Although the maximum volume will vary depending on the condition of the patient, the normal daily water requirement is approximately 25 to 40 mL/kg of body weight or 2000 mL per square meter of body weight. Daily volumes greater than 3 to 4 L in normal (nondehydrated) patients may cause a fluid overload. A dehydrated patient will require larger quantities. Water replacement therapy (hydration therapy) in an adult

may be 70 mL/kg. Thus, a 50-kg patient will need 3500 mL (replacement) plus 2400 mL (maintenance). *(24:440)*

45. **(E)** A subcutaneous injection will come into contact with a large number of nerve endings and may remain at the injection site for a long period of time. Pain will be experienced if the solution is not isotonic. The potential effects of hypotonic or hypertonic intravenous solutions are offset by their dilution in the large volume of blood into which they are injected, provided the volume injected is not excessive and the rate of injection is slow. *(1:61; 24:401)*

46. **(B)** The abbreviation of IVP represents intravenous push (bolus) administration indicating fast injection (usually < 1 minute) of the parenteral solution. IVPB requests a minibottle or minibag setup known as the piggyback arrangement. These bottles are usually infused over a time span of 20 minutes to 1 hour. KVO means to "keep the vein open" by setting up a large volume parenteral (LVP) of 5% dextrose or 0.9% sodium chloride injection for very slow infusion. The intent is to allow the quick hookup of additional drug solutions without having to enter the vein several times. *(13:92, 145)*

47. **(D)** The pH of solutions is often adjusted during the manufacturing procedure by the addition of either acid (hydrochloric acid) or alkali (sodium hydroxide). The amount needed may vary from batch to batch. Therefore, the label cannot specify an exact quantity. Also, isotonicity adjusters may be listed by name only with a statement as to their purpose. *(18c:VI–8)*

48. **(B)** Either 5% or 5.5% dextrose in water is isotonic, depending on whether the anhydrous or hydrous form of dextrose is used. *(1:916)*

49. **(D)** There is the potential danger of suspension particles blocking blood vessels. Also, relative insoluble suspension particles may dissolve faster than desired if injected intravenously into a relatively large volume of patient's blood, thus giving immediate therapeutic activity when a sustained-release activity was desired. For example, only insulin solution is administered by the IV route while the various suspension-dosage forms are intended for subcutaneous injection. *(24:400, 435)*

50. **(A)** Dextrose 5% injection (D_5W) has an osmolarity of approximately 300 mOsm/L, as does 0.9% sodium chloride injection (NS). If one liter of solution contains both 5% dextrose and 0.9% sodium chloride, its osmolarity will be approximately 600 mOsm/L and be hypertonic. Fortunately, infusing hypertonic solutions such as D_5W/NS is not dangerous since the solution is rapidly diluted by the blood with no significant damage to the red blood cells. One formula often used for infusion is $D_{2.5}W/.45NS$ which is isotonic. *(1:515; 23:163)*

51. **(B)** Factors affecting the distribution of a drug in the blood after an IV bolus include the blood volume, heart rate, and injection rate. Assuming that even distribution occurs within 4 minutes, drug sampling may be initiated after that time. *(1:616)*

52. **(B)** Although many of the parenteral admixtures are chemically stable for long periods of time, potential contamination of the products during preparation by the pharmacist is of prime concern. Usually no significant microbial growth will occur until after 24 hours. Therefore, an expiration date of 24 hours is safest unless the solution is known to be less stable chemically. Refrigeration also helps to retard microbial growth. *(13:247)*

53. **(B)** To avoid pain at the injection site, solutions injected into subcutaneous sites should be limited to not more than 1 mL. The usual limit suggested for deltoid IM injections is up to 2 mL while IM injections into the gluteal medial muscle may be up to 5 mL. *(4:32.3)*

54. **(A)** The osmotic pressure of the dextrose solution will be approximately one-half that of

an equimolar sodium chloride solution. The osmotic pressure of a substance in solution is an example of a colligative property. Equimolar concentrations of nonelectrolytes will have similar osmotic pressures. However, electrolytes ionize to form particles that quantitatively increase the magnitude of the colligative property. Because sodium chloride ionizes into two particles, a 0.1 molar solution has twice the osmotic pressure of a 0.1 molar solution of a nonelectrolyte such as dextrose. Deviations from this simple theory arise from interionic attractions, solvation, and other factors. *(1:164)*

55. **(E)** Osmolarity, expressed as mOsm/L, is included on the labels of large-volume parenteral (LVPs). Those injections with a value of approximately 300 mOsm/L will be isoosmotic and presumably isotonic with the blood. For example, 5% dextrose injection has a value of 280 mOsm/L, whereas 0.9% sodium chloride injection has a value of 308 mOsm/L. One calculates the osmolarity of a solution by first determining the millimoles of chemical present, then multiplying by the number of ions formed from one molecule. One liter of 0.9% sodium chloride solution contains 9 g of sodium chloride (MW = 58.4). The millimole concentration will be

$$\frac{9\text{ g}}{58.4} = 0.154\text{ mol or }154\text{ mM}.$$

The milliosmole (mOsm) concentration will be

$$154\text{ mM} \times 2\text{ (ions present in NaCl)} = 308\text{ mOsm}.$$

(1:1615)

56. **(E)** The vastus lateralis is the largest developed muscle in young children and is free of major nerves and veins. The volume limitation should be 1 mL. *(4:32.3)*

57. **(D)** Intradermal injections are usually limited to diagnostic determinations, desensitization, or immunization into the forearm. Usually only 0.1 mL volumes are used. *(24:402)*

58. **(B)** Except for the lactate concentration and the absence of sodium bicarbonate, lactated Ringer's (Hartmann's) solution closely approximates the extracellular fluid. Although the injection has a pH of 6 to 7.5, it has an alkalinizing effect because the lactate is metabolized to bicarbonate. *(1:915)*

59. **(D)** The ADD-Vantage system consists of a vial usually containing a powder which is already attached to a minibag. The health professional simply has to engage the vial into the bag, thus allowing reconstitution of the powder and subsequent mixing with the main body of diluent. *(1:1555; 24:417–18)*

60. **(C)** Heparin sodium is given by both IV bolus and infusion as well as by subcutaneous injection. The IM route is not used since it may be painful and also may cause a localized hematoma. *(1:923)*

61. **(B)** The Baxter and McGaw systems use a plastic airway tube that extends from the rubber stopper to above the fluid surface when the bottle is inverted for administration. The Abbott system uses a filtered airway that is an integral part of the administration set. *(1:1551)*

62. **(D)** There are two main sites of degradation for insulin—the liver and the kidneys. Insulin is filtered through the glomeruli and reabsorbed by the tubules, where some degradation occurs. When injected by the IV route, the half-life is estimated to be 5 to 6 minutes. Approximately 50% of the insulin that reaches the liver through the portal vein is destroyed. U100 insulin is available over-the-counter. *(10)*

63. **(A)** Although vitamin C's main attribute is in the prevention and cure of scurvy, it has been advocated for the prevention and alleviation of symptoms of the "common cold," to facilitate absorption of iron by maintaining iron in the ferrous state, and as an antioxidant in both pharmaceuticals and foods. The fat-soluble vitamin E also possesses antioxidant properties, especially within the body.

Vitamin D_2 prevents or treats rickets and is used in the management of hypoparathyroidism and hypocalcemia. Pantothenic acid is biologically important as a component in coenzyme A (CoA). *(1:1114, 1115–16, 1120)*

64. **(A)** Gentamicin sulfate (Garamycin) is stable for 2 years at room temperature. Of the five antibiotics listed, it is the only one marketed as an aqueous solution, ready for injection. The others are packaged as powders for reconstitution. *(21:502)*

65. **(B)** Esters of *p*-hydroxybenzoic acid are used as preservatives to protect against mold and yeast growth in pharmaceuticals. Toxicity, preservative effect, and lipid solubility all increase as the molecular weight increases. Of the four esters—methyl, ethyl, propyl, and butyl—the latter two are more suitable for oils and fats. They are often used in combination with each other, but these chemicals are slow-acting and are now unacceptable as ophthalmic antimicrobial preservatives. *(1:1573)*

66. **(C)** Pharmacy bulk packages are intended to provide the compounding pharmacist with a unit whose contents may be aseptically subdivided into several parenteral admixtures. The package is pierced only once, and used in a short period of time. These units are ideal when reconstituting an antibiotic powder for transfer into several minibottles or bags. *(1:1559)*

67. **(D)** Potassium chloride concentrate solutions are potentially very dangerous if infused undiluted. Because of numerous fatalities in hospitals, the FDA specifies that it is the only product that must be packaged in vials with black flip-off buttons. There is no color code for other parenteral solutions that are packaged in vials. *(18c:V9)*

68. **(C)** The inclusion of an antimicrobial preservative in parenteral solutions is intended only for multi-dose containers from which fairly small volumes of solution are used at one time. When large volumes of solution are infused, the presence of an antimicrobial preservative may increase potential toxicity of the product. *(24:403)*

69. **(C)** Human immune serum is obtained from human blood. It contains specific antibodies reflecting the diseases contacted by the donor. The immunity is passive because the recipient's body does not actively develop either antibodies or sensitized lymphocytes in response to a foreign antigen. Passive immunity does not last long; usually not more than 2 or 3 weeks of protection are achieved. Active immunity implies that the recipient of the biological will develop specific immunity due to an active response to the introduction of antigenic substances. *(24:457)*

70. **(A)** Protection against measles is recommended for persons 15 months and older. Usually the vaccine is administered as part of the measles, mumps, and rubella virus mixture. However, all individuals born after 1956 are considered susceptible to natural measles and should be revaccinated if they are unable to show immunity to measles. Fluogen protects against influenza; Havrix against hepatitis A; Recombivax HB against hepatitis B; and Sabin against poliomyelitis. *(1:1425)*

71. **(A)** Tuberculin is a solution of soluble products of tubercle bacillus. The solution is used as a diagnostic aid for exposure to the bacillus. It is administered intradermally. *(24:461)*

72. **(B)** The tuberculin skin test is based on skin hypersensitivity to a specific bacterial protein antigen. Tuberculin can be administered intracutaneously (Mantoux test) or by the multiple-puncture method (tine test). The intracutaneous method using purified protein derivative (PPD) is more reliable. Generally, the intermediate strength (5 U/0.1 mL) is used. The first strength (1 U) is generally used for individuals suspected of being highly sensitive, and the second strength (250 U) is exclusively for those who did not react to previous injections of either 1 or 5 units. *(1:1433; 9:36:84)*

73. **(B)** Tuberculin syringes are made of either plastic or glass with a total capacity of 1 mL. Despite their name, they are suitable for measuring small volumes of any liquid. *(13:322)*

74. **(B)** The immune gamma globulin is used to prevent or modify several diseases, including measles, infectious hepatitis, German measles, and chickenpox. The immunity is passive, lasting for 1 to 2 months. There are also special forms for individuals exposed to mumps, pertussis, tetanus, vaccinia, and rabies. *(1:1429; 24:457)*

75. **(E)** Serum albumin is the protein in plasma that controls blood volume through its water-containing capacity. Normal Human Serum Albumin USP, which is used in the treatment of shock or hemorrhage, is available in either a 6 or 25% sterile solution. *(1:913)*

76. **(B)** The labeling on biologicals is required to specify the recommended storage temperature. With few exceptions, biologicals are stored in a refrigerator at 2 to 8° C. *(24:328)*

77. **(C)** Booster doses of the common toxoids are required to sustain immunity. For example, a 0.5-mL dose of tetanus toxoid should be administered as a routine booster about every 10 years or, as a booster in the management of minor clean wounds, not more frequently than every 6 years. *(1:1427)*

78. **(A)** Diphtheria & Tetanus Toxoid and Pertussis Vaccine (DTP) is administered as a series of four injections starting when the baby is 6 weeks to 2 months of age. Two additional injections are given at 6-week intervals, with a final dose given 1 year later. If needed, a booster injection can be given when the child is 4 to 6 years old. DTP must never be given to children older than 6 years because of serious reactions that may occur. *(1:1428; 24:332)*

79. **(E)** Typhoid fever is a bacterial infection. *(1:1423)*

80. **(C)** Rabies is a viral infection. *(1:1426)*

81. **(B)** Passive immunizations are usually accomplished by the administration of purified and concentrated antibody solutions (antitoxins) derived from humans or animals that have been actively immunized against a live antigen. Active immunizations are usually accomplished by the administration of one of the following: (1) toxoids, (2) inactivated (killed) vaccines, (3) live attenuated vaccines. *(1:1431; 24:328–29)*

82. **(C)** A 4% concentration of chlorhexidine gluconate is available as Hibiclens topical solution. It is effective against both gram-positive and gram-negative bacteria as a skin cleanser, hand wash and surgical scrub. *(24:327)*

83. **(C)** Both ipecac syrup and activated charcoal have proved effective in the treatment of many types of drug poisoning. However, they must not be used concurrently because the charcoal will adsorb the active alkaloids present in ipecac syrup. Thus, the desired emetic effect may be lost. If both agents are to be administered, it is best to induce vomiting first with the ipecac, then administer the charcoal to absorb remnants of the poison. Activated charcoal is usually administered as a water slurry of 60 to 100 g. Often a mild cathartic such as magnesium sulfate is administered after the charcoal. Some charcoal products already contain either sorbitol or methylcellulose as a laxative. The "universal antidote" is a mixture of activated charcoal, magnesium oxide, and tannic acid. Only the charcoal in this combination is effective, and its activity is probably reduced by the other two ingredients. *(2:284, 287)*

84. **(B)** Chemicals that are not significantly adsorbed by activated charcoal include boric acid, cyanides, DDT, and ferrous sulfate. *(2:287)*

85. **(D)** Although Alcohol USP (95% V/V ethanol) is usually used in the production of pharmaceuticals, labels stating alcohol concentration are based on 100% V/V ethanol (absolute alcohol). Proof strengths of products are easily calculated by simply doubling

the % V/V ethanol concentration. *(1:1404; 23:27)*

86. **(C)** The benzophenones are effective in screening out the harmful (skin burning) UVB wavelengths as well as some of the UVA spectra. The cinnamates will screen the UVB wavelengths and a combination of the two categories of sunscreens are often incorporated into commercial formulas. Methyl salicylate (oil of wintergreen) is included in topical products mainly for its pleasant odor. It does not possess sunscreening properties. However, homomenthyl salicylate (homosalate) is a sunscreen. *(2a:620–24; 19:39–9)*

87. **(C)** The SPF (sun protection factor) is a numeric value that indicates the multiple length of time an individual may be exposed to the sun with minimum erythema as compared to the exposure time without any protection. In this example, 30 minutes × 12 = 6 hours maximum protection that may be expected. Obviously there are many variables that affect the quantity of radiation received on any day. *(2a:619–22; 19:39–41)*

88. **(C)** Colostomy pouches are available in several sizes based on the opening that will surround the stoma on the body. These sizes are designated in inches of diameter. Pouches are designed as either open end, in which the effluent may be drained while the pouch is on the patient, or closed end, for which the pouch must be removed to be either emptied or discarded. There is no difference between pouches worn by males or females but there are pediatric pouches with a smaller capacity. *(1:1863; 2:305)*

89. **(E)** Degradation of either proteins or peptides in solution may occur when denaturation occurs. Changes in temperature, addition of ionic salts, changes in solvent system, freezing, or even vigorous shaking may result in minor structural changes that will reduce the therapeutic activity of the protein. Many of the new "biotech" drugs specify that reconstitution should be accomplished by gentle rolling of the containers between the palms rather than vigorous shaking. *(1:1461; 24:530)*

90. **(C)** Although medicinal oxygen carries the federal legend concerning dispensing, many nonpharmacy sources supply the gas to patients under the concept that they are agents of the prescriber. Because the bulky and unsightly oxygen tanks require frequent refills if used at the normal flow rate of 2 L/min, other systems such as oxygen concentrators are popular substitutes. These concentrators use room air and home electricity. *(1:1854)*

91. **(C)** Liposomes consist of phospholipids that when dispersed in water form multilamellar vesicles. These liposomes can be utilized as drug carriers delivering drugs to specific body sites. Nanoparticles refer to dispersed drug consisting of colloidal size particles with diameters between 200 and 500 nm. After IV injection, the nanoparticles will be taken up by the reticuloendothelial system and localized in the liver. Transdermal delivery systems allow diffusion of drug through the skin into the general circulation. They do not "target" specific sites for drug delivery. *(1:598, 1673–4; 24:528)*

92. **(C)** Monoclonal antibodies (MAb) are antibodies derived from single hybrid cells. The resulting product has enhanced selectivity, making it invaluable as a specific diagnostic agent or drug. Gene splicing refers to those procedures resulting in alterations of the DNA make-up of a microorganism. Using recombinant DNA technology, specific antibodies useful for medical and agricultural applications can be developed. *(1:811; 24:504–8)*

93. **(B)** Most biotechnological drugs consist of amino acid sequences. Because these proteins have relatively poor stability in the GI tract and have erratic absorption, most of the drugs are intended for parenteral administration. *(13:349; 24:532)*

94. **(E)** The thrombolytic agent urokinase is an enzyme isolated from cultures of human kidney tissue. Epoetin (Protropin) is a human

growth hormone intended for the long-term treatment of children with growth failure due to insufficient endogenous hormone. A similar product is Lilly's Humatrope. Erythropoietin is used in dialysis, anemia, and chronic renal failure. Humulin is Lilly's human insulin. The interferons are used in numerous diseases including AIDS-related Kaposi's sarcoma and multiple sclerosis. *(1:819; 24:435, 510, 515)*

95. **(D)** The increased sensitivity of both types of tests is due to the use of monoclonal antibodies (MAb), which allow earlier determination of the specific hormones involved. Ovulation prediction tests detect surges in luteinizing hormone (LH), which indicate that ovulation is about to occur. Pregnancy determination tests detect an increased level of human chorionic gonadotropin (HCG) hormone that occurs when the egg is fertilized. The fecal occult blood tests are based on the colorimetric detection of hemoglobin. Various chemicals, such as guaiac, tetramethylbenzidine, etc., are used to elicit a characteristic color. The occult blood tests are not very selective or sensitive. *(2:34, 36–7)*

96. **(A)** Wyeth-Ayerst Norplant system consists of levonorgestrel in a silastic polymer. The rods are inserted under the skin of the upper arm and slowly release drug for up to 5 years. It is considered a reversible contraceptive system. However, it is not classified as a targeted delivery system, which would imply the delivery of drug only to a specific organ or area. *(1:1671)*

97. **(E)** The inclusion of surfactants in topical preparations appears to enhance the penetration of active drugs through the skin. Contact lens solutions may contain surfactants for the cleansing of the lenses before storage or insertion. Nontoxic and nonirritating surfactants such as docusate (dioctyl sodium sulfosuccinate) are used as emollient laxatives because they soften stools. *(2a:232; 24:361; 24:414)*

98. **(D)** The hydrophilic–lipophilic balance (HLB) system was originally designed by using combinations of nonionic surfactants in the preparation of a standard emulsion. Although some anionic and cationic emulsifiers have been assigned HLB values, the system's primary use is to classify the hundreds of nonionics that are commercially available. In the HLB system, emulsifiers are given numeric designations between 1 and 20, depending on the relative strength of the hydrophilic and hydrophobic portions of the molecule. Emulsifiers with low HLB values are hydrophobic (lipophilic), whereas emulsifiers with high HLB values are hydrophilic. By mixing two emulsifiers with different HLB values, one may determine the best HLB value in a certain emulsion formula. Generally, an emulsifier with an HLB of less than 9 will produce water in oil (W/O) emulsions, whereas those with values of greater than 11 will produce oil in water (O/W) emulsions. Emulsion systems between 9 and 11 will form either W/O or O/W, depending on other formulation factors. *(1:287)*

99. **(C)** Both ophthalmic and nasal preparations should have only mild buffer capacity so that the organ's natural buffer system can overcome any pH differences. Otherwise, irritation might result. Nasal preparations usually have a pH in the range of 5.5 to 6.5. Often, phosphate buffers are used. Rendering the nasal solution isotonic will decrease potential for damage to the local tissue. The presence of an antimicrobial preservative is important because there may be accidental contamination of the dropper or nasal spray tip. *(1:1502)*

100. **(D)** Chlorobutanol is included in some ophthalmic and parenteral solutions as an antioxidant. The three chemicals (ascorbyl palmitate, butylated hydroxytoluene, and vitamin E are oil soluble, thus limiting their use to lipophilic systems. Ascorbic acid is a water-soluble antioxidant. *(4:15.10, 16.4–5)*

101. **(D)** InFeD is Iron Dextran Injection USP, a colloidal solution of ferric hydroxide complexed with partially hydrolyzed dextran. It

is intended for treatment of confirmed cases of iron-deficiency anemias, particularly among those patients who cannot tolerate or who fail to respond to oral administration of iron. A second product is DexFerrum. *(1:938; 3)*

102. **(E)** Polycarbophil absorbs large quantities of water, allowing the formation of stools. There does not appear to be any effect on the digestive enzymes or nutrients. The drug itself is not absorbed systemically. Polycarbophil is present in Mitrolan and FiberCon. Activated charcoal possesses good adsorption properties but is seldom used as an antidiarrheal. Kaolin and attapulgite are typical examples of adsorbent clays. Attapulgite is a colloidal hydrated magnesium aluminum silicate clay. Studies have indicated that it is an effective adsorbent for alkaloids, toxins, bacteria, and strains of human enteroviruses. However, attapulgite and kaolin are not selective and will also adsorb nutrients and digestive enzymes. Probably their greatest efficacy will be in the treatment of mild functional diarrhea. *(1:899; 2a:258, 287)*

103. **(A)** Simethicone is a mixture of inert silicon polymers that may be used as a defoaming agent to relieve GI tract gas. This antiflatulent ingredient is present in Mylicon drops and Phazyme tablets. Simethicone is included in a number of combination antacid products (Mylanta, Riopan, and Gelusil). A newer antiflatulent agent is alpha-Galactosidase, an enzyme that breaks down oligosaccharides before they form intestinal gas. A commercial product is Beano. *(2a:216; 2b:159–161)*

104. **(D)** Pepto-Bismol contains bismuth subsalicylate. The subsalicylate salt is the preferred insoluble form because the subnitrate may form the nitrite ion in the gut. Absorption of this ion could cause hypotension and possibly methemoglobinemia. Bismuth salicylate is safe when taken orally but should not be consumed by patients sensitive to aspirin. Patients should be counseled that black-stained stools that may occur with bismuth intake are harmless. *(2a:258; 2b:186)*

105. **(E)** All three products contain the clay attapulgite, which has been proved to be a more effective adsorbent than kaolin. Another ingredient in Kaopectate and Donnagel is pectin, which is classified as an intestinal absorbent, adsorbent, and protective. The belladonna alkaloids formerly present in Donnagel as antispasmodics have been removed because of the lack of proof for efficacy. *(2b:185; 3:1182)*

106. **(D)** Phenylpropanolamine (PPA) in combination with behavioral modification and mild caloric restriction and exercise appears to result in weight loss. Although phenylpropanolamine appears to have anorexigenic properties, the dose present in most OTC products (25 mg) is too low. The FDA permits doses of 37.5 mg in immediate-release products and not more than 75 mg in sustained-release products. Higher doses increase the incidence of side effects, such as nervousness, insomnia, hypertension, nausea, and tachycardia. Another OTC drug that is considered effective for weight control is benzocaine. *(2a:432; 11:328)*

107. **(A)** Actron contains 12.5 mg of ketoprofen. Aleve contains 225 mg naproxyn sodium and Nuprin has 200 mg ibuprofen. *(2b:55–56)*

108. **(D)** Of the three analgesics, acetaminophen appears the safest for use during pregnancy. Aspirin, as well as all other salicylates, is especially dangerous during the last trimester and when breastfeeding, mainly due to increased fetal and maternal morbidity. Ibuprofen may also cause postpartum bleeding and prolonged labor. *(2b:60, 67; 11:788)*

109. **(C)** An antiflatulent is intended to disperse and prevent formation of mucus-surrounded gas pockets in the GI tract. It also allows the gas to coalesce for easier removal. Mylicon is available in a liquid form containing 40 mg/.6 mL. A second product is Phazyme Enteric-Coated tablets. *(3:1183)*

110. **(B)** Magnesium salicylate is similar to sodium salicylate in its analgesic activity, but

there is the danger of systemic magnesium toxicity, especially in the renal-impaired patient. *(2a:64; 2b:56)*

111. **(E)** The usual adult dose is 30 mg every 8 hours, with a maximum daily dose of 120 mg. Individual doses of 30 mg or higher do not appreciably increase antitussive activity. *(2b:150; 11:223)*

112. **(C)** Emetrol is a phosphorated carbohydrate solution containing levulose, dextrose, and orthophosphoric acid with a pH adjusted to 1.5. Its effectiveness in preventing or treating motion sickness has not been proved but is considered effective for nausea associated with pregnancy. The Emetrol label states that the oral solution should not be diluted with or accompanied by other fluids. *(2a:291; 11:98)*

113. **(B)** Calcium carbonate is a rapid, prolonged, potent neutralizer of gastric acid. Some scientists and consumer groups have advocated its use because of its high effectiveness and low cost. However, the listed side effects should warrant curtailment of its use, particularly for chronic therapy. Some of the insoluble calcium carbonate is converted to soluble calcium chloride, which is absorbed. Significant amounts of calcium may be absorbed after a few days of antacid therapy. Gastric hypersecretion is believed to be caused by the local effect of calcium on the gastrin-producing cells. *(2a:206)*

114. **(D)** Calcium carbonate appears to be the antacid of choice when formulating chewable tablets. Although both the Titralac and Rolaid products contain calcium carbonate, Rolaids chewable tablets also contain magnesium hydroxide. Basaljel capsules contain only aluminum hydroxide. Other antacids containing only aluminum hydroxide include Amphojel and ALternaGEL. *(2b:164, 167; 11:87)*

115. **(D)** The generic name for Ayerst's Riopan is magaldrate. The product is a chemical rather than a physical combination of aluminum and magnesium hydroxides. Although this chemical form has a lower neutralizing capacity, it is still considered to be an effective antacid with a low sodium level and does not cause electrolyte imbalance in the body. *(1:888; 2a:208)*

116. **(E)** Both film and sugar coats are water soluble and most will readily disintegrate in the stomach. However, the smooth tablet surface makes the tablet easier to dissolve with less chance of bitter drug powder remaining in the mouth or throat. Enteric coats are intended to slow the disintegration of the tablet until the unit reaches the small intestine. *(1:1616; 24:198–201)*

117. **(E)** The application of film coat, usually by spray techniques, to large batches of tablets is much easier and faster than sugar coating, which usually involves several steps. The film coat usually adds only 2 to 3% of weight to each tablet and is less likely to chip during handling. *(1:1652; 24:201.221)*

118. **(E)** The tablets are enteric-coated to avoid gastric irritation. They should not be taken within 1 hour of ingestion of milk or antacids because the enteric coating may be dissolved prematurely. *(4:989)*

119. **(A)** Magnesium stearate (as well as other stearates) is included in tablet formulations as a lubricant. *(1:1411; 24:185)*

120. **(C)** Tablet lubricants are characterized by lubricity, as they are usually water-insoluble and difficult to wet. The waterproofing property might retard disintegration and dissolution. *(1:1618)*

121. **(D)** Aspartame is a dipeptide that is approximately 200 times sweeter than sucrose. Because it provides less than 1 calorie per dose and does not impart the bitter aftertaste experienced by some people after consuming saccharin, it is a popular sweetening agent in drug products and foods. Its tendency to disintegrate on heating limits potential uses. Patients with phenylketonuria should avoid aspartame because one breakdown ingredient is phenylalanine. *(2a:335, 436)*

122. **(D)** Originally Ex-Lax and several other OTC laxatives contained phenolphthalein, a stimulant laxative, as the active ingredient. However, because of some evidence that phenolphthalein may be carcinogenic, many companies have reformulated by using other laxatives. The sennosides are active components from senna and stimulate the GI tract. *(2a:234; 3:1169)*

123. **(B)** Searle's Covera-HS is formulated into a COFR-24 delivery system. The 180- or 240-mg tablets are intended for bedtime dosing to ensure maximum plasma levels in the early morning. This time-factor design is intended to take advantage of the body's circadian rhythm because blood pressures tend to be higher when the patient rises in the morning. *(10)*

124. **(B)** Products such as Potassium Chloride Enseals are enteric-coated to protect the stomach from irritating substances or to prevent drug decomposition in the stomach. Endurets are sustained-release tablets. Preludin is an example. Extentabs are prolonged-action tablets (for example, Dimetapp Extentabs). Filmtabs are tablets coated with a transparent protective coating (for example, Eutron Filmtabs). *(1:1653; 10)*

125. **(D)** Mannitol possesses characteristics that make it an almost ideal sweetener for chewable tablets. Although not as sweet as sucrose, it has "good body," leaves a cool taste in the mouth, and is not hygroscopic. Mannitol is also easily compressed by wet granulation. *(24:217)*

126. **(B)** Sterile powders of water-unstable drugs are often prepared by lyophilization (freeze-drying). Mannitol may be included in the formula to build up the dry powder, known as the cake. The larger, more visible cake is helpful in that the pharmacist can more readily ascertain when dissolution is completed. *(13:36)*

127. **(A)** Benzyl alcohol is used in many parenterals, especially in Bacteriostatic Sterile Water for Injection, as an antimicrobial agent. Although its relative toxicity is low, there are a few reports of hypersensitivity. Also, it is contraindicated for use in premature infants because of incidences of fetal toxic syndrome. *(13:17)*

128. **(D)** Thickening a suspension will slow its sedimentation, but it is still necessary to get the product out of the bottle. A pseudoplastic flow is desirable because it is characterized by a greater flow rate after the system has been agitated. Thixotropy refers to a reversible sol-gel system; it is characterized by a gel that forms a flowable sol when shaken. On standing, the reformation of the gel will slow particle settling. Caking is undesirable because settling particles form a dense pack in the bottom of the container. It is very difficult to break this cake and to reconstitute the original suspension. *(1:295, 298)*

129. **(C)** Inhalation aerosol products may be intended for either localized activity (bronchodilators for asthma) or systemic action (ergotamine for migraine). In either situation, the onset of action will be rapid. When the drug is absorbed through the alveolar–capillary membrane, the first-pass metabolism in the liver is avoided. Because of the limited capacity of aerosol units, especially in the small-chamber metered valves, only a limited amount of drug can be administered. *(1:1676)*

130. **(A)** The acronym MDI refers to "metered-dose inhaler," which are the pressurized aerosol units that dispense accurate metered doses. Epinephrine is the active bronchodilator in such OTC products as Bronkaid Mist and Primatene Mist. Ephedrine is available OTC only in tablet and syrup dosage forms. Metaproterenol aerosol products are by prescription only. *(2a:167–68; 2b:148; 11:254)*

131. **(B)** An ileostomy results when the entire colon (large intestine) and a portion of the small intestine is removed and the remaining end of the small intestine is attached to the abdominal wall. Because of the narrow diameter of the small intestine, the wall opening

(stoma) is not as large when compared to colostomy stomas. The fecal discharge is watery because there has been limited opportunity for water reabsorption. Also, there are higher concentrations of enzymes present that may irritate the skin. *(1:1864; 22:208)*

132. **(A)** Diacetylmorphine is commonly known as heroin. It is a Class I controlled substance; this means that it may be used only for experimental work by special permit. *(1:401)*

133. **(A)** The first-degree burn is the mildest injury because only the epidermis is affected. Blisters and pain are characteristics of a second-degree burn, which affects the epidermis and portions of the dermis. The skin will regenerate. A third-degree burn penetrates through the entire skin. Damage may be permanent. Blackened skin is characteristic of a fourth-degree or char burn. Both the skin and underlying tissues are affected. There is a danger of deep infection. *(2a:635)*

134. **(C)** Benzocaine is widely used for surface anesthesia of the skin and mucous membranes. It remains on the skin for a long period of time because of its poor water solubility and because it is poorly absorbed. Systemic toxicity is rare. Although the possibility of local sensitization should be considered, the incidence is low considering the frequent use of benzocaine. Although the incidence of hypersensitivity to lidocaine is lower than that of benzocaine, prolonged administration of lidocaine to a large skin area may result in systemic side effects. Lidocaine is present in Medi-Quik Aerosol, Bactine, and Unguentine Plus. Although phenol (carbolic acid) possesses both antiseptic and local anesthetic effects, there is the possibility that it may accentuate tissue damage because of its caustic properties. *(1:1412, 1151; 2a:641)*

135. **(D)** A topical preparation should contain a minimum of 5% benzocaine. Some studies have indicated that 10 to 20% of the drug is needed. *(2a:641; 11:456)*

136. **(D)** Debrisan is not useful in the treatment of nonsecreting wounds. Its action appears to be absorption of fluids and particles that impede tissue repair. The product is available as 0.1- to 0.3-mm spherical beads (4-g packets) that are sprinkled onto secreting wounds. The hydrophilic nature of the beads creates a strong suction force; each gram absorbs about 4 mL of fluid. The beads become grayish yellow when they are saturated with fluid; they should then be washed away by irrigating with sterile water or saline. *(1:881)*

137. **(A)** The rectal thermometer bulb has a strong, blunt shape that facilitates insertion into the rectum and retention by sphincter muscles. The oral bulb is cylindrical, elongated, and thin-walled for quick registration of temperature. Rectal thermometers can be used orally. The oral bulb is too easily broken and is not suitable for rectal use. The short, sturdy, security bulb represents a compromise intermediate shape. *(1:1860)*

138. **(B)** Because fertilization can occur within only a few hours (perhaps 24) after ovulation, accurate knowledge of this event could permit timing of intercourse to either increase or decrease the possibility of conception. Basal temperature (the lowest temperature of the body during waking hours) typically passes through a biphasic cycle over the course of the menstrual cycle. From an initially low temperature, a midcycle thermal shift occurs to a high level, where it remains until it again becomes low premenstrually. The temperature rise roughly corresponds with the time of ovulation. The thermometer is used orally or rectally once daily, immediately on awakening in the morning and before getting out of bed. The scale may be either Fahrenheit or Celsius. The temperature rise is only about 0.5° F, which would be difficult to measure on the usual clinical thermometer. The basal thermometer scale ranges only from 96 to 100° F and is graduated to 0.1°. *(1:1860)*

139. **(C)** The French system is used for designating sizes of both urinary catheters and tubing used for enteral feedings. One French unit equals 1 mm on the outside circumference.

Thus, a catheter with an outside circumference of 20 mm is identified as a 20F or 20Fr size. Syringe needles are sized by another system—the Stubbs numbers. *(1:1867)*

140. **(D)** Although the venoms of some insects are potent, the amounts injected are too small to be toxic. The severity of the sting reaction in some individuals is due to their hypersensitivity to certain proteins in the venom. This results in the anaphylactic shock. *(2a:661; 11:446–50)*

141. **(D)** Persons who experience severe anaphylactic reactions to insect sting or bites should carry emergency kits. These kits usually contain antiseptic pads (to clean and disinfect the area), both an antihistamine and epinephrine injection (to counteract the anaphylactic reaction), and tweezers (to remove the stingers). A tourniquet would be of little value because the amount of venom is very small. Self-injectable units of epinephrine, such as EpiPen, are also available for individuals known to be susceptible to stings. *(2a:664)*

142. **(B)** Pamabrom, a xanthine derivative is present in several OTC products for the prevention of premenstrual syndrome (PMS), specifically bloating. Its diuretic activity is obtained with a dose of 25 to 50 mg four times a day. Examples of products containing pamabrom include Midol PMS and Pamprin. *(2b:73; 11:290)*

143. **(A)** The carbamide peroxide will effervesce, thereby softening the waxy material. An example of an OTC product is Debrox, which also contains glycerin and propylene glycol that acts as solvents. *(2b:334; 11:418)*

144. **(E)** Diffusion of a drug from a vehicle into the skin is often related to the solubility of the drug in the vehicle relative to the solubility in the skin, ie, the partition coefficient. Drugs that are very soluble in a vehicle will tend to remain in the vehicle and will penetrate more slowly than drugs with poorer solubility in the vehicle. Covering the area to which a topical drug product has been applied will often enhance the rate of drug absorption. Sweat accumulation at the skin–vehicle interface induces hydration of the skin, a condition that facilitates penetration of drugs. Poorer solubility of the drug in PEG ointment than in white ointment may lead to faster diffusion. This is the converse of choice E. The thicker epidermis of the palms results in slower drug penetration than that which occurs on the backs of the hands. Higher drug concentrations will increase the rate of diffusion and penetration. *(1:713; 24:363–64)*

145. **(A)** Benzocaine is included in some dietary aid products at levels of 3 to 15 mg. The products are formulated as lozenges, gum, or candies. The benzocaine is believed to decrease the person's ability to detect sweetness, thus reducing appetite. *(2b:313; 11:330)*

146. **(B)** Melatonin is an endogenous hormone produced by the human pineal gland. It appears to shift the circadian rhythm and serves as a sleep aid when taken 1 to 2 hours before bedtime. *(2a:184)*

147. **(E)** Allantoin is included in many topical formulations as a vulnerary (healing agent), which is a substance that stimulates tissue repair. *(1:880)*

148. **(D)** Compazine is available in hard gelatin spansules for sustained release of the drug. It is used to treat anxiety and as an antiemetic. All of the other drugs are formulated into soft gelatin capsules which allow formulation of water insoluble drugs in other solvents such as corn oil, coconut oil, and propylene glycol. Because of the liquid nature of the drug or its formula, the solid dosage form has faster disintegration/dissolution rates. All of the other choices consist of drug in soft gelatin capsules. Cyclosporine (Sandimmune) is an immunosuppressive agent. Ethchlorvynol (Placidyl) is used as an hypnotic. Ethosuximide (Zerontin) is an anticonvulsant, and ranitidine (Zantac GELdose) helps prevent peptic ulcers. Another example of a soft gelatin capsule is Lanoxicaps which is a

liquid form of digoxin. Less drug is required for the same activity as the solid tablet dosage form. *(10; 24:196)*

149. **(D)** The extent of drug release and absorption will vary depending upon the properties of the drug, the suppository base, and the condition of the colon. Oil-soluble drugs will be poorly released from a cocoa-butter base because of their high lipid/water solubility. The rectal fluid pH is essentially neutral and has a low buffer capacity. Therefore, drugs that can be destroyed by the acidity of the stomach may be successfully administered rectally. Drugs that are absorbed through the colon pass into the lower hemorrhoidal veins and into the general systematic circulation. Avoidance of first-pass exposure to the liver may enhance the effect of those drugs inactivated by the liver. Drugs that are absorbed from the upper intestinal tract pass directly through the portal vein into the liver, where metabolism may occur. The lesser dose frequency and lower propensity for irritation are the reasons certain drugs can be administered rectally but not orally. *(24:281)*

150. **(E)** Selected combinations of the polyethylene glycols (PEGs) can be formulated into water-miscible suppositories with a range of consistency. They are easy to insert and do not require refrigeration. *(24:293)*

151. **(A)** Lactose is a readily compressible and water-soluble inert ingredient. It also encourages the growth of Doderlein's bacilli, a microorganism present in the healthy vagina. *(24:295)*

152. **(B)** Semicid inserts contain 100 mg of the spermicide nonoxynol-9. The active ingredient in Norforms vaginal suppositories is the quaternary ammonium germicide benzethonium chloride, which decreases odor-producing microorganisms. Terazole contains terconazole for the treatment of moniliasis. *(2b:70; 24:293)*

153. **(C)** When moistened, starch will swell, thus aiding in the disintegration of a tablet. Corn starch in the form of a paste will bind powders during the formation of granules suitable for compression into tablets. *(1:1618–19)*

154. **(E)** Carbomers (Goodrich's Carbopols) are polymers with a number of carboxy groups present. When the pH of a solution containing the carbomer is increased, there will be a significant increase in viscosity. *(1:1396, 1518)*

155. **(D)** Excessive tablet compression may hinder tablet disintegration into aggregates, thus slowing the dissolution process. Other factors that affect dissolution include drug solubility, particle size, and crystalline structure; however, these factors may not influence the disintegration rate. However, there is usually fairly good correlation between tablet disintegration characteristics and dissolution, and disintegration times are a convenient in-house manufacturing control. Increasing drug particle surface area by micronization of drugs such as griseofulvin, chloramphenicol, and sulfadiazine have increased their dissolution rates (decreased dissolution times) and improved absorption. *(1:594–5)*

156. **(E)** The disintegration times for uncoated tablets may vary and will be specified in the official monographs. The usual time is 30 minutes. For sugar-coated tablets, the time may be as much as 2 hours. Enteric-coated tablets are first placed in gastric fluid, then transferred to a simulated intestinal fluid. Buccal tablets may need four hours to disintegrate while sublingual tablets such as nitroglycerin have a limit of only a few minutes. *(1:1641: 24:206–9)*

157. **(A)** Properties of a solution that depend on the number of particles of the solute and are independent of the chemical nature of the solute are termed colligative properties. The magnitude of vapor pressure, freezing-point reduction, boiling-point elevation, and osmotic pressure are all related to the number of particles in solution. *(1:206)*

158. **(A)** Solutions with equal osmotic pressure are isoosmotic; they also will be isotonic if

separated by a membrane permeable to the solvent but impermeable to the solute. Any of the colligative properties can be used to determine tonicity of solutions. Freezing-point depression values are used most frequently. The freezing point of a 0.9% sodium chloride aqueous solution is –0.52° C; the same as that of human blood and tears. Saline solutions of this concentration are isotonic with these body fluids. More concentrated solutions are hypertonic; less concentrated are hypotonic. *(1:207)*

159. **(D)** Solutions with the same osmotic pressure as blood are usually isotonic with blood. Solutions that have a higher osmotic pressure (ie, hypertonic) will cause water to pass out of the red blood cells. Solutions that have a lower osmotic pressure (ie, hypotonic) will allow water to pass into the cells. This causes them to swell and rupture with a release of hemoglobin (hemolysis). *(1:207; 112:180)*

160. **(C)** A hypertonic solution will draw water from within the cell until an equilibrium is reached with equal pressure on each side of the cell membrane. Because of the loss of volume, the cell will shrink and take on a wrinkled appearance (crenation). *(1:207; 24:472)*

161. **(A)** A sodium chloride equivalent is the weight of sodium chloride that will produce the same osmotic effect as 1 g of the specified chemical. For example, morphine hydrochloride has an E value of 0.15. This indicates that 1 g of morphine hydrochloride produces the same osmotic pressure (and depression of freezing point) in solutions as 0.15 g of sodium chloride. *(1:620; 12:182)*

162. **(C)** Any two solutions that have the same freezing points will have the same osmotic pressure and should be isotonic. Because blood freezes at –0.52° C, any aqueous solution that freezes at this temperature will be isoosmotic. The use of freezing-point data for isotonicity adjustment for both ophthalmic and parenteral solutions is common in the pharmaceutical industry because freezing points can be measured easily. *(1:620; 12:181)*

163. **(D)** Aqueous solutions that freeze at the same temperature as blood have the same osmotic pressure as blood (ie, are isoosmotic with blood and each other). However, to be isotonic a solution must maintain a certain pressure, or "tone," with the red blood cells. If the chemical in a solution passes freely through the red blood cell membrane, equalized pressure on both sides of the membrane is not possible without changes in the cell volume. Tone will not be maintained, and the solution will not be isotonic, though it might be isoosmotic with blood. *(1:619; 12:180)*

164. **(C)** The *Remington: The Science and Practice of Pharmacy* presents extensive tables of sodium chloride equivalents (E) and freezing point depression (D) values. *(1:622)*

165. **(E)** In spite of its name, Veegum is not an organic gum but is an inorganic clay. It is water-insoluble and would probably be unsuitable for ophthalmic administration since insoluble particles could be deposited in the ocular areas. *(1:1571)*

166. **(B)** Increasing the contact time between a drug and the cornea will often increase the amount of drug absorption that will occur. *(1:1571; 4:18.4)*

167. **(B)** Fluorescein sodium is an ophthalmic diagnostic agent. It is instilled into the eye to delineate scratches and corneal lesions. It would be very dangerous to place a contaminated solution on a damaged cornea through which microorganisms may easily pass. If *Pseudomonas aeruginosa* enters the interior of the eyeball, blindness may occur quickly. Pharmacists should not prepare fluorescein sodium solutions extemporaneously unless sterility can be guaranteed. Pharmaceutical manufacturers supply fluorescein as unit-dose solutions or individual paper strips. *(1:1569)*

168. **(A)** *Acanthamoeba* keratitis has been identified in solutions used by contact lens wearers. These solutions were either home-made or commercial solutions that were recycled.

Thermal disinfection is effective in eliminating microbial contamination including *Acanthamoeba*. *(2a:482)*

169. **(A)** The combination of benzalkonium chloride and edetate (0.01% of each) is effective against those microorganisms likely to contaminate ophthalmic solutions. These include some strains of *Pseudomonas aeruginosa* that are resistant to benzalkonium chloride alone. *(4:15.9; 24:472)*

170. **(A)** Epinal contains epinephrine borate while the other two products (Epifrin and Glaucon) contain the hydrochloride salt of epinephrine. There may be a distinct advantage in using the borate salt since the pH of the solution will be higher, thus causing less irritation when placed in the eye. *(3:1729)*

171. **(D)** Papain and subtilisin are proteolytic enzymes that aid in the removal of proteinaceous residues that slowly build up on soft lenses during wear. Allergan markets Enzymatic Contact Lens Cleaner as tablets containing papain. Subtilisin is present in Bausch & Lomb's ReNu series of products. A third enzyme that has been used is pancreatin. Once weekly, the soft lenses are soaked overnight in solutions prepared from the previously mentioned products. Hydrogen peroxide is the active ingredient in a number of soft lens disinfecting products. *(2a:142; 2b:329)*

172. **(A)** The capacity of the cul-de-sac is estimated to be not more than 0.03 mL, with a normal tear volume of approximately 0.007 mL. Probably less than 0.02 mL of an ophthalmic solution can be placed successfully in an eye at one time. This volume is less than the nominal 0.05 mL (1 drop) usually requested in prescription directions. This implies that a portion of the dose is lost through drainage or overflow onto the cheek. *(1:1565)*

173. **(C)** Sodium bisulfite and sodium metabisulfite are included in pharmaceutical solutions as antioxidants. For example, the oxidation of epinephrine may be retarded by the presence of sodium bisulfite, which is preferentially oxidized. Unfortunately, some individuals are sensitive to the bisulfites and must avoid products containing them. The labels of many wines caution about the presence of bisulfites. *(1:1381; 4:16.4)*

174. **(A)** One of the first signs of sensitivity to bisulfites is difficulty in breathing. Also, the patient may experience hives, abdominal pain, and wheezing. *(24:82–83)*

175. **(B)** LYMErix vaccine develops reasonable titers in approximately 80% of the population. It is injected into the deltoid muscle rather than subcutaneously. The spirochete is carried in ticks which are often found on wild deer. The original tick bite often appears as a small red bull's eye. Recovery rate for humans is fast if treated early with one of the tetracyclines. Otherwise, a severe form of arthritis may develop. *(3:1505)*

176. **(C)** Because membrane filtration does not involve heat, it is suitable for drug solutions that either are sensitive to heat or have not been studied sufficiently concerning their heat stability. The pharmacist may purchase presterilized filter units such as Millipore's Millex through which 15 to 100 mL of solution can be filtered. However, autoclaving is still considered the most reliable sterilization procedure. *(13:68–70)*

177. **(D)** By definition. *(1:221; 12:150)*

178. **(C)** The Henderson–Hasselbalch equation, or buffer equation, for a weak acid and its corresponding salt, is represented by

$$\text{pH} = \text{pKa} + \log \frac{\text{salt}}{\text{acid}}$$

where pKa is the negative log of the dissociation constant of the weak acid and salt/acid is the ratio of the molar concentrations of salt and acid in the system. The volume of the solution is not critical because the chemical concentrations are already expressed in terms of moles. *(12:170)*

179. **(E)** According to the Henderson–Hasselbalch equation, pH will equal pKa when the expression

$$\log \frac{[\text{salt}]}{[\text{acid}]} \text{ is equal to zero.}$$

This can occur only when the salt/acid ratio equals 1, because the log of 1 is 0. The point at which the salt concentration equals the acid concentration is the half-neutralization point. It is also the pH at which a buffer system, based upon the weak acid's pKa, has the best buffering capacity. *(12:170)*

180. **(D)** For many years, the curie (Ci) has been the basic unit for expressing radioisotope decay. Now the becquerel is recognized as the "official" unit. One becquerel equals one decay per second (dps).

$$1 \text{ curie} = 3.7 \times 10^{10} \text{ bq (dps)}$$

The rad is a quantitative measure of radioactivity. *(24:488)*

181. **(B)** Decay rate is the rate at which atoms undergo radioactive disintegration. The rate of decay (–dn/dt) is proportional to the number of atoms (n) present at any time (t); thus, radioactive decay is a first-order process. *(1:368)*

182. **(C)** Gamma radiation, x-rays, and ultraviolet radiation are forms of electromagnetic radiation and are radiated as photons or quanta of energy. These forms of radiation differ only in wave length and are the most penetrating types of radiation. Gamma rays are the most penetrating of all and can easily penetrate more than a foot of tissue and several inches of lead. Alpha radiation is particulate radiation consisting of two protons and two neutrons. The range of alpha particles is about 5 cm in air and less than 100 microns in tissue. Beta radiation is also particulate radiation, but exists as two types, the negative electron (negatron) and the positive electron (positron). Both may have a range of over 10 feet in air and up to about 1 mm in tissue. *(1:379)*

183. **(B)** ^{90m}Tc is available commercially as a technetium generator from various manufacturers in which molybdenum ^{99}Mo is the parent nuclide. The half-life of technetium (6 hours) is long enough to allow completion of usual diagnostic procedures for which it is used, yet short enough to minimize the radiation dose to the patient. Lack of a beta component in its radiation further decreases the dose delivered to the patient. The gamma energy is weak enough to achieve good collimation, yet strong enough to penetrate tissue sufficiently to permit deep-organ scanning. *(1:371)*

184. **(B)** Although it is desirable to use isotopes with short half-lives to minimize the radiation dose received by the patient, it is evident that the shorter the half-life, the greater the problem of supply. Radioisotope generators, or "cows," have been developed to deal with this problem. A radioisotope generator is an ion-exchange column containing a resin of alumina on which a long-lived parent nuclide is absorbed. Radioactive decay of the long-lived parent results in the production of a short-lived daughter nuclide that is eluted or "milked" from the column by means of an appropriate solvent such as sterile, pyrogen-free saline. *(1:371)*

185. **(B)** The drug solution lost 0.5 mg of its 2.0 mg/mL concentration in 24 hours. This represents a loss of

$$\frac{0.5}{2.0} = .25 \text{ or } 25\%$$

Because first-order reaction rates are expressed as fraction per unit of time, the value willl be 0.25/day. *(24:78)*

186. **(A)** This problem may be solved either by using an equation or by the simple relationship of

Original concentration = 2.0 mg/mL
After one half-life (4 days) = 1.0 mg/mL
After two half-lives (8 days) = 0.5 mg/mL
After three half-lives (12 days) = 0.25 mg/mL

(24:78)

187. **(B)** First determine the concentration after three days.

Original concentration	= 10,000 units/mL
After one half-life (1 day)	= 5,000 units
After two half-lives (2 days)	= 2,500 units
After three half-lives (3 days)	= 1,250 units

Next, determine the mL of the final solution that contains the required dose of 2,000 units.

$$\frac{1{,}250 \text{ units}}{1 \text{ mL}} = \frac{2{,}000 \text{ units}}{x \text{ mL}}$$

$$x = 1.6 \text{ mL}$$

(24:78)

188. **(C)** Hydrochloric acid is classified as a strong acid. Strong acids ionize almost completely into hydronium ions and the corresponding anions. Other strong acids are sulfuric and nitric. These acids do not have pKa values listed because the values would be close to 0. The fact that all of the other acids listed in the question have pKa's indicate that they are weaker acids (with less ionization) than hydrochloric acid. *(12:147, 154)*

189. **(C)** Strong acids have larger ionization constants than weak acids. Because the pKa is the reciprocal of the log of the ionization constant, stronger acids have lower pKa's than weaker acids. Of the acids listed, boric acid has the highest pKa; thus, it is the weakest of these acids. Salicylic acid, which has the lowest pKa on the list, is the strongest. *(12:146)*

190. **(D)** A buffer system consists of a weak acid or base and its corresponding strong salt. In preparing a buffer system, one should choose an acid or a base with a pKa close to the desired pH. For example, lactic acid and sodium lactate can be combined to obtain a pH of exactly 4.0. The needed molar concentration of each may be calculated by using the Henderson–Hasselbalch equation. *(1:225; 12:173)*

191. **(C)** This problem may be solved using the Henderson–Hasselbalch equation knowing that the pKa of boric acid is 9.24.

$$\text{pH} = \text{pKa} + \log \frac{\text{salt}}{\text{acid}}$$

$$\text{pH} = 9.24 + \log \frac{.05 \text{ moles/dL}}{.005 \text{ moles/dL}}$$

$$\text{pH} = 9.24 + \log 10$$

$$\text{pH} = 9.24 + 1 = 10.24$$

(23:300)

192. **(B)** For determining the ratio of a weak acid to its salt present at a given pH, the Henderson–Hasselbalch equation is used.

$$\text{pH} = \text{pKa} + \log \frac{[\text{disassociated}]}{[\text{undisassociated}]}$$

If the values for pH and pKa are used in this equation, it can be seen that the ratio of the dissociated form of the drug to the undissociated form will be the antilog of 2, a numeric value of 100.

$$7.5 = 5.5 + \log \frac{B}{A}$$

$$\log \frac{B}{A} = +2$$

$$\frac{B}{A} = 100$$

(24:104–5)

193. **(C)** Sustained-release dosage forms are intended to reduce dosing frequency while maintaining relatively consistent blood levels of the drug. The duration of activity of drugs with half-lives between 2 and 8 hours can be extended to obtain convenient once- or twice-daily dosing. Although it would be desirable to increase the therapeutic duration of those drugs with half-lives of less than 2 hours, the required high drug-release rates and high drug concentration in the dosage form reservoir usually preclude sustained-release dosage formulation. Also, individual biologic variation could result in either sub- or hypertherapeutic blood levels. Drugs with half-lives greater than 8 hours usually have long intervals between dosing, making sustained-release formulations unnecessary. *(1:1665)*

194. **(C)** SKB's spansule formulation consists of medicated pellets in a capsule dosage form. Some pellets are uncoated to give almost immediate drug release, whereas other pellets have lipid coatings of various thicknesses. Thus, the initial dose is reinforced with additional drug release over periods of time. Another group of products based on the same principle are the sequels such as Artane, Diamox, and Ferro-Sequels. *(1:1668; 24:232)*

195. **(A)** Pennwalt's Ionamin capsules contain phentermine, an agent used for dieting. *(1:1669)*

196. **(C)** The OTC product Efidac/24 contains pseudoephedrine for use as an oral-nasal decongestant. The weight-control agent, phenylpropranol amine is present in Acutrim, also an OTC product. Other osmotic tablets include Procardia XL (nifedipine) and Volmax (albuterol). Because the rate-limiting factor in these tablets is the osmotic pressure, drug release is not affected by GI tract pH. *(1:1668; 10; 24:235)*

197. **(D)** Because of individual patient biologic variation and technologic limitations of precise control of drug release, drugs with either short half-lives or low therapeutic indexes are not suited for sustained-release products. A drug which requires dosing of 500 mg TID is usually not suitable since 1500 mg would be needed in the sustained-release dosage form. Almost all sustained-release products are designed for the treatment of chronic conditions in which acute dosing adjustments are not necessary. Hopefully, sustained-release products will improve patient compliance by requiring less frequent dosing. *(24:230)*

198. **(C)** Liposomes are small vesicles of a bilayer of phospholipid encapsulating an aqueous compartment. Since phospholipids have both hydrophilic and hydrophobic portions, either lipophilic or hydrophilic drugs may be incorporated into the structure. Liposomes may vary in shape, usually with sizes between 0.5 and 100 microns. *(17:217; 24:548)*

199. **(E)** Liposomal dosage forms may be developed for any route of administration, but their parenteral use is exciting. Liposomal forms of amphotericin B have activity targeted at fungi localized in tissue, thus allowing lower doses and fewer side effects. The chemotherapeutic agent, doxorubicin, has been formulated into parenteral liposomes with reduced cardiotoxicity when compared to the conventional product. *(17:217; 24:258)*

200. **(C)** Augmentin consists of amoxicillin and clavulanate K. Ziac contains bisoprolol plus hydrochlorthiazide. Zithromax has only azithromycin as an active ingredient. *(3:25)*

201. **(A)** Percodan contains aspirin plus oxycodone *(3; 10)*

202. **(A)** Accolate (Zafirlukast), a lukotriene receptor antagonist, is available as a 20-mg tablet, not as an inhalation dosage form. Tilade Inhaler (Nedocromil) is used in maintenance therapy in patients with mild to moderate bronchial asthma. Intal inhaler (cromolyn sodium) is a mast-cell stabilizer, which prevents acute bronchospasms. *(24:394)*

203. **(B)** ERYC capsules are formulated with enteric-coated pellets to delay the release of erythromycin. A somewhat similar product is E-Mycin Delayed Release Tablets, which are enteric-coated tablets. *(10; 24:238)*

204. **(D)** Inderal (propranolol) is available as 20-, 40-, and 60-mg tablets; long-acting capsules (Inderal LA at 80, 120, and 160 mg); and an injection (1 mL ampules containing 1 mg of drug). *(25)*

205. **(C)** Coumadin is DuPont's brand of warfarin sodium and is available in several strengths for convenient dosage adjustments. Tablets containing 2, 2.5, 5, 7.5, and 10 mg are marketed. *(25)*

206. **(D).** *(3:925; 25)*

207. **(C).** *(25)*

208. **(E).** *(10)*

209. **(B)** Although all three products are available as inhalation aerosols, Vanceril contains beclomethasone and Atrovent contains ipratropium. *(10)*

210. **(C)** Both Dilacor XR and Tiazac are available as extended-release diltiazem. Verelan contains verapamil. *(10)*

211. **(D)** Hytrin is the antihypertensive agent terazosin. *(10)*

212. **(A)** Tylox, Roxicet, and Percocet contain oxycodone plus acetaminophen, whereas Vicodon contains a mixture of hydrocodone plus acetaminophen. Elocon (Mometasone) is a topical steroid. *(10)*

213. **(A).** *(25)*

214. **(C).** *(25)*

215. **(C).** *(25)*

216. **(B).** *(25)*

217. **(A).** *(25)*

218. **(I).** *(25)*

219. **(I).** *(25)*

220. **(F).** *(25)*

221. **(B).** *(25)*

222. **(D).** *(25)*

223. **(A).** *(25)*

224. **(E).** *(25)*

225. **(C).** *(25)*

226. **(D)** Lidocaine (Xylocaine) is a (local) anesthetic available as a cream, an ointment, and an oral spray. Lidocaine HCl is administered by injection as well as topically. *(1:1153, 1149)*

227. **(A)** Bupivacaine (Marcaine) is available only for parenteral use. *(10)*

228. **(C)** Procaine (Novocain) is available only for parenteral use. *(1:1150)*

229. **(A)** The antihyperglycemic drug Glucotrol (glipizide) is also available as a 5-mg tablet. *(10)*

230. **(C)** Ultram (tramadol) is classified as a central analgesic. *(10)*

231. **(D)** Sporanox (itraconazole) is an oral antifungal agent. *(10)*

232. **(E)** Zithromax (azithromycin) is classified chemically as a macrolide. The anti-infective is marketed by Pfizer in 250-mg capsules. *(1:1304)*

233. **(C)** Toradol (ketorolac) is available in several strengths including 50-, 100-, and 200-mg extended-release forms. It is also available under the trade name of Acular. *(10)*

234. **(B)** The antidepressant Paxil (paroxetine) is available as 10-, 20-, 30-, and 40-mg tablets. *(10)*

235. **(B)** Prilosec (omeprazole) is available as both a 10- and 20-mg delayed-release capsule. It is intended for the short-term treatment of active duodenal ulcers. *(10)*

236. **(A)** Kytril (granisetron) is marketed by Smith Kline Beecham as a 1-mg tablet for the prevention of nausea and vomiting. *(10)*

237. **(B)** Claritin (loratadine) is a very popular antihistamine. It is available as a regular 10-mg tablet and as Claritin Reditabs, which contain 10 mg of micronized drug for faster dissolution by placement on the tongue. Claritin-D contains 5 mg loratadine + 120 mg of pseudoephedrine. *(10)*

238. **(D).** *(10)*

239. **(D).** *(10)*

240. **(A).** *(10)*

241. **(E).** *(10)*

242. **(C).** *(10)*

243. **(F).** *(10)*

244. **(G).** *(10)*

245. **(I).** *(10)*

246. **(H).** *(10)*

247. **(J).** *(10)*

248. **(D).** *(10)*

249. **(E).** *(10)*

250. **(A).** *(10)*

251. **(B).** *(10)*

252. **(C).** *(10)*

253. **(A).** *(10)*

254. **(E).** *(10)*

255. **(D).** *(10)*

256. **(B).** *(10)*

257. **(A)** Procainamide. *(10)*

258. **(D)** Isosorbide dinitrate. *(10)*

259. **(C)** Fluticasone proprionate. *(10)*

260. **(B)** Verapamil. *(10)*

261. **(A)** Celebrex is available as 100- and 200-mg capsules for either once daily or twice a day dosing. It is intended for treatment of rheumatoid arthritis and osteoarthritis. *(10)*

262. **(E)** Cerebyx Injection is intended as a replacement for dilantin for both the prevention and treatment of seizures. *(10)*

263. **(B)** Celexa is available as 20- and 40-mg tablets for depression and is given once a day. *(10)*

264. **(D).** *(2b:137; 11:212)*

265. **(E).** *(2b:138; 11:212)*

266. **(B)** Besides Afrin, both Dristan 12-Hour and Neosynephrine 12-Hour sprays contain 0.05% oxymetazoline. *(2b:137; 11:212)*

267. **(C).** *(2b:138; 11:212)*

268. **(A)** Aluminum hydroxide is a commonly used antacid because of its nonabsorbability, demulcent activity, and ability to adsorb pepsin. It is somewhat slow in respect to onset of action. A second antacid product with just aluminum hydroxide is Basaljel. *(2a:207; 2b:164; 11:86)*

269. **(C)** Magnesium trisilicate appears to be longer-acting than aluminum hydroxide. When it reacts with hydrochloric acid in the stomach, hydrated silicon dioxide, which may coat ulcers, is formed. Gaviscon and Gaviscon-2 contains alginic acid, which forms a viscous solution, thereby prolonging contact time. The product is claimed to be effective in the relief of gastroesophageal reflux. All of the other Gaviscon products (Extra Strength and Liquid) contain aluminum hydroxide and magnesium carbonate but no magnesium silicate. *(1:888; 2a:207; 2b:165; 11:88)*

270. **(D)** Calcium carbonate is often considered the antacid of choice because of its rapid onset of action, high neutralizing capacity, and relatively prolonged action. Side effects include constipation, which may be prevented by combining calcium carbonate with either magnesium carbonate or magnesium oxide. Prolonged use of calcium carbonate may result in the formation of urinary calculi. Also, increased blood levels of calcium have been reported. *(2a:208; 2b:166; 11:87)*

271. **(B)** Magnesium hydroxide has been mixed with aluminum hydroxide in an attempt to

reduce the incidence of constipation attributed to the aluminum ion and reduce the incidence of diarrhea due to the magnesium ion. Most antacid products on the market consist of this combination. *(2a:207; 2b:165; 11:87)*

272. **(A).** *(2:206; 2b:166; 11:86)*

273. **(A).** *(13:290)*

274. **(B).** *(13:292)*

275. **(E).** *(13:287)*

276. **(A).** *(13:292)*

277. **(D).** *(1:1551)*

278. **(A).** *(1:1551)*

279. **(B).** *(1:1551)*

280. **(C)** The needle hub can be made of plastic or metal. It is fitted onto the syringe body either by a locking system such as the Luer-Lok or by a simple friction fit. *(13:325)*

281. **(A)** The bevel is ground to sharpness, but the back portion (heel) of the bevel is left dull. A dull heel has been shown to decrease the incidence of coring of the rubber closure and the skin. *(13:325)*

282. **(B)** Needle cannulae are made of various grades of steel. Both shaft strength and flexibility are needed. *(13:325)*

283. **(E)** The hole in the shaft is also called the bore. *(13:325)*

284. **(D)** Alcohol USP, sometimes known as grain alcohol, contains 94.9% V/V or 92.3% W/W of C_2H_5OH. The remaining portion is water. *(1:1404; 24:301)*

285. **(A)** Diluted Alcohol is prepared by mixing equal volumes of Alcohol USP and Purified Water. Because of some volume shrinkage (about 3%), the final strength is somewhat higher than that calculated by simple alligation. *(1:1405; 24:302)*

286. **(B)** Rubbing alcohol is a form of denatured alcohol containing approximately 70% of absolute alcohol. This product is used as a germicide and an external rubefacient. *(1:1264; 24:302)*

287. **(D).** *(1:875)*

288. **(A).** *(1:872)*

289. **(E)** Many OTC products intended for assisting in the removal of warts contain the keratolytic agent, 17% salicylic acid, in a collodion vehicle. Examples of products include Compound W, Duofilm, and Clear-Away. *(11:561)*

290. **(C).** *(11:440)*

291. **(E)** The normal pH range for the blood is 7.36 to 7.40 for venous samples and 7.38 to 7.42 for arterial samples. It is essential that the blood pH remains within the range of 7.35 to 7.45. Normal acid–base balance is generally maintained by three homeostatic mechanisms using endogenous chemical buffers (eg, bicarbonate and carbonic acid), respiratory control, and renal function. An impairment in any of these mechanisms can result in either acidosis or alkalosis. *(1:519; 24:104)*

292. **(E)** The pH of the lacrimal fluid is approximately 7.4 but varies with certain ailments. The eye can tolerate a pH from 6 to 8 with a minimum of discomfort. The buffering system of the lacrimal fluid is efficient enough to adjust the pH of most ophthalmic solutions. However, some solutions, particularly those containing strongly acidic drugs, will cause discomfort. *(24:474)*

293. **(B)** The pH of the skin is usually based on measurements of the lipid film that covers the epidermis. Although the value varies greatly between individuals and in various areas of the body, the average value is re-

ported to be 5.5, with a range of 4.0 to 6.5. *(1:1577)*

294. **(A)** The acidic pH (3.5 to 4.2) of the vagina discourages the growth of pathogenic microorganisms while providing a suitable environment for the growth of acid-producing bacilli. *(24:293)*

295. **(B).** *(1:1668)*

296. **(D).** *(1:1667)*

297. **(A).** *(1:1668)*

298. **(B)** Pennwalt's Tussionex is available in capsules, tablets, and suspension-dosage forms as a long-acting cough suppressant. *(1:1669; 10; 24:235)*

299. **(E)** Oramorph SR tablets consist of morphine sulfate in a hydrophilic matrix, which protects the interior of the tablet from disintegrating too rapidly. *(1:961; 1667; 24:234)*

300. **(D)** Repetabs are designed to release an initial dose, followed by a second dose from the inner core at a later time. This type of product reduces the number of doses the patient must take during the day. *(1:1668; 24:236)*

301. **(C)** The Durabond principle consists of complexing amine drugs with tannic acid to form the corresponding tannates. These relatively insoluble drug forms are released slowly over a 12-hour period. *(10; 24:235)*

302. **(C)** Echinacea is believed to reduce the severity of cold and flu symptoms, especially if consumed during the early stages of the exposure. *(2a:710; 11:763)*

303. **(B)** Some studies have indicated that Gingko extracts improve blood perfusion. There is hope that the herb will improve memory. A problem may occur if Gingko is taken by individuals being treated with anticoagulants. *(2a:703; 11:766)*

304. **(A)** St. John's Wort may help cases of mild depression. Its active ingredient, hypericin, is believed to cause photodermatitis if light-skinned clients are exposed to direct sunlight. *(2a:704; 11:770)*

305. **(D)** Saw Palmetto may be useful in treating symptoms of BPH (benign prostatic hyperplasia). It appears to improve urinary flow in men with enlarged prostates. *(2a:701; 11:770)*

306. **(C).** *(1:1122)*

307. **(D).** *(1:1121)*

308. **(B).** *(1:1120)*

309. **(A).** *(1:1123)*

310. **(C)** Phenazopyridine (Pyridium) is a urinary tract anesthetic and is available in tablet dosage form. Acetaminophen is inserted for its systemic analgesic properties. Ergotamine Tartrate and Caffeine Suppositories (Cafergot or Wigraine) are helpful in preventing or aborting vascular headaches such as migraine. Prochlorperazine (Compazine) and promethazine (Phenergan) possess antiemetic properties. The suppository dosage form of each allows convenient administration when a patient is actively vomiting or unconscious. *(3; 24:291)*

311. **(E)** Simethicone is an effective agent when taken orally to reduce gas discomfort in the GI tract. It aids in the coalescence of gas, which then can be discharged by belching or flatus. Infant's Myclicon Drops contain 20 mg of simethicone per 0.3 mL of liquid. There are also several simethicone-containing products for adults including Beano, Gas-X, and Phazyme. *(2a:216; 11:110–11)*

312. **(C)** Most nasal solutions are mildly buffered at pH's between 5.5 and 7.5 to prevent interference with normal cilia motion. The solutions should also be isotonic if possible. *(19:235)*

313. **(C)** Buprion (Zyban) is used to aid in smoke cessation. It is available as 100- and 150-mg

sustained-release tablets but not as a dermal patch. However, there are a number of nicotine patches on the market for smoke cessation. Scopolamine (Transderm Scop) is used to prevent motion sickness. Estradiol (Estraderm, Vivelle, and Climara) patches reduce symptoms of postmenopause. Fentanyl (Duragesic) reduces chronic pain. Testosterone patches (Testoderm and Androderm) are used when there is a deficiency of testosterone. *(24:267–69)*

314. **(E)** Transdermal drug delivery systems deliver drugs at an optimal rate through the skin and avoid the hepatic first-pass effect. Since the patch needs replacement only once daily or up to once a week depending upon the drug involved, patient compliance improved. Since most of the drug is in the patch reservoir, relatively large amounts of drugs with short half-lives can be formulated into transdermal patches. One criteria is the ability of the drug to diffuse through the skin. *(24:271–73)*

315. **(A)** Controlled studies of ginger root in the form of capsules indicate its ability to counteract mild cases of nausea and vomiting and also to prevent motion sickness. *(2a:697; 11:766)*

316. **(D)** Gauze that has been coated with a layer of emulsified petrolatum serves well as a primary cover over burns even if exudate is present. Not only will the exudate flow through the gauze, the gauze itself will not adhere to the wound. Typical products include J & J's Adaptic. *(2a:640; 11:502)*

CHAPTER 4

Pharmaceutical Compounding

Compounding is considered an intrinsic skill of the pharmacist. Although the number of extemporaneously compounded prescriptions is steadily declining, some pharmacists have experienced professional satisfaction in their ability to prepare products that would otherwise not be available to the patient. Pharmacists in institutional settings are expected to prepare parenteral admixtures, reconstitute parenteral powders and advise other health professionals in the handling, storage, administration, and potential incompatibilities of sterile products. The emerging field of home health care has called on both community and institutional pharmacists to prepare sterile chemotherapeutic, analgesic, and nutritional formulations.

This chapter reviews some of the compounding techniques, ingredients, and calculations that the practicing pharmacist may need to use.

Questions

DIRECTIONS (Questions 1 through 91): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

1. The prescription balance needed for weighing chemicals is currently designated as a Class_____ balance by the NBS.

(A) I
(B) II
(C) III
(D) P
(E) Q

2. Which ONE of the following statements concerning single-pan electronic balances as replacements for the Class III balance is true?

(A) They cannot be used since they are too accurate for routine weighings.
(B) They are not suitable since the official shift and rider balance tests cannot be performed.
(C) They may be used if they have a sensitivity requirement of 6 mg or better.
(D) They are not recommended since their total weight capacity is often less than 120 g.
(E) They may be used if their total weight capacity is not greater than 120 g.

3. Standards for chemicals being used for extemporaneous compounding are found in the

(A) FDA Good Manufacturing Practices
(B) *USP/NF*
(C) Remington
(D) Merck Index
(E) *USP/DI*

4. A clinical trial using capsules requires 200 grams of theophylline monohydrate. How many grams of anhydrous theophylline must be used if its label also indicates the presence of .4% water? [mol. wt. anhydrous theophylline = 180; monohydrate theophylline = 198]

(A) 181.1
(B) 181.8
(C) 182.5
(D) 220
(E) 220.8

Questions 5 through 8 relate to the following prescription:

For: James Latimer	Age: 3
Rx	
Sodium Fluoride	500 μg
M & Ft Cap DTD # LX	
Sig: one cap QD	

5. How many mg of sodium fluoride are required to prepare this prescription?

(A) 0.5
(B) 30
(C) 50
(D) 300
(E) 500

6. Problem(s) that the pharmacist should anticipate in preparing this prescription include

   I. caustic nature of sodium fluoride
   II. poor water solubility of sodium fluoride
   III. difficulty in weighing a small quantity of powder

   (A) I only
   (B) III only
   (C) I and II only
   (D) II and III only
   (E) I, II, and III

7. The best choice of a diluent for stock powders, especially when preparing capsules, is

   (A) ascorbic acid
   (B) lactose
   (C) sodium chloride
   (D) starch
   (E) talc

8. The pharmacist fills a #2 capsule and finds that the net weight of the powder is 40 mg less than needed. She may elect to

   I. use a #1 capsule
   II. place additional powder into the head of the capsule
   III. use a #3 capsule

   (A) I only
   (B) III only
   (C) I and II only
   (D) II and III only
   (E) I, II, and III

Questions 9 through 11 refer to the following prescription:

For: Daniel Cummins	Age: 16
Rx	
Codeine Sulfate	210 mg
Dimenhydrinate	1000 mg
ASA	3000 mg
M & Ft cap #20	
Sig: i cap QID prn for pain	

NOTE: The pharmacist has 50-mg dimenhydrinate tablets; each weighing 200 mg, and 30-mg codeine sulfate tablets, each weighing 100 mg. Aspirin is available as a powder.

9. Which of the following statements concerning the prescription is (are) true?

   I. The amount of codeine being consumed per day is an overdose.
   II. There is a chemical incompatibility between dimenhydrinate and codeine.
   III. The patient should be cautioned about the possibility of drowsiness from the capsules.

   (A) I only
   (B) III only
   (C) I and II only
   (D) II and III only
   (E) I, II, and III

10. When compounding this prescription, the pharmacist must

    I. use a rubber spatula rather than stainless steel
    II. add lactose to the formula
    III. take into consideration the weight of the excipients in the codeine and dimenhydrinate tablets

    (A) I only
    (B) III only
    (C) I and II only
    (D) II and III only
    (E) I, II, and III

11. The final weight of each capsule will be approximately

    (A) 150 mg
    (B) 210 mg
    (C) 235 mg
    (D) 360 mg
    (E) 385 mg

Questions 12 through 17 relate to the following parenteral admixture order as received in a hospital pharmacy:

> Patient: Claudia Smithen Room 614
> dob 4/28/44
>
> Aminophylline 400 mg + KCl 20 mEq in D_5W 500 mL
> Infuse over 4 hrs at 1000, 1400, and 1800

12. Aminophylline is available in 20-mL ampules (25 mg/mL). How many ampules are needed daily for this order?

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

13. When reviewing this order, the pharmacist should

(A) inform the prescriber that an incompatibility exists between aminophylline solution and potassium chloride solution
(B) inform the prescriber that the dose of aminophylline is too high
(C) inform the nursing staff that the mixture must be protected from sunlight
(D) inform the prescriber that aminophylline will precipitate when added to D_5W
(E) fill the order as written

14. Correct method(s) for preparing the previously shown admixture include

I. adding the potassium chloride solution to the D_5W, followed by the aminophylline solution
II. adding the aminophylline solution to the D_5W first, then add the potassium chloride solution
III. mixing the aminophylline solution and the potassium chloride solution, then add this mixture to the D_5W

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15. The total amount (mg) of potassium administered in each admixture bottle is [K = 39.1; Cl = 35.5]

(A) 780
(B) 1180
(C) 2340
(D) 4480
(E) 2240

16. Which of the following commercial parenteral solutions would be incompatible with the original admixture?

I. dobutamine
II. morphine
III. heparin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

17. After removing the aminophylline solution from the ampule, the pharmacist should pass the solution through a device such as a filter needle. The filter needle is intended for the removal of

I. particulate matter
II. microorganisms
III. pyrogens

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

18. Which of the following laminar flow hoods is (are) considered a suitable working area for preparing the previously mentioned admixture order?

I. convergent
II. horizontal
III. vertical

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19. When preparing most parenteral admixtures, the pharmacist will work

I. in an area within 6 inches of the HEPA filter
II. in a vertical laminar flow hood
III. in an area at least 6 inches from the edge of the benchtop

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20. Which of the following would the pharmacist consider as suitable agents for disinfecting a laminar flow hood?

I. alcohol 70%
II. acetone
III. betadine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

21. The American Society of Health-System Pharmacists (ASHP) has developed a risk level classification with the strictest controls designated as

(A) risk level 1
(B) risk level 3
(C) risk level X
(D) risk level A
(E) risk level F

Questions 22 through 24 relate to the following medication order:

Patient: Constance Morehead Room: CCU	Age: 57
Morphine Sulfate Hydroxyzine HCl	50 mg 25 mg
Administer stat	

22. Which of the following consultations by the pharmacist to the nurse is (are) appropriate?

I. The two solutions may be mixed together in a syringe in order to administer a single injection.
II. The morphine injection may be administered by either the IM or SC route.
III. A precipitate may occur if either drug solution is injected into a heparinized scalp-vein infusion set.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

23. Which of the following steps is INCORRECT when the pharmacist removes 6 mL of solution from a 30-mL multidose vial of morphine sulfate injection (10 mg/mL)?

(A) Draw up 5 mL of air into the syringe.
(B) Place point of syringe needle onto the vial's rubber closure at a 45° angle.
(C) Rotate needle so that the bevel opening is facing upwards.
(D) Raise the needle angle to 90° and insert needle through the rubber closure.
(E) After injecting the air, remove 6 mL of solution and aspirate excess solution into an alcohol swab.

24. When obtaining a 3-mL dose from a 5-mL ampule, which one of the following steps is INCORRECT?

(A) Draw up 3 mL of air into the syringe.
(B) Disinfect the neck of the ampule using an alcohol swab.
(C) Break ampule neck by snapping neck toward the side of the laminar-flow hood.
(D) Place needle tip into solution while holding the ampule almost horizontally.
(E) After drawing up approximately 4 mL of solution, aspirate excess solution into the alcohol swab.

25. Plastic parenteral bottles and bags differ from glass units in that the plastic units have

I. an air tube in the unit
II. a vacuum
III. two entry ports

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

Answer questions 26 through 28 in reference to the following medication order:

Medication Order—Carefree Hospital
Patient: James Gardner Room 314
Potassium Pen G 2 Megaunits in 100 mL mini-bottles q6h ATC for 4 days

NOTE: The pharmacy has vials containing 5 million units of potassium penicillin G that, when reconstituted with diluent, will contain 750,000 units/mL. The label on the vial states that the powder contains a citrate buffer to maintain a pH of 6 to 6.5.

26. The total number of bottles needed for Mr. Gardner's therapy will be

(A) 3
(B) 4
(C) 10
(D) 12
(E) 16

27. Which of the following vehicles is (are) suitable for the above order?

I. D_5W (pH = 4.5)
II. N/S (pH = 6.0)
III. $D_{2.5}W/.45NS$ (pH = 5.0)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

28. Which of the following procedures should the pharmacist use in preparing the minibottles?

(A) Remove 2.7 mL of vehicle from the minibottle, then inject 2.7 mL of penicillin solution.
(B) Inject 2.7 mL of penicillin solution directly into the minibottle.
(C) Remove 6.7 mL of vehicle from the minibottle, then inject 6.7 mL of penicillin solution.
(D) Inject 6.7 mL of penicillin solution directly into the minibottle.
(E) Inject 4 mL of penicillin solution directly into the minibottle.

Answer questions 29 through 31 based on the following prescription.

Name: James McMaster	Age: 4 yr Wt: 44 lb
Rx	
Ondansetron HCl	0.15 mg/kg/tsp
Cherry Syrup	qs 60 mL
Sig: 1 tsp before therapy	

29. How many 4-mg commercial tablets are needed to prepare this order?

(A) 3
(B) 6
(C) 9
(D) 12
(E) 15

30. Which of the following statements concerning compounding this prescription is (are) true?

I. It is necessary to dissolve the crushed tablets in alcohol before adding to the syrup.
II. The pH of the final product should be adjusted to a neutral pH.
III. It is possible to use Ondansetron injectable solution in place of the tablets.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

31. Ondansetron is available under the trade name of

(A) Kytril
(B) Marinol
(C) Reglan
(D) Zofran
(E) Zoloft

32. When preparing a liquid oral dosage form, elixirs may be preferred over syrups because elixirs have better solvent properties for

I. weak organic acids
II. weak organic bases
III. flavoring oils

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

33. Polymyxin B sulfate is available in 10 mL parenteral vials labeled as containing 500,000 units. Which of the following statements is (are) accurate if the pharmacist wants to prepare 30 g of ointment (15,000 U/g)?

I. The pharmacist will use 9 mL of the polymyxin B sulfate solution.
II. It will be best to incorporate the solution into an absorption base.
III. The solution should be incorporated into 30 g of ointment base.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

Questions 34 through 36 relate to the following prescription:

Rx	
Burow's solution	15 mL
White petrolatum	45 g

34. The active ingredient in Burow's solution is

(A) acetic acid
(B) aluminum acetate
(C) aluminum chloride
(D) alum
(E) hydrogen peroxide

35. When preparing this prescription, the pharmacist may wish to include

I. Aquaphor
II. Alcohol USP
III. Tween 80

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

36. The concentration (% W/W) of Burow's solution in the final preparation will be

(A) 15
(B) 16.7
(C) 20
(D) 22.5
(E) 25

37. The process of wetting and smoothing zinc oxide with mineral oil in preparation for incorporation into an ointment base is

(A) attrition
(B) levigation
(C) milling
(D) pulverization by intervention
(E) trituration

Questions 38 through 41 are based on the following order received from a hospital outpatient EENT clinic.

Tetracaine	1.0%
Boric acid	0.5%
Pur. water	qs 100%
Dispense 60 mL	
Make sterile and label as "Ophthalmic Solution TET 1%"	

38. Which of the following characteristics concerning tetracaine in the previously mentioned formula is (are) true?

I. poor water solubility
II. chemically incompatible with boric acid
III. not effective as a local anesthetic

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

39. Boric acid is present in the formula as a (an)

I. antioxidant
II. antimicrobial preservative
III. buffering agent

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

40. How many mg of sodium chloride are needed to adjust the tonicity of the formula? The following "E" values are available: tetracaine HCl = 0.18; boric acid = 0.50; sodium borate = 0.42.

(A) 260
(B) 280
(C) 440
(D) 540
(E) 640

41. The most practical method for sterilizing the ophthalmic solution is

(A) autoclaving for 15 minutes
(B) autoclaving for 30 minutes
(C) membrane filtration through 0.2-micron filter
(D) membrane filtration through 5-micron filter
(E) the use of ethylene oxide gas

42. How many mg of sodium chloride are needed to adjust the following solution to isotonicity if the pharmacist uses atropine sulfate powder and an isotonic solution of 2% cocaine HCl?

Atropine sulfate	
Cocaine HCl	aa 1%
Sodium chloride	qs
Purified water	qs 60 mL

[E values for atropine sulfate = .13; cocaine HCl = .16]

(A) 100
(B) 190
(C) 270
(D) 460
(E) 540

Questions 43 through 45 refer to the following prescription:

Rx	
Retinoic acid	0.02%
Ac. Sal.	2%
Emulsion base	qs 60 g

Sig: Apply small amount onto spots hs

43. Which of the following statements concerning this prescription is (are) true?

I. Another name for retinoic acid is tretinoin.
II. The amount of aspirin needed is 1.2 g.
III. The term "emulsion base" refers to a brand of ointment base.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

44. How many grams of 0.05% Retin-A Cream may be used to supply the retinoic acid?

(A) .012
(B) 1.2
(C) 2.4
(D) 15
(E) 24

45. Which of the following should the pharmacist use when compounding this prescription?

I. pill tile for mixing
II. rubber spatulas for weighing and incorporating the ingredients
III. alcohol to dissolve the salicylic acid

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

46. A physician requests a 0.1% strength of a steroidal cream that is commercially available as a 0.25% strength in a "vanishing cream" base. Which one of the following ointment bases is the best choice as a diluent for this order?

(A) cold cream
(B) hydrophilic ointment
(C) lanolin
(D) vaseline
(E) PEG ointment

47. When preparing the ointment in Question 46, the amount of diluent that should be added to 30 g of the 0.25% strength product is

(A) 6.5 g
(B) 12 g
(C) 30 g
(D) 45 g
(E) 75 g

Questions 48 through 50 refer to the following prescription:

Rx	
Calamine	
Zinc oxide	aa qs 15 g
Resorcinol	2 g
Glycerin	15 mL
Alcohol 70%	30 mL
Pur. water ad	120 mL
Sig: Use as directed TID	

48. The final dosage form of this prescription is best described as a (an)

(A) colloidal solution
(B) elixir
(C) O/W emulsion
(D) W/O emulsion
(E) suspension

49. When preparing the prescription, the pharmacist will

I. use 15 g of calamine
II. dissolve the resorcinol in the alcohol
III. triturate calamine and zinc oxide together and wet with glycerin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

50. Which of the following auxiliary labels should the pharmacist attach to the container when dispensing the previously mentioned product?

I. For External Use Only
II. Shake Well
III. Keep in a Cool Place

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

51. The following prescription is received:

Rx	
Norfloxacin	2%
Propylene glycol	10 mL
MC 1500	1.5%
Purified water	qs 100 mL
Sig: Apply to inflamed areas BID	

When preparing this prescription, the pharmacist should

I. disperse 1.5 g of methylcellulose 1500 in hot water
II. use the contents from five 400-mg Noroxin tablets
III. wet the Norfloxacin powder with the propylene glycol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

52. A major ingredient in the ointment base, Aquaphor®, is:

(A) cetyl alcohol
(B) cholesterol
(C) petrolatum
(D) polysorbate 80
(E) water

53. Eucerin® is another commercial base similar to Aquaphor except Eucerin contains

(A) cetyl alcohol
(B) cholesterol
(C) sodium lauryl sulfate
(D) polysorbate 80
(E) water

54. A prescription calls for 10% urea in Aquaphor base. Which of the following is the best technique to make a pharmaceutically elegant product?

(A) Dissolve urea in water then incorporate into the Aquaphor.
(B) Dissolve urea in alcohol then incorporate into the Aquaphor.
(C) Finely powder the urea and incorporate directly into the Aquaphor.
(D) Dissolve urea in small amount of mineral oil and incorporate into the Aquaphor.
(E) Melt the Aquaphor and dissolve the urea in the hot liquid.

Questions 55 through 57 refer to the following formula:

Progesterone 20 mg
PEG 400 60%
PEG 6000 40%

To make one vaginal suppository

55. Which of the following statements is (are) true with respect to the previously shown formula?

I. The weight of the individual suppository must be determined experimentally.
II. It is necessary to prepare the formula suppositories using a mold.
III. The volume density of the progesterone must be calculated.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

56. The ideal weight for a vaginal suppository will be approximately

(A) 1 g
(B) 2 g
(C) 5 g
(D) 10 g
(E) 15 g

57. Which of the following suppository bases melt rather than dissolve when inserted into the rectum?

I. Cocoa butter
II. Fattibase®
III. PEGs

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III only

58. A lotion formula calls for Coal Tar Solution. Which of the following statements concerning Coal Tar Solution is NOT true?

(A) Alcohol is used as the solvent.
(B) L.C.D. is another name for the solution.
(C) The solution is for external use only.
(D) Solution is usually diluted 1:9 with water or ointment base.
(E) The solution contains only coal tar and a volatile solvent.

Answer questions 59 through 62 based on the following prescription:

Rx	
Ephedrine sulfate	2%
Menthol	0.5%
Camphor	
Methyl salicylate	aa 0.2%
Mineral oil	qs 30 mL
Sig: gtt ii both sides TID	

59. This prescription is intended to be administered into the

I. nose
II. eyes
III. ears

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

60. Which of the following ingredients will NOT dissolve in the prescribed solvent?

I. ephedrine sulfate
II. menthol
III. methyl salicylate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

61. Which is NOT true for camphor?

I. forms a eutectic mixture with menthol
II. can be powdered by rubbing with a small amount of alcohol or ether
III. dissolves readily in water

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

62. Methyl salicylate is also known as

(A) camphorated oil
(B) peppermint oil
(C) salicylamide
(D) oil of wintergreen
(E) sweet oil

63. Alcohol is suitable as a solvent for menthol or salicylic acid when preparing which of the following dosage forms?

I. lotions
II. ointments
III. suppositories

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

64. Which one of the following diluents is LEAST suitable for reconstituting single-dose vials?

(A) Bacteriostatic Sterile Water for Injection (BSWFI)
(B) D_5W injection
(C) N/S injection
(D) 1/2 N/S injection
(E) Sterile Water for Injection (SWFI)

65. When dispensing amphotericin, which of the following statements is (are) true?

I. The original powder may be reconstituted only with SWFI.
II. The resulting liquid is a colloidal solution.
III. The solution is intended to be infused into a patient within 60 minutes.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

66. Which of the following are liposomal formulations of amphotericin?

I. Abelcet injection
II. Amphocil injection
III. Docil injection

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

67. Which of the following cautions must be considered when dispensing most parenteral liposomal products?

I. Do not reconstitute with sodium chloride injection.
II. Dosing may differ from that of the conventional drug solutions.
III. Infuse only through administration sets that have an in-line filter.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

68. What caloric density value (kcal/g) should be used when calculating the contribution of dextrose in infusion solutions?

(A) 3.4
(B) 4.0
(C) 5.5
(D) 6.0
(E) 10

69. What is the average weight in grams of nitrogen present in every 100 mL of a 10% amino acids injection?

(A) 1.0
(B) 1.6
(C) 10
(D) 16
(E) 50

Questions 70 through 88: Answer the following series of questions based on the availability of the following parenteral solutions and hospital medication order:

Patient: Danielle Howell	Room: Main 218
Aminosyn II 8.5%	
$D_{50}W$	aa 500 mL
Potassium chloride	40 mEq
Sodium chloride	20 mEq
Potassium phosphate	40 mEq
MVI-12	1 vial
Zinc chloride	2 mg
Insulin	40 units
Calcium gluconate	10 mL
Infuse above TID for 6 days.	
Add 500 mL Liposyn III 10% once daily.	

Available to the pharmacist are the following parenteral solutions:

Aminosyn II 8.5%	500-mL full bts
Dextrose 50% injection	500-mL full bts
Calcium chloride 10%	10-mL vials
Calcium gluconate 10%	10-mL vials
Intralipid 10%	250-mL bottles
Magnesium sulfate	20-mL vials
Sodium chloride injection	30-mL vials
MTE-4	10-mL vials
Potassium chloride injection	20-mL vials
Potassium phosphate	10-mL vials

70. The TPN formula is best prepared by

(A) adding the $D_{50}W$ to the Aminosyn bottle
(B) adding the Aminosyn to the $D_{50}W$ bottle
(C) transferring both the Aminosyn and the $D_{50}W$ to an empty, sterile infusion bag
(D) hanging the Aminosyn and the $D_{50}W$ solutions separately on the patient
(E) piggybacking the $D_{50}W$ into the Y-tubing of the Aminosyn administration set

71. How many nonprotein kcalories is present in every liter of the TPN solution?

(A) 850
(B) 1000
(C) 1250
(D) 1700
(E) 2000

72. Which of the following options are available to the pharmacist if $D_{50}W$ solutions were out of stock?

I. Use 360 mL of $D_{70}W$.
II. Increase the amount of amino acids solution to obtain the same calories.
III. Use 200 mL of $D_{70}W$ plus 300 mL of $D_{20}W$.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

73. A potential problem is the incompatibility between

(A) potassium chloride and calcium gluconate
(B) potassium chloride and insulin
(C) potassium phosphate and calcium gluconate
(D) potassium phosphate and zinc chloride
(E) insulin and zinc chloride

74. To avoid the possibility of a precipitate, the pharmacist may choose to

I. place the calcium gluconate and potassium phosphate into separate, alternate containers
II. use sodium phosphate rather than potassium phosphate
III. use calcium chloride rather than calcium gluconate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

75. Potassium phosphate has been included in the formula as a (an)

(A) source of phosphorus
(B) source of potassium
(C) buffer
(D) antioxidant
(E) stabilizer

76. The prescribing physician should be encouraged to order the potassium phosphate using concentration expressions of

(A) milliequivalents
(B) milligrams
(C) milliliters
(D) millimoles
(E) milliosmoles

77. It is convenient and accurate for the pharmacist to measure the insulin required for this order by using a

I. tuberculin syringe
II. low-dose insulin syringe
III. a 10-mL regular syringe

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

78. The pharmacist may consider contacting the physician to inform him that

I. approximately half of the insulin will be adsorbed onto the walls of the glass container
II. a strength of insulin is needed
III. insulin is available as both a solution and a suspension

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

79. The addition of Liposyn to the TPN

I. causes the final solution to be cloudy
II. is intended to prevent EFAD
III. will adversely affect the osmolarity of the already hypertonic solution

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

80. Other names given to TPN solutions that contain the intravenous fat emulsions include

I. MCTs
II. TNA
III. 3 in 1's

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

81. Before placing a patient on IV fatty oil emulsions, the clinical pharmacist should confirm that the patient does not have

(A) egg allergies
(B) sensitivities to bisulfite
(C) milk intolerance
(D) lactose intolerance
(E) sensitivities to tartrazine

82. Approximately how many kcalories is the patient receiving when a 500-mL bottle of Liposyn 10% is included in the TPN?

(A) 500
(B) 1000
(C) 1500
(D) 1700
(E) 2000

83. What is Ms. Howell's daily intake of nitrogen from the amino acids solution?

(A) 7 g
(B) 20 g
(C) 42 g
(D) 60 g
(E) 130 g

84. Which one of the following vitamins is not present in MVI-12 nor is added to TPN solutions?

(A) B_1
(B) B_6
(C) C
(D) E
(E) K

85. Which of the following metals is NOT included in M.T.E.-4 or multiple trace element solutions?

(A) chromium
(B) copper
(C) iron
(D) manganese
(E) zinc

86. Another trace metal that the physician is likely to include in the TPN is

(A) lithium
(B) sodium
(C) selenium
(D) silicon
(E) fluoride

87. To reduce the amount of chloride ion being consumed, the physician requests that the acetate salts of potassium and sodium be used. What minimum information must the pharmacist have for these changes?

I. The molecular weights of both acetate salts.
II. The valences of the ions.
III. The concentrations of the salt solutions in mEq/mL.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

88. A nurse reports that a previously clear TPN solution now appears to be slightly cloudy. The pharmacist should advise the nurse to

(A) discontinue the infusion
(B) gently warm the solution
(C) slow the infusion rate
(D) continue with the infusion
(E) use an administration set that has an in-line filter

89. A dermatologist requests a prescription for tetracycline HCl 4% in sufficient Lubriderm lotion to make 45 g. How many 500-mg capsules of the antibiotic are needed for compounding this order?

(A) 1
(B) 3
(C) 4
(D) 8
(E) 16

90. Which of the types of topical bases should be formulated to include an antimicrobial preservative?

I. aqueous gels
II. water in oil (W/O) emulsion
III. oil in water (O/W) emulsion

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

91. Which ONE of the following ingredients is most likely to be utilized in the formulation of a topical gel?

(A) carbomer
(B) edetate
(C) lanolin
(D) mineral oil
(E) vegetable oil

DIRECTIONS (Questions 92 through 102): Each group of items in this section consists of lettered headings followed by a set of numbered words or phrases. For each numbered word or phrase, select the ONE lettered heading that is most closely associated with it. Each lettered heading may be selected once, more than once, or not at all.

Questions 92 through 98

(A) hydrocarbon (oleaginous)
(B) absorption (anhydrous)
(C) emulsion (W/O type)
(D) emulsion (O/W type)
(E) water-soluble

92. Cold cream

93. Hydrophilic petrolatum

94. Lanolin

95. Petrolatum

96. Polyethylene glycol

97. Hydrophilic ointment

98. Aquaphor

Questions 99 through 102

(A) cold cream
(B) hydrophilic ointment
(C) hydrophilic petrolatum
(D) PEG ointment
(E) white petrolatum

99. For an ophthalmic drug

100. For an antibiotic with limited stability

101. For absorbing a large quantity of water

102. To aid in hydrating the skin

Answers and Explanations

1. **(C)** The prescription torsion balance designated by NBS as Class III must have a sensitivity requirement (SR) of not greater than 10 mg. This SR allowance is greater than the 6-mg requirement for the former Class A balance. Most Class III balances have a maximum capacity of 60 g rather than the usual 120 g for the Class A. The pharmacist should check the serial plate on the back of the balance to ascertain the limits of the balance. Obviously a balance with an SR of 6 mg is more accurate than one with an SR of 10 mg. The USP/NF specifies that more accurate balances such as certain electronic balances may be used. *(1:69; 4:13.2)*

2. **(C)** While free-swinging pan balances based upon the torsion principle are traditional in pharmacy, the more sophisticated electronic balances are suitable provided that they meet USP/NF standards of a sensitivity requirement of 6 mg or less (better). While the usual largest quantity to be weighed on the torsion balance without causing damage was 120 g, this is not an absolute quantity. The most important value for compounding is the allowable error, which should be not more than ± 5%. *(19:15)*

3. **(B)** The preferred grade of chemical to be used for compounding is the USP/NF grade, which is described in official monographs in this book. If there is no official monograph for a specific chemical, the pharmacist must carefully evaluate available grades and select one that is of high quality. For example, ACS (American Chemical Society) grade or AR (analytical reagent) grade may be suitable. It is important to consider the quantity of active moiety present since some official chemical designations do not indicate 100% pure chemical. For example, waters of hydration, a certain amount of moisture, or other impurities must be taken into consideration. *(4:12.4; 19:4)*

4. **(C)** $\frac{x\ g}{180\ (anhyd)} = \frac{200\ g}{198\ (hydrous)}$

   x = 181.8 grams of anhydrous theophylline

   Since the anhydrous theophylline has 0.4% unbound water, it is only 99.6% pure.

   $$[Q_1]\,[C_1] = [Q_2]\,[C_2]$$

   $$[181.8\ g]\,[100\%] = [x\ g]\,[99.6\%]$$

   $$x = 182.5\ g$$

   While the differences between 184.5 and 181.1 or 181.8 do not appear significant, the principle of correcting for either waters of hydration or unbound water is important. Drugs such as magnesium sulfate, theophylline, citric acid, and iron salts often have waters of hydration. The pharmacist must ascertain which form is present in a given formula. Other drugs such as morphine may have absorbed water, thus changing its strength. *(4:7.22)*

5. **(B)** 500 mcg is equivalent to 0.5 mg. Because 60 capsules were requested

   $$0.5\ mg \times 60\ capsules = 30\ mg \qquad (23:61)$$

6. **(B)** The minimum quantity that can be weighed accurately on the Class III (Class A) prescription balance with an error of not more than 5% is 120 mg (assuming an SR of 6

mg). In order to weigh the required 30 mg of sodium fluoride, a stock powder of NaF is needed. In this problem, mixing 120 mg of NaF with 360 mg of diluent and using 120 mg of this stock powder will deliver the required 30 mg of sodium fluoride. Because of its strong ionic bonds, sodium fluoride is not caustic. A stainless steel spatula can be used for the weighing procedure. Sodium fluoride has good water solubility. *(1:69, 884; 23:32–33)*

7. **(B)** Lactose is a relatively inert water-soluble substance that also packs well into capsules. An alternative would be the use of starch. For the sodium fluoride prescription, the pharmacist will have to include additional lactose to raise the content of the capsules to a quantity that is weighable and convenient to pack. For example, a net weight of 300 mg may be selected arbitrarily. *(24:171)*

8. **(A)** Empty capsules are sized by a numbering system, the largest being a #000 and the smallest a #5. If the #2 capsule is too small, the pharmacist should try the next largest, the #1. The correct capsule-filling procedure is to place powder only into the body or base of the empty capsule. It is not good technique to place powder into the head of the cap because the fit of the head onto the body may not be tight. *(1:1642; 24:170–73)*

9. **(B)** Both codeine and dimenhydrinate have a tendency to produce drowsiness as a side effect. Codeine is a weak organic base whereas dimenhydrinate is a combination of diphenhydramine and 8-chlorotheophylline. No chemical reaction between the two drugs would be expected. The amount of codeine consumed per dose is 10 mg or 40 mg daily. This is within the therapeutic dosage range for a 10-year-old child. *(1:1199)*

10. **(B)** If only pure chemicals were available, the weight of powder in each capsule would be 210 mg (4210 mg divided by 20 caps). However, if the pharmacist has to use commercial tablets when preparing this prescription, the contributory weight of the additional ingredients (excipients) present in the tablets must be included in the calculations. Although lactose is a popular diluent when making capsules, the high weight of each capsule precludes its use. Weighing the aspirin with a rubber spatula is not necessary because aspirin is not as reactive as salicylic acid. *(4:25.1–20)*

11. **(E)** The total amount of ingredients may be calculated as follows:

Drug	Total Weight of Powder	
Codeine	7 tabs each weighing 100 mg	= 700 mg
Dimenhydrinate	20 tabs each weighing 200 mg	= 4000 mg
Aspirin	powder weighing	3000 mg
	Total weight	= 7700 mg

7700 mg divided into 20 capsules = 385 mg each *(4:25.12–20)*

12. **(C)** Each 20-mL ampule of aminophylline contains 500 mg of drug. Because the individual admixture order requires 400 mg, the pharmacist will have to open an ampule for each admixture and remove 16 mL of solution. Even if the pharmacist is preparing all three admixtures at one time, three ampules (48 mL total) will still be needed for the order. *(23:61)*

13. **(E)** Aminophylline injection has an alkaline pH (8.6–9.0), whereas potassium chloride solutions are essentially neutral (pH of 4–7) and have no buffering capacity. Therefore, a mixture of these two solutions will not represent either a physical or chemical incompatibility resulting in a precipitate. Aminophylline solutions are not sensitive to light, nor is the dose requested unrealistic. *(21:55)*

14. **(C)** Because no incompatibilities exist between the aminophylline and the potassium chloride, either could be added first to the D_5W container. It would be impractical and time consuming to mix the two solutions first in a syringe and then add them to the D_5W.

Also, there would be an increased possibility of inaccurate measurements. For example, if only 9 mL of KCl solution was drawn up instead of the correct 10 mL, 17 mL rather than 16 mL of aminophylline solution may be drawn into a syringe to make the desired volume of 26 mL. *(21:62)*

15. **(A)** Each admixture container will contain 20 mEq of KCl or 20 mEq each of potassium and chloride ion. To determine the mg of potassium present, use the relationship

$$\text{mg (potassium)} = \frac{(20\ \text{mEq})\ (39.1)}{1}$$

$$x = 780\ \text{mg, ANS}$$

The above calculation is based on the atomic weight of potassium = 39.1 and a valence of 1. *(23:157)*

16. **(C)** The pH of the original admixture is likely to be alkaline due to the presence of aminophylline. Therefore, the addition of solutions with acidic pH's may result in a chemical reaction and precipitation. Both dobutamine and morphine are weak organic bases that are combined with acids to form water-soluble compounds. Dobutamine HCl solutions have a pH of 2.5 to 5.5 and morphine sulfate solutions have pH's ranging from 2.5 to 6. Because heparin sodium solutions have higher pH's (5 to 8), they will be compatible with aminophylline solutions. *(21:61, 369, 526, 537)*

17. **(A)** The pore size of filter needles is approximately 5 microns, which is too coarse for removing either pyrogens or bacteria. Instead, the filter needle is intended to remove larger particulate matter such as glass fragments that may have fallen into the ampule during the breaking of the ampule's neck. *(13:84)*

18. **(C)** Air in the horizontal laminar flow hood flows directly toward the operator, thereby preventing contaminants from entering the admixtures being prepared. This hood provides maximum protection for the parenteral admixture. Vertical hoods have downward air flow, which increases the risk of product contamination but protects the operator from droplets of product solution. These hoods should be used only for the preparation of products that pose a significant risk to the operator; for example, carcinogenic or mutagenic chemotherapeutic drugs. The newest concept for hood design is the convergent flow, which combines both vertical and horizontal flow. *(13:59)*

19. **(B)** As the air passing through the HEPA filter nears the edge of the bench top, it becomes more turbulent, thus defeating the purpose of the horizontal or convergent laminar flow hood. For this reason, many horizontal laminar flow hoods have a line drawn 6 inches from the edge as a reminder to work further inside the hood. Usually hoods are left running 24 hours a day or are turned on and left running throughout the workday. Work should not commence until the hood has been running for at least 15 to 30 minutes. It is inadvisable to work within 6 inches of the HEPA filter because airflow may be partially blocked. *(13:60–63)*

20. **(A)** Alcohol 70% or isopropyl alcohol 70% are the two disinfectant solutions usually used to disinfect laminar flow hoods before compounding admixtures. Both are effective antimicrobial agents and will evaporate within a few minutes. Acetone is never used because it is flammable and dangerous if inhaled. Betadine is an effective antimicrobial agent as a skin antiseptic or hand wash but would leave a residual build-up if used in hoods. It also is not very volatile. *(1:1404)*

21. **(B)** Improvements in quality control for the preparation of sterile products by pharmacies have been advocated by several health groups, including the ASHP and FDA. The ASHP "Risk Level Classification" describes compounding, storage, and stability standards that should be followed. Of the three risk levels, level 3 is the strictest. Clean room standards have also been proposed to assure tight standards, especially when manipulating unsterile ingredients. *(24:313)*

22. **(E)** Both morphine sulfate and hydroxyzine HCl solutions will have acidic pH's and are therefore expected to be compatible when mixed together in a syringe. However, if either solution is placed directly into a heparinized lock or infusion set, there may be a precipitate because heparin sodium has a higher pH. *(21:590, 761–66)*

23. **(E)** It is preferable to aspirate excessive solution and air bubbles while the needle is still in the vial. This prevents accidental contamination of the hood and personnel. Also, it is inadvisable to waste 1 mL of drug solution, especially a controlled substance. It is necessary to inject a volume of air equal to the volume of solution to be withdrawn. Otherwise, a vacuum would occur in the vial, making it difficult to remove liquid. *(13:84)*

24. **(A)** There is no reason to inject air into the opened ampule because no vacuum will form when an ampule is opened and solution is removed. All ampules are intended as single-dose units and should be discarded after opening. *(13:84)*

25. **(B)** Parenteral plastic bottles and bags are characterized by the presence of two entry ports or sleeves. One port is covered with a latex-type cap through which the pharmacist or nurse can inject solutions into the unit. When the unit is to be administered to the patient, the spike of the administration set is inserted into the second port. This second port does not have a latex cap. Advantages of the plastic units include their lighter weight and resistance to breakage as compared to glass. They also will collapse as solution flows out, thus precluding the need for a method to add air as the solution exits. Glass bottles require either an air tube or air filter. *(13:131–39)*

26. **(E)** The direction of q6h ATC indicates that a minibottle will be hung every 6 hours around the clock. Therefore, 4 bottles daily × 4 days = 16 bottles. *(23:40)*

27. **(E)** The citrate buffer system is intended to readily adjust the pH of each listed vehicle to a pH range in which the penicillin is stable. Although the D_5W has a pH of 4.5, it has virtually no buffering capacity and does not influence the pH of admixtures. Some hospitals prefer to use dextrose solutions as the vehicle for most admixtures to limit the sodium intake by patients. Other hospitals use normal saline (NS) injection to avoid supplying the calories present in dextrose solutions. *(13:243; 21:843)*

28. **(B)** There is no need to remove vehicle solution when adding small volumes of drug additives. The final volume will always vary because the manufacturer places some excess of solution into each unit. To calculate the mL of penicillin solution required:

$$\frac{750{,}000 \text{ units}}{1 \text{ mL}} = \frac{2{,}000{,}000 \text{ units}}{x \text{ mL}}$$

$$x \text{ mL} = 2.7 \text{ mL} \qquad (23:192)$$

29. **(C)** The weight of the child in kg

$$44 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} = 20 \text{ kg}$$

Each teaspoon dose will contain

$$.15 \text{ mg} \times 20 \text{ kg} = 3 \text{ mg}$$

number of doses = 60 divided by 5 mL = 12 doses

$$12 \text{ doses} \times 3 \text{ mg/dose} = 36 \text{ mg};$$

therefore 9 tablets are needed. *(23:67)*

30. **(B)** Ondansetron HCl injection is available in vials containing 2 mg/mL. The solution contains both methyl and propyl paraben preservatives that will protect the prescription from microbial growth. Because ondansetron HCl has good water solubility, it is inadvisable to include alcohol in the prescription. As the pH of solutions of the drug is increased, a precipitate may occur. It is best to use acidic vehicles such as orange juice, Coca-Cola, or cherry syrup. *(3; 20:187)*

31. **(D)** Zofran is often prescribed during chemotherapy, especially with cisplatin therapy, to reduce the severity of nausea and vomiting. Kytril (granisetron), Marinol (dronabinol), and Reglan (metoclopramide) are also antinauseants, whereas Zoloft is an antidepressant. *(3; 25)*

32. **(E)** Elixirs may be defined as clear, sweetened, usually flavored hydroalcoholic solutions intended for oral use. Ethanol, commonly at a 20 to 25% V/V concentration is included and serves as a good solvent for most weak organic acids and bases. The water in the elixir is a good solvent of the salts of weak organic acids and bases. Although water will keep the ionized drug in solution, alcohol will dissolve any un-ionized drug formed if there is a change in solution pH. Problems caused by sucrose competing for water molecules in either syrups or elixirs have been solved by using the newer artificial sweeteners. Flavoring oils, which are usually mixtures of terpenes, possess good alcohol solubility.

33. **(C)** 15,000 units/g × 30 g = 450,000 units

$$\frac{500{,}000\ \text{U}}{10\ \text{mL}} = \frac{15{,}000\ \text{U}}{x\ \text{mL}}$$

$$x = 9\ \text{mL of solution}$$

To incorporate 9 mL of an aqueous solution into an ointment, water absorption bases such as Aquaphor or hydrophilic petrolatum are suitable. The pharmacist would not incorporate 9 mL of antibiotic solution directly into 30 g of ointment base because the incorrect concentration of drug would result. Instead, 9 mL should be mixed with a total of 21 g of base. *(1:1506; 4:30.7, 30.19)*

34. **(B)** Burow's solution is officially known as Aluminum Acetate Topical Solution. It is classified as a topical astringent dressing. *(1:871; 24:324)*

35. **(A)** Aqueous solutions such as Burow's solution cannot be incorporated directly into oleaginous bases such as petrolatum or white petrolatum. Aquaphor is an adjuvant that will absorb aqueous solutions and is miscible with petrolatum. Although smaller amounts could be used, 15 g of Aquaphor will readily pick up the required amount of Burow's solution. The amount of white petrolatum must be decreased by 15 g to assure the correct concentration of Burow's solution in the final preparation. Alcohol is seldom included in semisolid ointments or creams because it is likely to evaporate slowly. It is more likely to be included in lotion formulas. *(20:373)*

36. **(E)** The prescription requires 15 mL of Burow's solution plus 45 g of white petrolatum (of which the pharmacist replaced 15 g with Aquaphor). Because Burow's solution is essentially an aqueous solution, one may assume its specific gravity is close to that of water (ie, 1.0). Therefore, the total weight of the final ointment prescription will be 60 g, and 15 g divided by 60 g equals 25% W/W. *(1:86, 871)*

37. **(B)** Incorporating powders into ointment bases may be eased by first wetting the powders with a small amount of liquid that is miscible with the main vehicle. The wetted powder is rubbed with a spatula on an ointment tile to form a paste. Usually, mineral oil is employed when the vehicle is oleaginous. Glycerin or propylene glycol may be used for more hydrophilic bases. *(1:1588; 4:30.5; 24:166)*

38. **(A)** Tetracaine is a weak organic base with poor water solubility (1 g in 1 L of water). The hydrochloride salt, which is very soluble (1 g needs less than 1 mL of water), should be used. Boric acid, which is a very weak acid, is chemically compatible with both tetracaine free base and the HCl salt. Tetracaine, epinephrine (Adrenalin), and cocaine combinations are used as local anesthetics and are known as "TAC Topical Solutions." *(1:1151; 20:246)*

39. **(D)** Boric acid is an effective buffer in ophthalmic solutions because it will maintain a slightly acidic pH, but when placed in the

eye, it is quickly neutralized by the buffers in the lacrimal fluid. Boric acid has weak antimicrobial activity. *(1:1407; 4:27.3)*

40. **(B)** This problem may be solved using the "E" values for the chemicals.

Drug	Wt. of Drug	×	"E" values		Equiv. Amt. of NaCl
Tetracaine	600 mg		0.18	=	108 mg
Boric Acid	300 mg		0.50	=	150 mg
			Total	=	258 mg

60 mL of solution × 0.9% NaCl = 540 mg of NaCl
540 – 258 mg = 282 mg of NaCl to adjust for tonicity
(1:620–21; 23:149)

41. **(C)** Membrane filtration represents one of the most convenient sterilization methods available to the pharmacist performing extemporaneous compounding. It involves the passing of solutions through a 0.2 micron filter using one of the commercially available sterile filter units such as Millipore's Millex or Swinnex units. The method does not involve heat, therefore, there is little decomposition of heat-labile drugs as might occur with autoclaving. Ethylene oxide gas is not practical for solutions because it would have to penetrate the solution and residues may be left behind. *(1:1478; 13:350)*

42. **(B)** The pharmacist will use 30 mL of the 2% cocaine HCl solution. Since this solution is already isotonic, it is necessary to render the 30-mL balance isotonic after calculating the contribution of the atropine sulfate toward isotonicity.

Atropine sulfate 60 mL × 1% = .6 g or 600 mg
600 mg × E value of .13 = 78 mg
30 mL × .9% NaCl = 270 mg (if only ingredient)
270 mg – 78 mg = 190 mg of NaCl needed
(4:10.5; 23:149)

43. **(A)** Tretinoin is the official name for retinoic acid. The drug is commercially available under the trade name of Retin-A. The designation of Ac. Sal. refers to salicylic acid, not aspirin (acetylsalicylic acid). The term emulsion base is nondescript. It could refer to a number of ointment bases, including those with either W/O or O/W characteristics. Clarification of the type of ointment base desired should be made. Before compounding this prescription, the pharmacist should contact the prescriber concerning the inclusion of a keratolytic agent such as salicylic acid in a topical preparation containing tretinoin, a compound that exhibits keratolytic activity as a side effect. *(1:879; 19:37–3; 20:235)*

44. **(E)** An easy method for determining the amount of 0.05% cream is

60 g × .02% = .012 g of pure retinoic acid

$$\frac{0.012\ g}{\times\ g} = \frac{0.05\ g}{100\ g}$$

$$.05\times = 1.2$$

x = 24 grams of .05% *(23:117)*

45. **(C)** Incorporating powders or liquids into relatively small amounts of ointment base is best accomplished on a pill tile (also known as an ointment tile). Because of the caustic nature of salicylic acid, rubber spatulas should be used rather than stainless steel, which would be discolored by the acid. While salicylic acid is soluble in alcohol, the use of alcohol as a levigating agent is discouraged because crystals of salicylic acid may form on the surface of the product when the alcohol evaporates. *(1:879, 1588)*

46. **(B)** Hydrophilic ointment is an O/W emulsion base containing sodium lauryl sulfate, petrolatum, and stearyl alcohol. Of the listed bases, it is closest to a vanishing cream base because such a system is characterized by the presence of an O/W stearate emulsion. *(24:378)*

47. **(D)** Let Q_1 and C_1 represent the quantity and concentration desired and Q_2 and C_2 represent the original quantity and strength:

$$[Q_1]\,[C_1] = [Q_2]\,[C_2]$$
$$[x\ g]\,[.1\%] = [30\ g]\,[0.25\%]$$

x = 75 g (total amount of ointment that can be prepared)

75 g minus 30 g (original amount of 0.25% ointment available) equals 45 g (amount of diluent ointment base needed). *(1:89)*

48. **(E)** A suspension must be prepared because there are water-insoluble powders present in the prescription. An emulsion is not possible because there is no oil indicated in the formula. *(1:1515, 1519)*

49. **(D)** The designation "aa qs" translates as "of each enough to make 15 g." Therefore, 7.5 g of calamine and 7.5 g of zinc oxide are needed. The water-insoluble powders, calamine and zinc oxide, should be triturated together in a mortar and pestle, and then wetted with the glycerin. Resorcinol is soluble in both water and alcohol, but it is more convenient to dissolve it in the alcohol and dilute the powder paste with the liquid. Finally, add portions of purified water to rinse out the mortar while placing the suspension into a precalibrated wide-mouth bottle. *(1:1515, 1519)*

50. **(C)** Most of the ingredients in this preparation are intended for topical use only. Although the suspension may not separate or settle immediately, it may do so after a few days. It is standard procedure to place "Shake Well" labels on all suspension formulas. None of the ingredients decompose in the presence of moderate heat; therefore, a "Store in a Cool Place" label is not required. *(24:357–58)*

51. **(E)** The easiest way to hydrate methylcellulose is to add the powder to hot water and allow the powder to hydrate for 10 to 15 minutes before adding cold water. Five norfloxacin 400-mg tablets are crushed and wetted by the addition of propylene glycol. The thickened methylcellulose solution can then be added to the powder and sufficient purified water added to make 100 mL. *(1:1312, 1515; 19:159)*

52. **(C)** Aquaphor® is a commercial anhydrous absorption base containing petrolatum, liquid petrolatum, mineral wax, and woolwax alcohol. Upon the addition of water to the anhydrous base, a water in oil emulsion forms. *(4:22.4)*

53. **(E)** Eucerin® contains water; thus, it is already a water in oil emulsion base. Further quantities of water or other liquids may be added. It also contains an antimicrobial preservative, which is critical for any topical base that contains water. *(4:22.5)*

54. **(A)** Urea has good solubility in water. The resulting solution can readily be incorporated into the Aquaphor. *(4:30.7; 24:373)*

55. **(C)** Because the exact density of the PEG 400/6000 mixture is not known, the pharmacist must prepare a trial batch in a mold to determine the weight of an individual suppository. In this prescription, the volume occupied by 20 mg of progesterone is insignificant, and it is not necessary to determine its volume density. However, one must realize that larger quantities of drugs will contribute to the bulk volume of the suppository. In these situations, one must prepare a trial suppository that includes the active drug to calculate its bulk density. For example, boric acid has been prescribed at a dose of 600 mg per suppository. Progesterone has been extemporaneously incorporated into vaginal suppositories for the maintenance of pregnancy in luteal phase dysfunction. The usual dose has been 25 mg. *(1:1594; 4:31.11; 24:283, 287)*

56. **(C)** Vaginal suppositories or pessaries are traditionally larger in size and weight (5 grams) than rectal suppositories (2 grams). However, a regular rectal suppository mold could be used if the larger vaginal mold is not available. For many suppository formulas, a water-soluble base such as the polyethylene glycol (PEG) or glycerinated gelatin are preferred over oil bases such as cocoa butter. *(1:1591–93; 24:293)*

57. **(C)** Cocoa butter, a mixture of triglycerides, has been used for more than 100 years as a suppository base. A disadvantage of cocoa

butter is its inability to absorb aqueous solutions. It melts at slightly below body temperature, and drugs might affect its melting point. Fattibase is a mixture of triglycerides from palm, palm kernel, and coconut oils plus glyceryl monostearate SE and polyoxyl-stearate emulsifers. Other suppository bases that melt include the Witepsols and the Wecobees. Although cocoa butter suppositories can be hand-rolled or prepared by fusion in molds, the other bases are intended for mold use. Different molecular weight PEGs can be blended and formed into suppositories by fusion using molds. However, the PEG suppositories do not melt in the body; instead, they slowly dissolve in the limited amount of water in the colon. *(1:1593; 4:23.2; 19:126; 24:282–84)*

58. **(E)** The solution also contains Polysorbate 80. This nonionic surfactant is included to disperse the water-insoluble components of coal tar, which will precipitate when the highly alcoholic solution is mixed with an aqueous preparation. The Latin name of coal tar solution is Liquor Carbonis Detergens (L.C.D.). *(20:74; 24:326)*

59. **(A)** This prescription uses mineral oil as the solvent. It is not suited for administration into the eye. Ephedrine is used as a topical decongestant when administered by the intranasal route. The product would be ineffective if placed in the ear. *(1:989; 24:335–37)*

60. **(A)** Ephedrine sulfate is water-soluble. It is best to receive the prescriber's permission to use ephedrine base, which is soluble in nonpolar solvents such as mineral oil. *(1:989)*

61. **(B)** Camphor is soluble in alcohol or organic solvents but is only slightly soluble in water (1 g in 800 mL). *(1:874)*

62. **(D)** Methyl salicylate can be used in small quantities as a flavoring or perfuming agent. It is also included in many topical products such as rubbing alcohol, gels, and liniments as a counterirritant. *(1:1387; 2a:80)*

63. **(A)** Because of the volatility of alcohol, it is not suitable in dosage forms from which it may slowly evaporate. If ingredients were dissolved in alcohol and incorporated into either ointments or suppositories, crystals of the ingredients would slowly appear on the surface of the dosage unit. However, one would expect alcohol to remain within the lotion formula until placed on the skin. *(1:1404)*

64. **(A)** Product inserts are the best sources of information concerning appropriate diluents for a given drug powder. However, BSWFI should not be used for reconstituting single-dose units because the preservative present would serve no useful purpose, and large amounts of the preservative could increase the incidence or severity of toxicity. The use of BSWFI may be appropriate if a powder in a multidose vial is being reconstituted. *(13:423; 24:403)*

65. **(C)** Amphotericin B is available in vials containing 50 mg of drug as a powder. Because of the colloidal nature of the product, only sterile water for injection without preservatives is suitable as a reconstituting vehicle. Other vehicles such as normal saline may cause a precipitate. Amphotericin B is administered by slow intravenous infusion over a 2 to 6-hour period. *(21:74)*

66. **(C)** Abelcet is a sterile suspension and Amphotec is a sterile lyophilized powder for reconstitution, both intended for intravenous administration. While both are liposome formulas, the particle size of each differ; thus, they are used or are targeted for different organs and are not interchangeable. Doxil is a liposome form of doxorubicin HCl and appears to have less toxicity than the parent compound. *(24:550)*

67. **(C)** Liposomal powders are usually reconstituted using sterile water for injection. Other diluents such as sodium chloride injection may cause breakage of the liposomal system. Since many of the liposomal products are formulated as "targeted drug delivery systems," the drug present will concentrate in areas of

the body in which they are most active. Thus, the drug dose required is often less. Consequently, if the larger conventional dose is given, toxic levels of the drug may occur. Conversely, if the conventional drug is required and the liposomal drug dose is given, the dose may be subtherapeutic. *(24:549–50)*

68. **(A)** The concentration of dextrose in parenteral infusion solutions is based on the official form of hydrous dextrose. Its caloric density (or count) is 3.4 kcal/g. *(4:33.15)*

69. **(B)** While the exact amount of nitrogen in an amino acid structure varies with the molecular weight of the amino acid, approximately 16% of any mixture of common amino acids will consist of nitrogen.

Therefore

100 mL of 10% amino acids injection
= 10 g amino acids
10 g amino acids × 16% = 1.6 g of nitrogen
(4:33.13)

70. **(C)** Because the pharmacist only has the $D_{50}W$ and Aminosyn II packaged in 500-mL bottles, it is most convenient to transfer each solution aseptically to an evacuated glass bottle or plastic bag. *(3)*

71. **(A)** Each one liter of the TPN solution contains 500 mL each of the Aminosyn II solution and 50% dextrose injection.

500 mL × 50% = 250 g of dextrose

Since the caloric density of hydrated dextrose = 3.4 kcal/gram,

250 g × 3.4 kcal/g = 850 kcal *(4:33.14)*

72. **(A)** From the previous problem the amount of dextrose requested was calculated to be 250 g. Using 360 mL of $D_{70}W$ will give 360 mL × 70% = 250 g (the correct amount). Answer II is incorrect since the calories provided by the amino acids should not be included as a supply of energy. Answer III using 200 mL of $D_{70}W$ + 300 mL of $D_{20}W$ will give 200 mL × 70% = 140 g dextrose + 300 mL × 20% = 60 g dextrose, which equals 200 g dextrose, not the 250 g requested. *(23:117–19)*

73. **(C)** Many calcium salts, such as the phosphate and carbonate, have limited water solubility. When calcium salts and phosphate salts are included in the same admixture, it is possible that the very insoluble calcium phosphates may form. The pharmacist must recognize the potential danger of infusing such solutions into patients. Several reference sources list the limits of each salt that is compatible with the other. However, the precipitate may form slowly and would be invisible if a fat emulsion is included in the TPN. *(4:33.9; 21:160)*

74. **(A)** It is often possible to reduce the incidence of a precipitation if the potassium phosphate is dissolved or mixed with the vehicle first followed by the calcium solution, which is added slowly while stirring. The pharmacist could also alternate the calcium and the phosphate solutions in the series of TPN containers. However, he or she should inform the prescriber and double the amount of ion added each time. *(4:33.9–13)*

75. **(A)** Phosphorus is an essential mineral for the body and is readily available in the phosphate ion. When the potassium ion is required, the chloride or acetate salts are used. *(13:215–16)*

76. **(D)** Most electrolytes are ordered in terms of milliequivalents. The exception is phosphate. Commercially available potassium phosphate injections consist of a mixture of monobasic (potassium) and dibasic (dipotassium) phosphates. Because body phosphate requirements are usually expressed in terms of millimoles (mM) per kg per day and the available solutions are mixtures of the two salts, it is more convenient to express the phosphate additive in terms of mM/L rather than mEq/L. The average adult needs 10 to 15 mmol of phosphorus per day. *(4:33.16; 13:216)*

77. **(C)** Low-dose insulin syringes are calibrated to contain 0.5 mL (50 units) of insulin. The 40 units of insulin (0.4 mL) could also be measured accurately using the tuberculin syringe, which has the capacity of 1 mL. The smallest calibrations on 10-mL syringes will not allow accurate enough measurements of 0.4 mL. *(13:322)*

78. **(A)** When low concentrations of insulin are included in LVPs, the percentage of insulin adsorbed onto the walls of the containers and also onto the administration sets is significant. One can expect a 30 to 50% insulin loss when only 40 units are added to the container. The other answers are incorrect. Because the insulin dosage is expressed in units, the strength of the insulin is not needed. Most likely the U-100 solution will be used. Only insulin solution is given intravenously; the suspension forms are intended for subcutaneous administration. *(13:265; 24:445)*

79. **(C)** Liposyn is a fatty acid emulsion with a physical appearance similar to that of milk. When included in TPN solutions, the resulting product will be somewhat cloudy. The intent of the Liposyn is to correct or prevent fatty acid deficiencies by providing linoleic and linolenic acids, which are present in either soybean or safflower oil. The fat emulsions also provide calories. For example, every mL of the 10% strength contributes 1.1 kcal, and one mL of the 20% provides 2.0 kcal. Because the fat emulsions have been adjusted for tonicity, they do not adversely affect the osmolarity of TPN solutions. *(4:33.5; 21:435)*

80. **(D)** Multicomponent admixtures that contain dextrose, amino acids, and fatty oil emulsions are referred to as total nutrition admixtures (TNA's), or 3 in 1's. Although these combinations simplify administration of calories and protein, the cloudy nature of the product precludes examination of the product for fine precipitants. The designation MCT has been used to represent medium chain triglycerides, which may be used in patients suffering from malabsorption. *(21:47; 24:442–43)*

81. **(A)** Fatty oil emulsions are stabilized by the presence of egg phospholipids. As such they are usually contraindicated in those patients with serious allergies to eggs. *(4:4:336; 5:2252)*

82. **(A)** Depending on the reference source, the caloric density of the 10% fatty oil emulsions is reported as either 1 kcalorie/mL or probably the more accurate 1.1 kcal/mL. The 20% fatty oil emulsions use a value of 2 kcal/mL.

Using 1 kcal/mL 500 mL × 1 = 500 kcal

Using 1.1 kcal/mL 500 mL × 1.1 = 550 kcal

83. **(B)** The TPN formula calls for 500 mL of 8.5% amino acids solution per bottle. Since three bottles are administered per day, the total amount of amino acids is 500 mL × 3 bts × 8.5% = 127.5 g.

The average amount of nitrogen in amino acids is 16%, therefore,

$$127.5\ g \times 16\% = 20.4\ g \qquad (4:33.4)$$

84. **(E)** Vitamin K is not included in TPN solutions because it is unstable to light and will interfere with anticoagulant therapy. Also severe, potentially fatal, reactions to IV administration of the vitamin have been reported. *(4:33.11; 5:2253)*

85. **(C)** There are several sterile solutions that contain the most popular trace metals likely to be requested for TPNs. Iron is not included mainly because of compatibility problems. *(3)*

86. **(C)** Selenium deficiencies may cause muscle pain and tenderness and cardiomyopathy. *(3; 5:2262)*

87. **(B)** Milliequivalent expressions allow direct comparisons of ions when different salt forms are being used. In other words, 40 mEq of sodium acetate will contain the same weight of sodium as will 40 mEq of sodium chloride. *(23:156)*

88. **(A)** While the exact cause of the cloudy solution is unknown, it is likely due to a calcium/phosphate interaction. This slight precipitate may worsen as time elapses, especially if infused into the patient, since calcium phosphate's solubility decreases with higher temperatures. Use of an in-line filter will slow down the infusion with eventual clogging of the line. *(4:33.7)*

89. **(C)** The tetracycline strength requested is 4% and 500-mg capsules are available.

$$45\ g \times 4\% = 1.8\ g \text{ or } 1800\ mg \text{ of drug}$$

$$\frac{1800\ mg\ tetracycline}{x\ capsules} = \frac{500\ mg\ tetracycline}{1\ capsule}$$

$x = 3.5$ or 4 capsules

When preparing this prescription, the pharmacist should carefully empty four capsules and weigh the powder obtained. Then a proportion is set up:

$$\frac{3.5}{wt\ to\ use} = \frac{4}{total\ wt\ in\ 4\ caps}$$

The powder from the capsules can be mixed easily with the Lubriderm lotion. Lubriderm is a W/O emulsion base with good emollient activity. Tetracycline is still used both topically and orally for treatment of acne. Oral dosing is 500 mg once a day. *(1:1311; 23:195–98)*

90. **(E)** Any product containing water is susceptible to the growth of microorganisms. *(4:22.6; 24:249)*

91. **(A)** Carbomer is a high molecular weight copolymer of acrylic acid. An aqueous solution will have a low viscosity and low pH. However, when the pH is raised, the viscosity will increase due to cross linkages of the molecules. Depending upon the concentration of carbomer present, a gel can be formed. *(4:18.11, 22.6; 24:379)*

92. **(C)** Cold cream is a W/O emulsion base with good emollient properties *(4:22.5)*

93. **(B)** Hydrophilic petrolatum is an anhydrous preparation that will absorb significant amounts of water forming a W/O emulsion. It contains cholesterol as the emulsifying agent. *(1:1586; 24:245)*

94. **(C).** *(1:1586; 4:22.4; 24:246)*

95. **(A).** *(1:1585; 24:245)*

96. **(E).** *(1:1587; 24:246)*

97. **(D).** *(1:1586; 24:246)*

98. **(B)** Large quantities of liquids may be incorporated into Aquaphor. *(1:1586; 4:22.3; 19:191)*

99. **(E)** White petrolatum is a bland base with a very low incidence of irritation to the eye. Also, because of the absence of water, it has low susceptibility to microbial growth. *(24:409)*

100. **(E)** The decomposition of most antibiotics is initiated with the presence of water. White petrolatum is anhydrous and is relatively inert. *(1:1585; 4:22.2)*

101. **(C)** Of all the bases listed, hydrophilic petrolatum will absorb the greatest quantity of water. *(1:1586)*

102. **(E)** The occlusive characteristics of petrolatum will prevent further water loss through the stratum corneum. Thus, the skin will remain more hydrated. *(1:1585)*

CHAPTER 5

Biopharmaceutics and Pharmacokinetics

Biopharmaceutics is a scientific discipline concerned with the relationship between the physicochemical properties of a drug in a dosage form and the biological response observed after its administration. It includes the study of the release of the drug from its dosage form. Pharmacokinetics is the study of the absorption, distribution, metabolism, and elimination (ADME) of drugs. As more quantitative and sophisticated assay techniques have been developed, a better understanding of the therapeutic pathways for drugs has emerged. This chapter tests the reader's knowledge of the principles of biopharmaceutics and pharmacokinetics, which is fundamental to the rational selection of quality drug products, the determination of appropriate dose and dosing schedules, and the monitoring of therapy.

Questions

DIRECTIONS (Questions 1 through 83): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

1. The term "biological availability" or "bioavailability" refers to the relative amount of drug that reaches the

(A) small intestine
(B) stomach
(C) systemic circulation
(D) liver
(E) kidneys

2. The AUC can be described as being a

I. theoretic value
II. measure of drug concentration–time curve
III. value with units of weight and time/volume

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

3. The relative bioavailability of a drug product can be determined by comparing which of the following values to similar control drug values?

I. areas under the curve (AUC)
II. total drug urinary excretion
III. peak blood drug concentrations

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

4. Which of the following is the first process that must occur before a drug can become available for absorption from a tablet dosage form?

(A) dissolution of the drug in the GI fluids
(B) dissolution of the drug in the GI epithelium
(C) ionization of the drug
(D) dissolution of the drug in the blood
(E) disintegration of the tablet

5. Which of the following may be the rate-limiting step for drug absorption from an orally administered drug product?

I. disintegration of the unit
II. dissolution of the active drug
III. diffusion of active drug through the intestinal wall

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

6. The rate of dissolution may be described by which one of the following equations or laws?

(A) Fick's Second Law
(B) Fick's First Law
(C) Noyes–Whitney Equation
(D) Poiseuille's law
(E) Stoke's law

7. The AUC of a drug can be determined from a graph by using the

I. law of diminishing returns
II. rule of nines
III. trapezoidal rule

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

8. Bioavailability and pharmacokinetic data either is or may be required when pharmaceutical companies submit

I. new drug applications
II. abbreviated new drug applications
III. supplemental applications

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

9. The "F" value for a drug product is ideally compared to its

(A) absolute bioavailability
(B) dosing rate
(C) clearance rate
(D) relative bioavailability
(E) route of administration

10. Determine the F value for a drug available as a 100-mg capsule with a calculated AUC of 20 mg/dL/h when a 100-mg IV bolus of the same drug exhibits an AUC of 25 mg/dL/h.

(A) 0.2
(B) 0.4
(C) 0.8
(D) 1.25
(E) 20

11. What is the F value for an experimental drug tablet based on the following data?

Drug Dosage

Form	Dose	AUC (μg/mL/h)
Tablet	100 mg po	20
Solution (control)	100 mg po	30
Injection (control)	50 mg IV push	40

(A) 0.25
(B) 0.38
(C) 0.50
(D) 0.66
(E) 0.90

12. The peak of the serum concentration versus time curve approximates the

(A) point in time when the maximum pharmacologic effect occurs
(B) point in time when absorption and elimination of the drug have equalized
(C) maximum concentration of free drug in the urine
(D) time required for essentially all of the drug to be absorbed from the GI tract
(E) point in time when the drug begins to be metabolized

13. Differences in bioavailability are most frequently observed with drugs administered by which of the following routes?

(A) subcutaneous
(B) intravenous
(C) oral
(D) sublingual
(E) intramuscular

14. Two different oral formulations containing the same dose of the same drug having equal areas under their respective serum concentration–time curves

(A) deliver the same total amount of drug to the body and are, therefore, bioequivalent
(B) deliver the same total amount of drug to the body but are not necessarily bioequivalent
(C) are bioequivalent by definition
(D) are bioequivalent if they both meet USP disintegration standards
(E) are bioequivalent if they both meet USP dissolution standards

15. For two drug products to be considered "pharmaceutical equivalents," the products must

I. have the same active drug (therapeutic moiety)
II. consist of the same salt
III. contain the same excipients

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

16. Requirements for drug products to be considered "pharmaceutical alternatives" include having the same

I. active drug or precursor
II. dosage form
III. salt or ester

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

17. If an oral capsule formulation of the drug A produces a serum concentration–time curve having the same area under the curve as that produced by an equivalent dose of drug A given IV, it can generally be concluded that

(A) the IV route is preferred to the oral route
(B) the capsule formulation is essentially completely absorbed
(C) the drug is very rapidly absorbed
(D) all oral dosage forms of drug A will be bioequivalent
(E) there is no advantage to the IV route

18. According to pH partition theory, a weakly acidic drug will most likely be absorbed from the stomach because

(A) the drug will exist primarily in the un-ionized, more lipid-soluble form
(B) the drug will exist primarily in the ionized, more water-soluble form
(C) weak acids are more soluble in acid media
(D) the ionic form of the drug facilitates dissolution
(E) weak acids will further depress pH

19. Which of the following statements concerning the blood protein albumin is (are) true?

I. Blood levels are approximately 3.5 to 5.0 g/liter.
II. It is a very site-specific binding agent.
III. It will generally bind acidic drugs.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20. Reducing drug particle size to enhance drug absorption is limited to those situations in which the

(A) absorption process occurs by active transport
(B) absorption process is rate-limited by the dissolution of drug in GI fluids
(C) drug is very water-soluble
(D) drug is very potent
(E) drug is irritating to the GI tract

21. Drugs whose absorption have been significantly increased by micronization include

I. griseofulvin
II. penicillin
III. potassium chloride

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

22. Gastric emptying is slowed by all of the following EXCEPT

(A) vigorous exercise
(B) fatty foods
(C) hot meals
(D) hunger
(E) emotional stress

23. Drugs that are absorbed from the GI tract are generally

(A) absorbed into the portal circulation and pass through the liver before entering the general circulation
(B) filtered from the blood by the kidney, then reabsorbed into the general circulation
(C) absorbed into the portal circulation and are distributed by an enterohepatic cycle
(D) not affected by liver enzymes
(E) stored in the liver

24. Which of the following routes of administration is (are) least likely to be influenced by the first-pass effect?

I. oral
II. inhalation
III. transdermal

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25. For many drugs, bioavailability can be evaluated using urinary excretion data. This is based on the assumption that

(A) bioavailability studies can be done only on drugs that are completely excreted unchanged by the kidneys
(B) drug levels can be measured more accurately in urine than in blood
(C) a drug must first be absorbed into the systemic circulation before it can appear in the urine
(D) all of the administered dose can be recovered from the urine
(E) only drug metabolites are excreted in the urine

26. A drug has an elimination half-life of 3 hours and its apparent volume of distribution is 100 mL/kg. What is the total body renal clearance of this drug in a 70-kg male in terms of liters per hour?

(A) 0.5 L/hr
(B) 1.6 L/hr
(C) 8 L/hr
(D) 14.6 L/hr
(E) 16.3 L/hr

27. Estimating bioavailability from urinary excretion data is less satisfactory than estimates based on blood level data because accurate urinary excretion studies require

I. complete urine collection
II. normal or near-normal renal function
III. that the drug be completely excreted unchanged by the kidney

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

Questions 28 and 29 are to be answered using the following data.

Product by Company	Dosage Form	Dose Administered	Cumulative Urinary Amount (mg)
A	Parenteral injection	10 mg IV	9.4
A	Tablet	20 mg po	12.0
B	Tablet	20 mg po	8.2
B	Capsule	15 mg po	6.8

28. The absolute bioavailability of Company B tablets is best estimated to be

(A) 25%
(B) 40%
(C) 44%
(D) 68%
(E) 87%

29. True statements concerning Company B dosage forms when compared to the standard Company A include

I. the relative bioavailability of Company B tablets is 68%
II. the relative bioavailability of Company B capsules is 57%
III. Company B products could be considered to be bioequivalent to Product A tablets

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

30. The excretion of a weakly acidic drug (eg, pKa of 3.5) will be more rapid in alkaline urine than in acidic urine because

(A) all drugs are excreted more rapidly in alkaline urine
(B) the drug will exist primarily in the un-ionized form, which cannot be reabsorbed easily
(C) the drug will exist primarily in the ionized form, which cannot be reabsorbed easily
(D) weak acids cannot be reabsorbed from the kidney tubules
(E) active transport mechanisms function better in alkaline urine

31. The biological half-life of a drug

(A) is a constant physical property of the drug
(B) is a constant chemical property of the drug
(C) is the time for one-half of the therapeutic activity to be lost
(D) may be decreased by giving the drug by rapid IV injection
(E) depends entirely on the route of administration

32. The biological half-life of a drug that is eliminated by first-order kinetics is represented mathematically by _____, where k is the first-order rate constant for elimination.

(A) 1/k
(B) log k
(C) 0.693/k
(D) 2.303/k
(E) peak serum concentration/2k

33. A specific drug has a first-order biological half-life of 4 hours. This half-life value will

(A) be independent of the initial drug concentration
(B) increase when the concentration of the drug increases
(C) decrease when the concentration of the drug increases
(D) decrease if the patient has renal impairment
(E) be the same whether the drug level is determined in the blood or by observing the pharmacological action

34. Assuming complete absorption and an elimination half-life of 4 hours, how many mg of a drug will remain in the body 12 hours after administering a 400-mg dose? Assume linear pharmacokinetics (ie, first order).

(A) 10
(B) 25

(C) 50
(D) 100
(E) 200

35. The biological half-life of many drugs is often prolonged in newborn infants because of

(A) a higher degree of protein binding
(B) microsomal enzyme induction
(C) more complete absorption of drugs
(D) incompletely developed enzyme systems
(E) incompletely developed barriers to the distribution of drugs in the body

36. The time needed to achieve a steady-state plasma level for a drug administered by infusion will depend on the

I. amount of drug being infused
II. volume of distribution of the drug
III. half-life of the drug

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

37. Determine the half-life of furosemide if it appears to be eliminated from the body at a rate constant of 46% per hour. (Assume that first-order kinetics occurs.)

(A) < 1 hour
(B) 1.5 hours
(C) 3.0 hours
(D) 4.0 hours
(E) > 5 hours

38. The volume of distribution of a drug is a

I. mathematic relationship between the total amount of drug in the body and the concentration of drug in the blood
II. measure of an individual's blood volume
III. measure of an individual's total body volume

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

39. The volume of distribution (V_d) of a particular drug will be

(A) greater for drugs that concentrate in tissues rather than in plasma
(B) greater for drugs that concentrate in plasma rather than in tissues
(C) independent of tissue concentration
(D) independent of plasma concentration
(E) approximately the same for all drugs in a given individual

40. A knowledge of V_d for a given drug is useful because it allows us to

(A) estimate the elimination rate constant
(B) determine the biological half-life
(C) calculate a reasonable loading dose
(D) determine the best dosing interval
(E) determine the peak plasma concentration

41. Estimate the plasma concentration of a drug when 50 mg is given by IV bolus to a 140-lb patient if her volume of distribution is 1.6 L/kg.

(A) 0.1 mg/L
(B) 0.5 mg/L
(C) 1 mg/L
(D) 5 mg/L
(E) 31 mg/L

42. How many mg of aminophylline should be given as a loading dose if a theophylline plasma level of 10 mg/L is desired in a 55-year-old male patient weighing 70 kg? His volume of distribution has been calculated to be 35 liters. Assume that aminophylline consists of 85% theophylline and 15% ethylenediamine.

(A) 150
(B) 300
(C) 400
(D) 800
(E) 1000

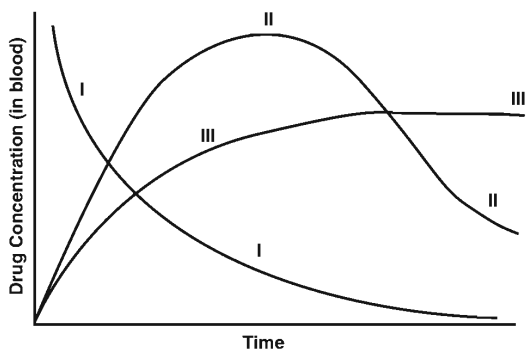
43. What maintenance dose is appropriate in the above patient if the clearance is estimated to be .35 mL/min/kg?

(A) 10 mg/hr
(B) 14 mg/hr
(C) 17 mg/hr
(D) 20 mg/hr
(E) 25 mg/hr

44. Which one of the following equations would have enabled the pharmacist to estimate the creatinine clearance in the previous patient?

(A) Cockcroft–Gault
(B) Harris–Benedict
(C) Henderson–Hasselbalch
(D) Loo–Riegelman
(E) method of least residuals

Questions 45 through 49: The following graph represents drug blood level curves. Answer the next five questions based on this graph.



45. Curve I represents the blood level concentration of a drug administered by

I. the oral route
II. intramuscular injection
III. intravenous injection

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

46. The upward slope of curve II could represent

I. increased absorption of drug from a capsule dosage form
II. absorption of drug from an intramuscular injection
III. absorption of drug from a sustained-release tablet

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

47. Which one of the following statements concerning the graph is completely true?

(A) Once the peak in curve II has been reached, no further drug absorption is likely to occur.
(B) Doubling the administered dose will double the height of curve II.
(C) The Y-axis (concentration of drug in the blood) should be expressed as a log function.
(D) The X-axis (time) should be expressed as a log function.
(E) The curves in lines II and III indicate that the absorption rate (k_a) is greater than the elimination rate (k_e).

48. Curve III would best illustrate a drug administered by

(A) intravenous push
(B) intravenous infusion
(C) intramuscular injection
(D) intrathecal injection
(E) either intravenous push or infusion

49. The time needed to reach optimum drug blood levels (the plateau portion of curve III) during constant-rate intravenous infusion is

(A) directly proportional to the rate of infusion
(B) inversely proportional to the rate of infusion
(C) independent of the rate of infusion

(D) independent of the biological half-life
(E) not related to either the infusion rate or the biological half-life

50. Compartmental models are often used to illustrate the various principles of pharmacokinetics. A compartment is best defined as

(A) any anatomic entity that is capable of absorbing drug
(B) a kinetically distinguishable pool of drug
(C) specific body organs or tissues that can be assayed for drug
(D) any body fluid, such as blood or urine, that may contain drug
(E) any component of the blood, including blood proteins, that would have a tendency to absorb drug

51. Characteristics of nonlinear pharmacokinetics include

I. follows zero-order kinetics
II. elimination half-life will change as the dose is increased
III. half-life is expressed in terms of fraction per unit of time

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

52. The pharmacokinetic parameter known as clearance is essentially the

(A) rate at which the plasma is cleared of all waste materials and foreign substances (eg, drugs)
(B) volume of blood that passes through the kidneys per unit of time
(C) volume of blood that passes through the liver per unit of time
(D) rate at which a drug is removed (cleared) from its site of absorption
(E) volume of blood that is completely cleared of drug per unit of time

53. A knowledge of the clearance (CL) of a given drug is useful because it allows the

(A) calculation of the maintenance dose required to sustain a desired average steady-state plasma concentration
(B) determination of the volume of distribution
(C) determining of the ideal dosing interval
(D) decision whether a loading dose is necessary
(E) determination if the drug is metabolized or excreted unchanged

54. The difference between peak and trough concentrations is greatest when a drug is given at dosing intervals

(A) much longer than the half-life
(B) about equal to the half-life
(C) much shorter than the half-life
(D) equal to the half-life times serum creatinine
(E) equal to the time it takes to reach peak concentration following a single oral dose

55. Which of the following pharmacokinetic parameters is (are) likely to decrease in the geriatric population when compared to the average population?

I. renal elimination
II. drug metabolism
III. volume of distribution

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

56. Which of the following values is likely to increase in the geriatric population?

(A) blood level of albumin
(B) enzymatic metabolism
(C) total body water
(D) volume of distribution of lipophilic drugs
(E) volume of distribution of water-soluble drugs

57. In dosing drugs that are primarily excreted by the kidneys, one must have some idea of the patient's renal function. A calculated pharmacokinetic parameter that gives us a reasonable estimate of renal function is the

(A) blood urea nitrogen (BUN)
(B) serum creatinine (Sr_{Cr})
(C) creatinine clearance (Cl_{Cr})
(D) urine creatinine (U_{Cr})
(E) free water clearance (Cl_{fw})

58. If the rate of elimination of a drug is reduced because of impaired renal function, the effect on the drug half-life and the time required to reach steady-state plasma levels (steady-state concentrations—C_{ss}) will

(A) both increase
(B) both decrease
(C) be an increase in half-life and a decrease in the time to reach C_{ss}
(D) be a decrease in half-life but an increase in the time to reach C_{ss}
(E) be negligible

59. When comparing a highly protein-bound drug to its less- or nonprotein-bound analog, the highly bound drug will probably have

I. faster metabolism rate
II. a longer biological half-life
III. slower diffusion into tissue

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

60. Which one of the following drugs does NOT bind to plasma protein to any significant extent?

(A) allopurinol (Zyloprim)
(B) clofibrate (Atromid-S)
(C) furosemide (Lasix)
(D) propranolol (Inderal)
(E) warfarin (Coumadin)

61. The metabolism of drugs generally results in

(A) less acidic compounds
(B) more acidic compounds
(C) compounds having a higher oil/water partition coefficient
(D) more polar compounds
(E) compounds with lower aqueous solubility

62. The pharmacist may suspect that a drug undergoes a significant first-pass effect when

I. the average oral dose is significantly higher than the parenteral bolus dose
II. the drug is marketed in a sustained-release dosage form
III. the drug is contraindicated when renal impairment is present

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

63. All of the following drugs are believed to undergo significant first-pass hepatic biotransformation EXCEPT

(A) lidocaine
(B) morphine
(C) nitroglycerin
(D) phenytoin
(E) propranolol

64. All of the following drugs have shown an increase in their bioavailability with the coadministration of concentrated grapefruit juice EXCEPT

(A) coumadin
(B) cyclosporine
(C) felodipine
(D) phenytoin
(E) saquinavir

65. When converting a patient from theophylline to aminophylline, a dose adjustment

(A) is not needed
(B) with an increase of 20% is suggested
(C) with an increase of 50% is suggested
(D) with a decrease of 20% is suggested
(E) with a decrease of 50% is suggested

66. The equation that describes the process of "passive transport" is

(A) Fick's law
(B) Henderson–Hasselbalch
(C) Noyes–Whitney
(D) Stoke's law
(E) Michaelis–Menten

67. The rate of diffusion of drugs across biological membranes is most commonly

(A) independent of the concentration gradient
(B) directly proportional to the concentration gradient
(C) dependent on the availability of carrier substrate
(D) dependent on the route of administration
(E) directly proportional to membrane thickness

68. When graphed, nonlinear pharmacokinetics are characterized by data that

(A) does not yield a straight line at any time
(B) exhibits a straight line only when plotted as log/log functions
(C) follows zero-order kinetics
(D) follows first-order kinetics
(E) will have a negative slope

69. Which one of the following concerning active transport is NOT correct?

(A) also known as carrier-mediated transport
(B) may be adversely affected by certain chemicals
(C) structure specific
(D) reaches equilibrium faster than passive transport systems
(E) consumes energy

70. When the active transport system described in Question 69 becomes saturated, the rate process will be

(A) zero order
(B) pseudo–zero order
(C) first order
(D) pseudo–first order
(E) second order

71. The term "prodrug" refers to a

(A) chemical substance that is part of the synthesis procedure in preparing a drug
(B) compound that liberates an active drug in the body
(C) compound that may be therapeutically active but is still under clinical trials
(D) drug that has only prophylactic activity in the body
(E) drug that is classified as being "probably effective"

72. Which of the following drugs is (are) classified as prodrugs?

I. clorazepate (Tranxene)
II. enalapril (Vasotec)
III. lisinopril (Zestril)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

73. The decanoate form of haloperidol is used to obtain

(A) better water solubility
(B) longer duration of therapeutic activity
(C) greater stability
(D) immediate activity
(E) sustained-release from a capsule

74. The rectal route of administration may be preferred over the oral route for some systemic-acting drugs because

(A) the drug does not have to be absorbed
(B) absorption is predictable and complete
(C) a portion of the absorbed drug does not pass through the liver before entering the systemic circulation
(D) inert binders, diluents, and excipients cannot interfere with absorption
(E) the dissolution process is avoided

75. If a drug appears in the feces after oral administration

(A) the drug cannot have been completely absorbed from the GI tract
(B) the drug must not have completely dissolved in the GI fluids
(C) the drug must have complexed with materials in the GI tract
(D) parenteral administration of the drug may determine the contribution of the biliary system to the amount of drug in the feces
(E) parenteral administration of the drug will be useful to determine the bioavailability of the oral formulation

76. Drugs that are poorly lipid-soluble, polar, or extensively ionized at the pH of blood generally

(A) penetrate the CNS very slowly and may be eliminated from the body before a significant concentration in the CNS is reached
(B) penetrate the CNS very slowly but are centrally active in much lower concentration
(C) achieve adequate CNS concentrations only if given IV
(D) must be metabolized to a more polar form before they can gain access to the CNS
(E) can gain access to the CNS if other drugs are used to modify blood pH

77. Which of the following is likely to occur with those cephalosporins having the greatest percentage of protein binding?

I. The drug's half-life will be longer.
II. The renal clearance value will be greater.
III. Transfer into tissue will be easier.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

78. Dialysis is most successful with drugs that

I. have relatively low molecular weights
II. are protein bound
III. have high volumes of distribution

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

79. Which of the following properties of a drug may preclude its formulation into a sustained-release dosage form?

I. half-life less than two hours
II. erratic absorption from the GI tract
III. low therapeutic index

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

80. Which one of the following peroral dosage forms is likely to exhibit the longest lag time?

(A) delayed-release tablet
(B) elixir (20% alcohol)
(C) enteric-coated tablet
(D) osmotic tablet
(E) sustained-release capsule

81. Dosage forms of nitroglycerin that are minimally affected by the first-pass effect include

I. intravenous
II. transdermal patches
III. sublingual tablets

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

82. Company A conducts a study comparing the AUCs for its generic version of a drug with Company B's trade name product. The respective AUCs for each company's 10-mg oral tablets were 80 mcg hr/mL and 76 mcg hr/mL. Which of the following statements is (are) true?

I. The absolute bioavailability of Company A's product cannot be determined from this data.
II. The relative bioavailability of Company A's product is 0.95.
III. The study is flawed since Company A's drug has a higher AUC than Company B's.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

83. The above drug follows linear pharmacokinetics and has a half-life of 8 hours with complete renal clearance. What is the clearance rate for this drug when a 10-mg dose is given?

(A) 0.087/hr
(B) 0.33/hr
(C) 1.25 mg/hr
(D) 4 mg/hr
(E) 5.5 L/hr

Answers and Explanations

1. **(C)** For most drugs, a dose-response relationship can be correlated with the amount of drug that gains access to the general circulation. In many cases, the amount of drug that is present in the blood (blood level) directly relates to the intensity and duration of the pharmacological effect. The relative amount of drug that is biologically available, compared to the total amount of drug in the dosage form administered, is a measure of bioavailability. Usually, bioavailability is expressed as the fraction or percentage of the administered drug that is absorbed. The term "absolute bioavailability" compares the amount of drug absorbed with the "gold standard" of the amount present in the blood after administration by an IV bolus. *(15:34)*

2. **(D)** The AUC can be calculated mathematically by the use of equations or evaluation of a graph when concentration (drug W/V) is plotted on the Y axis and time is plotted on the X axis. Units for AUC are weight and time/volume. *(17:14)*

3. **(C)** The availability of a drug from a specific formulation is compared to a reference standard that is administered at the same dose level. The standard for oral drugs is usually a solution of the pure drug. The relative bioavailability is then calculated by dividing either the AUC of the drug or the total amount of the drug excreted in the urine by respective values for the reference standard. The absolute bioavailability can be calculated by comparing similar data for the drug product to an IV bolus dose. *(17:195)*

4. **(E)** The surface area of a drug is so limited in the intact tablet that dissolution of drug from the intact tablet is negligible except for very water-soluble drugs. Therefore, although a drug must dissolve before it can be absorbed, a tablet must generally disintegrate before the drug can dissolve. *(17:136–37)*

5. **(E)** The rate-limiting step is considered the slowest step in the kinetics of drug absorption. For some drugs, especially tablet dosage forms, the slow release of the drug from the dosage form may be due to slow tablet disintegration due to excessive tablet hardness or excessive amounts of water-insoluble lubricant. Once disintegration has occurred, a poorly water-soluble drug may only slowly dissolve, thus limiting absorption. If a drug has high water solubility and the tablet has disintegrated rapidly, the rate-limiting step may be the ability of the drug to diffuse through the GI tract wall. *(17:136)*

6. **(C)** Terms in the Noyes–Whitney Equation reflect the rate at which a drug dissolves from the surface of a solid mass followed by diffusion through the stagnant layer that surrounds the solid particle. The Noyes–Whitney Equation is a modified form of Fick's First Law used to describe diffusion. *(17:138)*

7. **(B)** By employing the mathematic technique known as the trapezoidal rule, one may calculate an AUC. The AUC is subdivided into individual segments and the area of each is determined. By totaling these areas, an accurate estimate of the total AUC is obtained. *(17:180)*

8. **(E)** Unless a special waiver is granted, the FDA expects to see human bioavailability and pharmacokinetic data on all applications.

Possible exceptions will be for intravenous solutions, topicals, and inhalation products. *(24:111–12)*

9. **(A)** F values are calculated for drugs in their dosage forms by comparing AUCs, or total amount of drug excreted, to the control reference of an IV bolus dose, as outlined in Question 3. An ideal F value would be 1.0, which indicates complete absorption of the drug and no losses from other mechanisms such as hepatic first-pass effect. The F value is also known as the bioavailability factor. *(17:196; 23:201)*

10. **(C)** As outlined in Question 9; the F value can be estimated by using the equation

$$F = \frac{AUC_{cap}}{AUC_{iv}} = \frac{20}{25} = 0.8$$

Because in this example the comparison of AUCs relates to the absolute standard of an IV bolus dose, the drug's absolute bioavailability was calculated. If the comparison had been to another standard, such as to an oral solution or another product of the same drug, the F value would be the relative bioavailability. *(17:197)*

11. **(A)** This problem is similar to Question 10, except that a correction factor is necessary because different doses of the drug were administered. *(17:197)*

12. **(B)** Prior to the peak time, the rate of absorption is greater than the rate of elimination, and the curve ascends. After the peak, the rate of elimination is greater than the rate of absorption, and the curve descends. If these rates are equal for some time interval, the curve will show a plateau rather than a distinct peak. *(1:607; 17:172)*

13. **(C)** Differences in bioavailability of various drug products might be anticipated with any route of administration that requires the drug to be absorbed into the blood compartment. The oral route is most often involved because it is the most common route of administration and the drug must pass through the GI lumen, gut wall, and the hepatic circulation system before reaching general circulation. *(15:123; 17:153)*

14. **(B)** Although equal areas indicate that the same total amount of drug was made available to the body, the areas alone give no information regarding the rate at which the drugs were made available. Two formulations of a drug can yield radically different serum concentrations versus time curves that have approximately equal areas. It should be emphasized that the concept of bioequivalence involves not only the amount of drug that is available, but also the rate at which it becomes available. *(1:607)*

15. **(C)** Pharmaceutical equivalents are considered to be drug products that are almost identical in all aspects and are expected to exhibit almost identical therapeutic activity. Bioavailability data submitted to the FDA must show that similar values for onset of action, duration, peak concentrations, and time for peak concentration are obtained. One of the few variables allowed is the choice of excipients. These excipients or "inactive ingredients," include binders, diluents, lubricants, and so on. Naturally the manufacturers must include data proving that these excipients do not adversely affect the performance of their product. *(17:248; 24:73)*

16. **(A)** Drug products considered to be pharmaceutical alternatives are allowed greater variations from each other. Although they must contain the same active drug or its precursor, they may consist of different dosage forms and strengths, or contain a different salt of the drug. *(17:248; 24:73)*

17. **(B)** If the areas under the respective curves are equal, it can be concluded that the total amount of drug delivered to the body by each dosage form was equal. Because the intravenous administration did not involve an absorption process, the fact that the same amount of drug administered in a capsule formulation delivered the same total amount of drug indicates that the absorption of the drug from the oral capsule was essentially complete. *(1:609)*

18. **(A)** The ionic equilibrium that is established in the acid contents of the stomach will favor a relatively higher concentration of un-ionized drug in solution. The un-ionized molecule, because of the absence of a charge, is more lipid soluble than the ionic species and will be able to cross biological membranes more easily. If the drug reaches the more alkaline contents of the intestines before absorption is complete, the higher pH will then favor the ionic form of the drug, which has considerably less lipid solubility and is much less readily absorbed. It should be pointed out, however, that because of the extremely large surface area of the intestine, weakly acidic drugs can be absorbed from the intestine in spite of the unfavorable ion/molecule ratio. *(15:114, 120)*

19. **(B)** Albumin will bind numerous drugs that have an acid functional group. Because of its nonspecificity and high blood levels (3.5 to 5%), the loading doses of some drugs must be high to at least partially saturate the protein binding sites. *(1:181–82; 15:143, 271–72)*

20. **(B)** Drugs must be in solution for significant absorption from the GI tract. Thus, drugs with poor water solubility may have their dissolution rate as the rate-limiting factor. However, making a drug dissolve faster (eg, by particle size reduction) will not increase the rate of its absorption if the absorption process itself is the rate-limiting step in the overall transport of the drug from its intact dosage form to the blood. *(17:159)*

21. **(A)** Griseofulvin (Fulvicin U/F) has been formulated into a dosage form as micronized powder. This poorly water-soluble drug will dissolve faster due to the increase in surface area with subsequent absorption. Potassium chloride readily dissolves in water. Reducing its particle size will not significantly enhance its dissolution or absorption. *(1:595; 17:134)*

22. **(D)** Gastric emptying appears to be an exponential process with a normal half-life of between 20 and 60 minutes. However, many factors can influence the rate of this process. It is slowed by the A, B, C, and E choices and is speeded by hunger, mild exercise, cold meals, dilute solutions, and lying on the right side. Because some drugs and some dosage forms (eg, enteric-coated tablets) are absorbed at rather specific sites along the GI tract, alterations in the rate of gastric emptying may lead to erratic and unpredictable absorption. For example, if an acid-labile drug that is preferentially absorbed from a portion of the small intestine is consumed as an enteric-coated tablet, a greatly reduced gastric emptying rate may permit the tablet to dissolve in the stomach and be degraded by the acid fluids of the stomach. Similarly, if the gastric emptying rate is greatly increased, the tablet may not dissolve before it reaches its primary site of absorption. *(17:116)*

23. **(A)** Drugs are generally absorbed from the GI tract through capillaries that empty into the portal vein. This vessel carries the absorbed drugs to the liver, where they are subjected to varying degrees of metabolism before they are carried into the general circulation. This initial passage through the liver is therapeutically significant, primarily for drugs that are metabolized to a less active or inactive form by the liver. *(17:377)*

24. **(D)** Routes of administration that avoid the first-pass effect include intravenous injections, inhalation, and transdermal. By these routes the drug is distributed within the body before metabolism by the liver. The "F" value, which indicates the AUC of a non-IV dose, divided by the AUC resulting from an IV dose, which represents absolute bioavailability is a fraction. The higher the fraction, the greater the bioavailability of the non-IV drug. A second, more accurate method to evaluate the first-pass effect is determining the liver extraction ratio (ER). *(17:377)*

25. **(C)** After a drug gains access to the systemic circulation, it may be metabolized to varying degrees and/or be excreted unchanged. For most drugs and their metabolites, the kidneys are the primary organ of excretion. The presence of a drug and/or its metabolites in the urine must be preceded by the presence of drug in the blood. When an appreciable amount of drug is excreted in the urine, it is

often possible to use urinary excretion data—such as cumulative amount of drug in the urine and maximum urinary excretion rate—to evaluate the systemic availability of various drug formulations. *(17:53)*

26. **(B)** Since the volume of distribution is given as 100 mL/kg body weight, convert this to liters.

$$100 \text{ mL/kg} \times 70 \text{ kg} = 7000 \text{ mL or } 7 \text{ liters}$$

$$t_{0.5} = \frac{.693 \text{ Vd}}{\text{CL}}$$

$$3 \text{ hr} = \frac{.693 \times 7 \text{ L}}{\text{CL}}$$

$$\text{CL} = 1.6 \text{ L/hr} \qquad \textit{(17:335)}$$

27. **(C)** Urinary excretion studies require complete urine collection so that the total quantity of drug that is excreted in the urine can be determined. Normal or near-normal renal function is also a prerequisite for accurate urinary excretion studies because sufficiently impaired renal function can alter the composition of various body fluids that, in turn, can alter the pharmacokinetic properties of many drugs. Although urinary excretion studies are usually conducted on drugs that are primarily excreted unchanged by the kidney, it is not necessary that a drug be completely excreted unchanged by the kidney. *(17:254)*

28. **(C)** The best measure of absolute bioavailability is considered to be AUC data obtained after a bolus IV injection of a drug. Because AUC data is not available for these drug products, the next best comparison will be the use of cumulative drug amounts found in the urine. Because the IV injection dose was 10 mg, whereas the oral tablet dose was 20 mg, a correction factor of 2 x is needed. Cumulative amount if 20 mg had been injected will be $9.4 \times 2 = 18.8$. Dividing 8.2 mg by 18.8 mg = 0.44, or 44%. *(17:250)*

29. **(A)** Relative bioavailability of Company B's tablet when compared to Company A's tablet will be 8.2 mg divided by 12 mg = 0.68, or 68%. To determine the relative bioavailability of Company B's capsule, one must correct for the fact that the capsule dose was 15 mg. That is, determine the mg of drug that would accumulate in the urine if a 20-mg capsule dose was administered.

$$\frac{\text{15mg cap}}{\text{6.8 mg (in urine)}} = \frac{\text{20 mg}}{\text{x mg (in urine)}}$$

$$x = 9.1 \text{ mg}$$

Relative bioavailability will equal 9.1 divided by 12 mg = 0.76, or 76%. Neither Company B's tablet or capsule can be considered bioequivalent to Company A's tablet because neither is within 80% of the cumulative amount of drug in the urine. This 80% guideline has been accepted by the FDA for determining bioequivalency of similar drug products. *(17:250)*

30. **(C)** Just as shifting the ionic equilibrium in favor of the ionic species reduces the probability that a weakly acidic drug will be absorbed from the alkaline fluids of the intestines, it also reduces the probability that the drug will be reabsorbed from the renal tubules into the blood. Consequently, a greater fraction of drug in the tubules cannot be reabsorbed and will be excreted in the urine. *(15:176; 17:271–72)*

31. **(C)** Generally, when a particular drug has a half-life of 6 hours, there is reasonable certainty that in spite of as much as a one- to two-fold intersubject variation, the mean biological half-life in any group of subjects will approximate 6 hours. Alterations in biological half-life can be expected when a particular drug is primarily excreted unchanged by the kidneys. The presence of renal impairment slows the process of excretion and thereby increases the biological half-life of the drug in the blood. *(1:605; 24:136)*

32. **(C).** *(1:728; 24:136)*

33. **(A)** Most drugs have biological half-lives that follow first-order kinetics. A basic characteristic of first-order kinetics is that the rate constants for metabolism or excretion are independent of the initial drug concentration. That is, a specific fraction of drug will be lost in a given time period. Doubling the drug

concentration will not change the rate constant, even though the amount of drug lost in a given time period would increase. Renal impairment may affect the biological half-life of drugs eliminated by the kidneys. However, the half-life would be expected to increase (not decrease), because the drug remains in the circulation for longer periods of time. Two methods for determining half-life are (1) to determine drug blood levels with respect to time and (2) to quantify with respect to time actual biological responses to the drug. Ideally, the half-life values by each method should be identical. However, they will be identical only when there is a direct and measurable relationship between drug blood concentrations and the biological response. *(17:28)*

34. **(C)** One-half (200 mg) of the administered dose will be eliminated in 4 hours. Of the remaining 200 mg, one-half (100 mg) will be eliminated in the second 4-hour period. In the next 4-hour span, an additional 50 mg of drug will be lost. Therefore, after 12 hours (or three half-lives), only 50 mg of drug remains. If graphed as log drug remaining (Y axis) versus time (X axis), the data will appear as a straight line (first-order kinetics). *(1:593; 23:206)*

35. **(D)** The metabolic pathways of newborn infants are incompletely developed at birth; most notably, the oxidative and conjugative mechanisms that are known to metabolize many drugs. The reduced capacity to metabolize certain drugs will therefore result in prolonged biological half-lives of these drugs in newborn infants. Because of inadequate metabolic inactivation, the plasma concentration of chloramphenicol is higher in infants younger than 2 weeks of age than in older infants. Kidney function also varies. Many drugs such as penicillin and gentamicin have longer half-lives in neonates than in adults (3.2 hours versus 0.5 hours for penicillin and 5 hours versus 2 to 3 hours for gentamicin). *(17:494–95)*

36. **(B)** For any drug that is eliminated by first-order kinetics, the time required to achieve steady-state plasma levels is dependent only on the biological half-life of that drug in a given individual. As a drug is repeatedly administered in constant dosage and at constant time intervals (that are short enough to preclude complete elimination of the drug), the elimination rate of the drug increases as the concentration of drug in plasma increases. The tendency of a drug to accumulate on repeated dosing is, therefore, balanced by increased amounts of drug being eliminated. Eventually, a steady state will be reached in which the amount of drug absorbed will equal the amount of drug being eliminated. The time to reach steady state corresponds to about four to five half-lives and is more completely described in the following table:

Time Plasma (Half-Lives)	Concentration (% of Steady-State Level)
1	50
2	75
3	88
4	94
5	97
6	98
7	99

(17:401)

37. **(B)** A rate constant of 46% per hour refers to a fractional loss of 0.46 per hour. The equation for determining half-lives for first-order reactions is

$$t_{0.5} = \frac{0.693}{k} \text{ or } \frac{0.693}{0.46} = 1.5 \text{ hours}$$

(23:306)

38. **(A)** Volume of distribution (V_d) is an "apparent volume" measured in terms of a reference compartment, usually the blood, because of the accessibility of this compartment to sampling. Because the drug dose is known and the blood concentration can be determined, the V_d may be calculated by

$$V_d = A_b/C_b$$

Where A_b = total amount of unchanged drug in the body, and

C_b = concentration of drug in the blood.

Knowledge of the V_d for a particular drug permits calculation of the total amount of drug in the body (A_b) at any time by measuring the drug concentration in the blood (because $A_b = V_d$) accumulation in specific body areas. Also, because only the unbound fraction of drug is available for biotransformation and excretion, protein-bound drugs have a tendency to remain in the body longer (ie, delayed elimination and longer half-lives). *(1:726; 17:49)*

39. (A) Following a given dose of a drug, the greater its concentration in various tissue compartments, the smaller its concentration in plasma. Therefore, according to the relationship $A_b = V_d C_b$ (see commentary for Question 38), the V_d of a particular drug will be greater for those drugs that tend to concentrate in tissues as opposed to plasma. *(1:726; 15:20–22)*

40. (C) Because the V_d is a parameter that allows accountability for all of the drug in the body, it can be used to calculate the loading dose that would rapidly result in a desired plasma concentration (C_p).

$$\text{Loading dose} = \frac{(V_d)(C_p)}{(S)\ (F)}$$

where S = portion of the salt form that is active drug and F = fraction of dose absorbed. *(19:2–3)*

41. (B) One can easily picture that the plasma concentration of the drug (C_p) will be equal to the amount of drug (D) administered or absorbed, divided by the body volume (V_d) in which it is distributed.

$$C_p = \frac{D}{V_d} \quad \text{or} \quad \text{Dose} = (C_p)\,(V_d)$$

In this problem:

Step 1: 140 lb × 1 kg/2.2 lb = 64 kg (body wt)

Step 2: V_d = 64 kg × 1.6 L/kg = 102 L

Step 3: 50 mg = (C_p) (102 L)

Step 4: C_p = 0.5 mg/L, ANS *(6:25; 23:205)*

42. (C) (F) (Loading Dose) = (Plasma Conc.) (Volume of Distribution)

(0.85) (LD) = (10 mg/L) (35 L)

LD = 412 mg *(5:31; 17:486–87)*

43. (C) Converting the clearance to L/hr and eliminating the kg weight,

.35 mL/min/kg × 60 min/hr × 70 kg
= 1470 mL/hr or 1.47 L/hr

(F) (Maintenance dose)
= (Plasma Conc.) (Clearance)

(.85) x = (10 mg/L) (1.47 L/hr)

x = 17.3 mg per hour *(5:31)*

44. (A) The Cockcroft–Gault is very useful in estimating creatinine clearance. For a male, it reads

$$\text{Cr Cl} = \frac{(140 - \text{age})\ \text{Body Wt}}{72\ \text{Scr}}$$

where age is in years and weight is in kg. For the female, a factor of 0.85 is placed before the (140 – age) expression. *(5:30; 17:538)*

45. (B) Curve I shows an initial high concentration of drug in the blood with a steadily decreasing concentration. This curve is characteristic of drugs administered by rapid intravenous injection. *(17:160)*

46. (E) Any of the listed dosage forms could exhibit blood level curves similar to curve II. The first portion of the curve shows an increasing concentration of drug in the blood. This pattern would be expected whenever there is steady drug absorption (ie, when absorption is greater than elimination), either from the GI tract or from a tissue injection site. Curve III is also a good representation for a sustained-release product as it illustrates a plateau effect. *(17:160)*

47. (E) For any drug to exhibit high blood levels, it must be absorbed at a rate significantly greater than the rate by which it is eliminated. That is, K_a must be greater than K_e, at

least in the early period of its therapeutic curve. Obviously the manufacturer bases dosing amounts on the relative speed and extent of absorption versus how quickly the drug is being eliminated.

Blood levels of drug increase until a peak occurs where the rate of absorption equals the rate of elimination. Drug absorption will usually continue to occur even after the peak blood concentration has been reached. However, the blood level curve is then declining, because the rate of elimination is greater than the rate of absorption.

Because most of the factors affecting pharmacokinetics are first order, doubling a drug dose will seldom double the height of a blood level curve. However, the total area under the drug curve can be expected to double, because the AUC is directly proportional to the dose.

The pharmacokinetics of most drugs follow a first-order pattern. Therefore, if the concentration of drug in the blood is plotted as a log function on the Y-axis, a straight line will be obtained rather than a curve, as shown on the graph.

The time factor is a constant variable plotted at regular intervals (hours, days, etc). It is very seldom expressed as a log function. *(15:36–37)*

48. **(B)** Administration of drugs by intravenous infusion, which implies slow flow into a vein, will result in a plateau effect in respect to drug blood levels. The resulting steady-state levels are directly proportional to the infusion rate. An intravenous push (bolus dose) will give a curve similar to curve I on the graph. The blood level curve for an intrathecal (spinal) injection will probably resemble curve II as the drug slowly diffuses into the blood. *(15:68)*

49. **(C)** The time in which the optimum drug blood level is obtained is independent of the infusion rate. It is dependent only on the biological half-life of the particular drug. The time required to reach the plateau (steady state) is approximately four to five half-lives. At the blood concentration plateau, the K_e equals the infusion rate. *(15:69)*

50. **(B)** Although various organs, tissues, and fluids in the body can be considered to be compartments for a specific drug, a compartment does not necessarily have to be an anatomic entity. Any body site or fluid that appears to contain the drug may be described as a compartment or "pool" in the model. *(17:38; 24:133)*

51. **(C)** Linear pharmacokinetics follows first order kinetics in which the half-life does not change as the drug dose is changed. Nonlinear pharmacokinetics follows zero-order kinetics. It usually reflects the effect of enzymes or the presence of carrier-mediated systems. In these situations, the elimination half-life of the drug will increase when the dose is increased. *(17:447)*

52. **(E)** This is the definition of total systemic (whole body) clearance, which is the sum of all the separate clearances (ie, renal, hepatic, etc). *(17:53)*

53. **(A)** When the clearance (Cl) of a drug is known, the maintenance dose required to sustain a desired average steady-state plasma concentration can be calculated by

$$\text{Maintenance dose} = \frac{(Cl)\,(C_p)\,(\tau)}{(S)\,(F)}$$

Where C_p = average steady-state plasma concentration

τ = dosing interval (tau)

S = portion of salt that is active drug

F = fraction of dose absorbed *(17:486)*

54. **(A)** Drugs (eg, aminoglycosides) given at intervals that are much longer than one half-life are almost completely eliminated from the body before the next dose is given. This results in a large difference between peak and trough drug concentrations, thus timing of blood sample(s) becomes crucial to interpretation of results. At the other extreme, drugs given at intervals that are much shorter than one half-life (eg, phenobarbital) are slowly cleared from the body; conse-

quently, their peak-to-trough concentration differences are relatively small. *(17:419)*

55. (E) Decreased efficiency in renal function occurs in approximately 70% of the geriatric population. Also, both blood circulation and hepatic function decrease in many of the elderly. Because both extracellular and other body fluids may decrease in volume, reported volume of distributions in some geriatric patients may be lower than expected. *(2a:26; 17:496–99)*

56. (D) While all of the other values tend to decrease in the elderly, the volume of distribution of lipophilic drugs may increase since the proportion of body fat increases. *(5:54; 17:496)*

57. (C) Drug elimination by the kidneys can often be correlated with blood urea nitrogen (BUN), serum creatinine (Sr_{Cr}), and creatinine clearance (CL_{cr}). The BUN and Sr_{Cr}, however, are less useful indices of renal function than the CL_{cr} because they are influenced by other factors (eg, state of hydration, age, etc). For example, as patients age, both the production and clearance of creatinine decrease. Therefore, an elderly patient with a normal serum creatinine of 1 mg/dL may have a CL_{cr} of much less than 100 mL/min (normal CL_{cr} is 100 to 120 mL/min for a 70-kg adult). There are a number of methods used to calculate CL_{cr}. One equation, the Cockcroft–Gault equation reads

$$CL_{cr}\ (\text{for a male}) = \frac{(140 - \text{age})\ (\text{weight})}{72\ (Sr_{Cr})}$$

Units include age in years, weight in kilograms, and serum creatinine measurements in mg/dL. For females, the calculated CL value is reduced by multiplying by 0.85. *(17:538; 23:209)*

58. (A) If the biological half-life of a drug increases in patients with impaired renal function, the time required to reach steady-state plasma levels will also be increased. This time factor is only dependent on the biological half-life of a given drug in a given individual. *(17:422–23)*

59. (D) Only the unbound fraction of a drug is available for biotransformation and excretion. Protein-bound drugs have a tendency to remain in the body longer because they do not readily enter hepatocytes for metabolism by the liver. Protein-bound drugs are larger molecules and cannot as readily diffuse through the renal glomeruli for eventual excretion, thus their half-lives will be longer. *(17:282, 302; 24:129)*

60. (A) When administered in therapeutic doses, allopurinol does not appear to bind to plasma proteins. The pharmacist should carefully monitor drug therapy when two or more drugs that exhibit significant protein-binding properties are prescribed. Relatively small changes in the degree of protein binding caused by competition for binding sites can result in significant changes in plasma concentration of free drug and in the intensity of the clinical response. *(1:745; 17:315)*

61. (D) Drug metabolites are usually more polar and less lipid-soluble than the parent compound. Because of these changes, metabolites are usually not as tightly nor as extensively protein-bound. They are ionized to a greater degree and are less likely to cross biological membranes than the parent compound. Drug metabolism, therefore, is generally a process that inactivates a drug and changes it to a form that can be excreted more easily and rapidly. For some drugs, however, metabolism may result in activation of an inactive substance, or an active substance may be transformed into (an) active metabolite(s). In these cases, either further biotransformation takes place to inactivate the metabolite(s), or it (they) is (are) excreted unchanged. *(1:717)*

62. (A) The term "first pass" refers to the first passage of drug molecules through a designated organ such as the lungs or the liver. Biotransformation will often occur at this site, thereby altering the absolute bioavailability of a drug. Commercial preparations of such drugs are formulated to contain sufficient quantities of drug to compensate for loss due to first-pass biotransformation. Al-

though acetylsalicylic acid does not appear to undergo a significant first-pass hepatic biotransformation, some drug loss does occur in the intestinal lumen or during absorption through the GI mucosa. *(17:316)*

63. **(D)** Only 5% of phenytoin is metabolized in the liver; most of the drug is excreted unchanged. When significant amounts of a drug are metabolized by the liver immediately after absorption through the GI tract wall (first-pass effect), manufacturers may compensate by increasing the dose present in oral dosage forms. For example, propranolol is available as 40- and 80-mg tablets, whereas the parenteral form is 2-mL ampules containing 2 mg/mL. *(17:320; 24:122)*

64. **(D)** All of the listed drugs have shown improvement in their bioavailability when administered with grapefruit juice. Most notable is saquinavir, which normally has only a 4% bioavailability, but demonstrated a 150 to 220% increase with the juice. It is believed that the bioflavonoid, naringin, inhibits the liver cytochrome P-450 enzyme. *(17:375–76)*

65. **(B)** The water solubility of theophylline is enhanced by combining it with ethylenediamine, forming the drug aminophylline. Because the active moiety, theophylline, contributes 80% of the molecular weight of aminophylline, a correction factor is needed to convert between the two drugs when predicting therapeutic activity. This conversion factor is often referred to as the "S" factor, and is expressed as a fraction. In some books, a correction of 85% is used instead of 80. This minor discrepancy is based on whether the hydrous or anhydrous form of aminophylline is present. *(1:971–73; 5:31; 17:486)*

66. **(A)** Fick's First Law states that the rate of diffusion is directly related to the diffusion coefficient and the surface area of the membrane and inversely proportional to the thickness of the membrane. The driving force in the equation is the concentration gradient, because the greater the difference in concentrations on each side of the membrane, the greater the amount of drug diffusing (first-order kinetics).

One form of the equation used for the passage of drug through the intestinal wall reads

$$Jw = Pw\ Cw$$

in which Jw is the drug flux, Pw is the permeability of the intestinal membrane, and Cw is the drug concentration at the membrane surface. *(17:146; 24:57)*

67. **(B)** The greater the difference between the drug concentrations on each side of a biological membrane, the greater the rate of transfer from the side having the higher concentration to the side having the lower concentration. *(24:104)*

68. **(C)** Linear pharmacokinetics is characterized by straight-line relationships when plotted as a log function (Y axis) versus time (X axis). Some drugs are described as following dose-dependent or nonlinear pharmacokinetics and exhibit straight lines without a log function. The classic example is a drug that demonstrates saturable elimination process. *(17:449–51)*

69. **(D)** As the name implies, carrier-mediated or active transport involves active participation of a membrane in transferring molecules from one side to the other. The "carrier," such as an enzyme in the membrane, aids in transporting the molecules of drug across the membrane. Because this transfer process is continuous, it can work against a concentration gradient and continue until all of the drug has been transported. Therefore, equilibrium does not occur.

Active transport requires energy. Facilitated diffusion is a carrier-mediated transport process that does not require energy. Certain chemicals, known as poisons, can reduce active transport, probably by destroying or inactivating the drug carriers. Carriers are often very specific in respect to the drug they will transport. Only a certain chemical structure or similar chemical structures may be actively transported by a given carrier. Because of the chemical specificity and limited capacity of carriers, active transport systems may become saturated. When this occurs, the active trans-

port rate becomes a constant value until the drug concentration is reduced. *(6:4, 23; 17:105)*

70. **(A)** A characteristic of a zero-order process or reaction is a constant rate of change. When the active transport system is saturated, there are not enough carriers to handle the large number of transferable molecules. Therefore, the carriers work at maximum capacity, transferring molecules at a constant rate until the drug concentration is reduced to less than the capacity of the carrier system. At this time, the number of molecules transferred will be a fraction of those present for transfer (ie, a first-order rate will exist). *(1:725)*

71. **(B)** In order to take advantage of certain desirable characteristics, some drugs are marketed as prodrugs. These are chemical modifications of biologically active drugs and are not active themselves. However, the active form of the drug, the metabolite, is liberated in the body by biotransformation. Prodrugs may possess better water solubility, be more stable, have a less objectionable taste, or give higher blood levels than the parent compound. *(17:366; 24:130)*

72. **(C)** Clorazepate (Tranxene) is rapidly decarboxylated in the acidic stomach to an active metabolite that possesses antiepileptic properties. Enalapril (Vasotec) is hydrolyzed to enalaprilate, which is the active angiotensin-converting enzyme (ACE) inhibitor for hypertension. However, lisinopril (Zestril) does not undergo metabolism, and instead is excreted unchanged in the urine. Other drugs, such as verapamil (Calan) form a large number of metabolites. *(10; 24:130–31)*

73. **(B)** The antipsychotic drug, haloperidol (Haldol) is available in several dosage forms including oral tablets, liquid, and parenteral. The injectable forms are designed for IV use with immediate activity and an elimination half-life of about 14 hours. The IM form has peak concentrations after .3 hours with an elimination half-life of 21 hours. The haloperidol decanoate in sesame oil is intended for sustained activity. It reaches peak concentrations in about 6 days with an elimination half-life of 3 weeks. Other drugs formulated as esters for slow (depot) release include fluphenazine decanoate (Prolixin). *(5:17, 161–62; 17:161)*

74. **(C)** Although it is desirable for certain drugs rapidly metabolized by the liver to bypass absorption into the portal circulation, the value of using the rectal route for this purpose is limited. This is due to the fact that whereas three principal veins drain the blood supply to the rectum, only the middle and inferior hemorrhoidal veins actually bypass the liver. The superior hemorrhoidal vein enters the portal circulation via the inferior mesenteric vein. *(17:155–56; 24:280–81)*

75. **(D)** If an orally administered drug appears in the feces, it might be desirable to determine whether this is the result of incomplete absorption or secretion of the drug into the GI tract via biliary excretion. The clinical significance of biliary excretion or enterohepatic cycling of the drug depends on the fraction of the dose excreted in the bile. By administering the drug parenterally, this fraction can be determined. *(15:168; 17:392)*

76. **(A)** The "blood–brain barrier" appears to behave as a lipoid membrane toward foreign compounds. This barrier may be due to a sheath of glial cells surrounding the capillaries of the brain. The rate of entry of a drug can often be correlated with its oil/water partition coefficient and degree of ionization at plasma pH. *(17:291)*

77. **(A)** Cephalosporins are mainly eliminated from the body by renal excretion. The greater the degree of protein binding, the slower the excretion clearance, thus increasing both the body half-life and the elimination half-life. For example, ceftriaxone is 96% protein bound with a half-life of 8 hours and a clearance of 10 mL/min/1.73 m^2. Cefazolin, which is 70% protein bound, has values of 2.7 hr half-life and 56 mL/min/1.73 m^2 clearance. Since protein-bound drug is less able to diffuse through membranes, the elimination through the kidneys will be less, resulting in a longer half-life. *(17:303)*

78. **(A)** Drugs that can be dialyzed include those that are water-soluble and have relatively low molecular weights. Protein-bound drugs that do not readily diffuse through membranes thus will dialyze slowly. A high volume of distribution indicates that the drug is distributed throughout the body or concentrated in certain organs or tissue and thus not available for fast dialysis. *(17:556)*

79. **(E)** All of these drug characteristics are probably undesirable for a sustained-release dosage form. For a successful sustained-release product, the rate-limiting step must be drug release from the dosage form. If the drug has poor solubility, the dissolution rate may become the rate-limiting step. In this case, the patient may not absorb the quantity of drug needed for desired blood levels and therapeutic activity. Drugs with very long half-lives do not need to be formulated for sustained-release, because they will be biologically present for a long period of time. Intelligent dosing, such as every 12 or 24 hours (depending on the actual half-life), ensures sufficient blood levels. The release of drug from most sustained-release dosage forms is subject to individual biological variations. This patient-to-patient variability may result in the release of two or three times the normal dose in a particular patient. Therefore, a dangerous situation may develop if very large amounts of very potent drugs are formulated as sustained-release products. Thus, drugs that possess high therapeutic indexes are desired. Conversely, a drug with a very short half-life is also a poor candidate for sustained release. A very large amount of drug would have to be included in the dosage form, and rapid release of the drug would be necessary. *(17:232; 24:230–32)*

80. **(C)** The lag time is the time delay between drug administration and the beginning of absorption, usually reflected in the appearance of drug in the plasma. Enteric-coated tablets are intended for disintegration in the small intestine, which could slow absorption for several hours. Both delayed-release and sustained-release tablets are usually designed to begin some drug release shortly after administration. *(15:36)*

81. **(E)** All three routes of administration are used for delivering nitroglycerin. In each case the drug enters systemic blood before significant loss occurs due to the first-pass effect. *(17:320)*

82. **(A)** Since there are no data based on calculated AUCs after intravenous bolus dosing, the absolute bioavailability of Company A's drug cannot be determined. The relative bioavailability can be determined by

$$\text{Relative bioavailability} = \frac{\text{AUC (Company A)}}{\text{AUC (Company B)}}$$

$$= \frac{80 \text{ mcg hr/mL}}{76 \text{ mcg hr/mL}} = 1.05$$

As shown above, it is possible for the experimental drug to have greater bioavailability than the standard or control drug. *(17:250–52)*

83. **(A)** Linear pharmacokinetics indicate first-order rates, thus

$$\text{Half-life} = 0.693/k$$

$$8 \text{ hr} = \frac{0.693}{k}$$

$$8k = 0.693$$

$$k = .087/\text{hr} \qquad (17:335)$$

CHAPTER 6

Pharmaceutical Care

Pharmaceutical care is a term many have found difficult to define. A U.S. Supreme Court Justice, when challenged to define pornography, is said to have replied that although he could not define it, he was sure he could recognize it if he saw it. One definition of pharmaceutical care states that it is "the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life." [1] With this example in mind, we have assembled a series of questions for this chapter that we believe fall under the category of Pharmaceutical Care—that is, they relate to patients, diseases, drugs, information, and pharmacists.

[1] C. D. Hepler and L. M. Strand. *Opportunities and responsibilities in pharmaceutical care.* Amer J Hosp Pharm 47:533–543, 1990.

Questions

DIRECTIONS (Questions 1 through 210): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

1. Which of the following drugs is generally considered a drug of choice in treating status epilepticus?

(A) phenobarbital
(B) ethosuximide (Zarontin)
(C) buspirone (BuSpar)
(D) lorazepam (Ativan)
(E) phenytoin (Dilantin)

2. The use of which of the following drugs has resulted in the development of a syndrome strongly resembling systemic lupus erythematosus (SLE)?

(A) pirbuterol (Maxair)
(B) lamotrigine (Lamictal)
(C) hydralazine (Apresoline)
(D) methyldopa (Aldomet)
(E) diazoxide (Hyperstat IV)

3. The antiparkinson effect of levodopa may be inhibited by

(A) niacinamide
(B) d-alpha tocopherol
(C) pyridoxine HCl
(D) dihydrotachysterol
(E) riboflavin

4. In terms of its major pharmacological effect, atenolol (Tenormin) is most similar to

(A) isoproterenol (Isuprel)
(B) metaproterenol (Alupent)
(C) fenoldopam (Corlopam)
(D) albuterol (Ventolin)
(E) pindolol (Visken)

5. The pharmacist should advise a patient that he or she may experience dizziness and syncope after taking the first dose of

(A) trandolapril (Mavik)
(B) fosinopril (Monopril)
(C) clonidine (Catapres)
(D) terazosin (Hytrin)
(E) labetalol (Trandate)

6. A common measure in assessing the degree of immunodeficiency in acquired immunodeficiency syndrome (AIDS) patients is the determination of levels of

(A) CD_4 cells
(B) *Pneumocystis carinii* organisms
(C) leukocytes
(D) serotonin
(E) erythrocyte sedimentation rate (ESR)

7. In the treatment of acute hypertensive crisis, nitroprusside (Nitropress) is administered

(A) sublingually
(B) subcutaneously
(C) as an IV bolus
(D) transdermally
(E) as an IV infusion

8. Which of the following drugs should NOT be used to treat bacteremias?

(A) dirithromycin
(B) erythromycin lactobionate
(C) clarithromycin
(D) azithromycin
(E) amoxicillin

9. An IV admixture should not be prepared between tobramycin sulfate (Nebcin) and

I. phenytoin sodium
II. ticarcillin sodium
III. acetazolamide

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

10. Which of the following agents has NOT been suggested as an agent to use to eradicate *Helicobacter pylori* from the gastrointestinal (GI) tract?

(A) clarithromycin
(B) bismuth subsalicylate
(C) metronidazole
(D) itraconazole
(E) tetracycline

11. Cholestyramine (Questran) will probably interfere with the GI absorption of

I. warfarin
II. levothyroxine
III. pyridoxine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

12. A clinically noticeable drug interaction resulting from the displacement of drug A by drug B from common plasma protein–binding sites is most often seen when

(A) drug A has a high association constant (K) for binding the protein
(B) drug B has a low association constant (K) for binding the protein and is given in large doses
(C) drug B has a high association constant (K) for binding the protein and is given in large doses
(D) drug B is more toxic than drug A
(E) drug B is rapidly absorbed

13. Dalteparin (Fragmin) should be administered

(A) transdermally
(B) subcutaneously
(C) by IV bolus
(D) intramuscularly
(E) by IV infusion

14. Which of the following agents would be likely to affect the platelet aggregation of an adult?

I. dipyridamole
II. clopidogrel
III. acetylsalicylic acid

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15. A microorganism that is particularly dangerous to the eye is

(A) *Streptococcus thermophilus*
(B) *Bacillus subtilis*
(C) *Pseudomonas aeruginosa*
(D) *Aspergillus niger*
(E) *Escherichia coli*

16. Purulent boils in the ear are usually caused by species of

(A) *Streptococcus*
(B) *Candida*
(C) *Pseudomonas*
(D) *Aspergillus*
(E) *Staphylococcus*

17. The treatment of choice for herpes simplex infection of the eyelids and conjunctiva is

(A) idoxuridine (Stoxil)
(B) bacitracin (Baciguent)
(C) amphotericin B (Fungizone)
(D) metronidazole (Flagyl)
(E) mupirocin (Bactroban)

18. Which of the following antifungal agents is ineffective against *Candida* organisms?

(A) miconazole (Micatin)
(B) clotrimazole (Lotrimin)
(C) ciclopirox olamine (Loprox)
(D) tolnaftate (Tinactin)
(E) nystatin (Mycostatin)

19. Permethrin (Nix) has been shown to be of clinical use in the management of

(A) venereal warts
(B) scabies
(C) acne
(D) ringworm infections of the skin
(E) psoriasis

20. Important potential complications of corticosteroid therapy include

I. dissemination of local infection
II. masking symptoms of an infection
III. increased susceptibility to infection

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

21. The primary advantage of oxaprozin over most other nonsteroidal anti-inflammatory drugs (NSAIDs) is that it

(A) does not interact with warfarin
(B) may be used concomitantly with aspirin
(C) may be given on a once-a-day schedule
(D) has a cytoprotective effect
(E) has essentially no adverse GI effects

22. A major advantage of celecoxib (Celebrex) over most other NSAIDs is that it

(A) has a longer half-life than most
(B) can safely be used in patients who are allergic to aspirin
(C) decreases the production of gastric mucus
(D) causes fewer adverse GI effects
(E) is metabolized to a corticosteroid in the body

23. When dispensing isotretinoin (Accutane) capsules to a 19-year-old female college student with acne, the pharmacist should advise the patient to

I. avoid pregnancy while using the drug
II. discontinue the drug if the acne gets worse
III. increase her exposure to sunlight to help eliminate lesions

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

24. Which of the following best describes the condition known as hypoprothrombinemia?

(A) development of transient ischemic attacks (TIAs)
(B) development of deep vein thromboses (DVTs)
(C) low level of iron in the blood
(D) decrease in the production of red blood cells by the bone marrow
(E) reduced capability for blood to clot

25. The rapid reversal of warfarin-induced hemorrhage can be accomplished by the administration of

I. phytonadione (AquaMEPHYTON)
II. ergocalciferol (Drisdol)
III. dihydrotachysterol (Hytakerol)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

26. A patient complains of a reddish discoloration of his or her urine. Which of the following drugs would most likely produce such an effect?

(A) naratriptan
(B) terbutaline
(C) sulfamethoxazole
(D) phenazopyridine
(E) isoniazid

27. Menotropins (Pergonal, Humegon) is used clinically in the treatment of

(A) ovarian carcinoma
(B) infertility
(C) partial seizures
(D) migraine headache
(E) dysmenorrhea

28. Patients using amiloride (Midamor) tablets should be advised to

I. avoid large quantities of potassium-rich foods
II. take the medication on an empty stomach
III. avoid the use of acetaminophen while using the drug

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

29. The clinical investigation of a new drug consists of four phases. Phase I of the clinical testing involves administering the drug

(A) by select clinicians to healthy volunteers
(B) to animals for toxicity studies
(C) to animals to determine the effectiveness of the drug
(D) by select clinicians to patients suffering from the disease
(E) by general practitioners to patients suffering from the disease

30. Which of the following best describes the common clinical manifestations of hypoparathyroidism?

(A) hypercalcemia and hypochlorhydria
(B) hypocalcemia and hypophosphatemia
(C) hypercalcemia and hypophosphatemia
(D) hypercalcemia and hyperphosphatemia
(E) hypocalcemia and hyperphosphatemia

31. Which of the following is true of raloxifene (Evista)?

(A) It is used to induce ovulation.
(B) It is an H_2-receptor antagonist.
(C) It is used to treat acute migraine headaches.
(D) Patients using the drug should avoid aspirin.
(E) It is used to prevent osteoporosis.

32. A patient who is hypothyroid may have

I. a goiter
II. Hashimoto's disease
III. elevated levels of TSH

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

33. Enuresis refers to

(A) gout
(B) bedwetting
(C) urinary retention
(D) diminished stature
(E) urinary tract infection

34. Which of the following should NOT be used in patients who are allergic to aspirin?

(A) Fiorinal
(B) Darvocet-N
(C) Excedrin PM
(D) Stadol
(E) BuSpar

35. Which of the following phrases best defines the clinical disorder known as hemochromatosis?

(A) a lack of circulating antibodies
(B) spontaneous hemolysis of red blood cells
(C) excessive storage of iron by the body
(D) abnormally shaped red blood cells
(E) absence of pigmentation in circulating red blood cells

36. A reversible cholestatic hepatitis with fever and jaundice has been observed as an adverse drug reaction in patients taking erythromycin

(A) ethylsuccinate (EES)
(B) estolate (Ilosone)
(C) base (E-Mycin tablets)
(D) stearate (Erythrocin Filmtab)
(E) lactobionate

37. Patients about to use metronidazole (Flagyl) should be advised

I. to avoid consumption of alcoholic beverages
II. that their urine may become discolored while using the drug
III. to take the drug on an empty stomach

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

38. Lansoprazole (Prevacid) inhibits gastric acid secretion as a result of

(A) H_2-receptor antagonism
(B) proton pump inhibition
(C) anticholinergic action
(D) buffer generation
(E) *Helicobacter pylori* inhibition

39. Patients with chronic inflammatory bowel disease who are allergic to sulfa drugs may safely use

I. Azulfidine
II. Dipentum
III. Pentasa

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

40. Which of the following is true of metoclopramide (Reglan)?

I. It is an anticholinergic agent.
II. It may cause agranulocytosis.
III. It is used in the treatment of GERD.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

41. Which of the following agents are indicated for the treatment of the human immunodeficiency virus (HIV) infection?

I. ifosfamide
II. cytarabine
III. didanosine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

42. A patient complains about a headache that is localized in the periorbital area and seems to be worse in the morning than in the after-

noon. Which of the following would be the best way to characterize the headache?

(A) tumorigenic
(B) vascular–migraine
(C) muscle contraction
(D) eye strain
(E) sinus

43. The purpose of combination drug treatment in tuberculosis is to

I. increase the tuberculostatic effects of the drugs
II. delay the emergence of drug resistance
III. reduce the duration of therapy

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

44. Patients taking the antitubercular drug rifampin (Rifadin) should be told that the drug

(A) may cause diarrhea
(B) may cause them to sunburn more easily
(C) may impart an orange color to their urine and sweat
(D) may produce nausea and vomiting if used with alcohol
(E) should be swallowed whole (ie, not chewed) to prevent staining of the teeth

45. A patient using ticlopidine (Ticlid) should be monitored for the development of

(A) pseudomembranous enterocolitis
(B) renal toxicity
(C) abnormal bleeding
(D) respiratory impairment
(E) hyperpyrexia

46. A penicillin derivative that has significantly greater activity against *Pseudomonas* than amoxicillin is

(A) bacampicillin (Spectrobid)
(B) dicloxacillin (Dynapen)
(C) nafcillin (Unipen)
(D) mezlocillin (Mezlin)
(E) oxacillin (Bactocill)

47. Antibiotic-induced pseudomembranous colitis is most commonly treated with

(A) metronidazole (Flagyl)
(B) loperamide (Imodium)
(C) attapulgite (Kaopectate)
(D) gentamicin (Garamycin)
(E) sulfasalazine (Azulfidine)

48. Cushing syndrome is a condition associated with

(A) hyperthyroidism
(B) excessive accumulation of copper in the body
(C) hypothyroidism
(D) adrenal hyperplasia
(E) polyuria

49. The aminoglycoside antibiotics are

I. metabolized by the liver
II. suitable for long-term treatment of chronic urinary tract infections (UTIs)
III. bactericidal for a wide range of gram-positive and gram-negative microorganisms

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

50. Which of the following is an infectious complication associated with HIV?

I. *Mycobacterium avium* complex
II. oral candidiasis
III. *Pneumocystis carinii* pneumonia

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

51. A disadvantage of using cromolyn sodium in asthma treatment is

(A) that it is ineffective in treating acute attacks
(B) its nephrotoxicity
(C) that it may cause tachyphylaxis
(D) its brief duration of action
(E) that it causes cardiac stimulation

52. An asthmatic patient who is currently taking terbutaline (Brethine) 5-mg tablets (TID), prednisone 5 mg (QID), and Proventil Inhaler (PRN) presents you with a prescription for Vanceril Inhaler. The directions on the prescription are "one inhalation PRN breathing difficulty." The most appropriate action for you to take is to

(A) fill the prescription
(B) advise the prescriber to discontinue the terbutaline tablets
(C) inform the prescriber that the prednisone should be discontinued before Vanceril therapy is initiated
(D) advise the patient to stop using the Proventil Inhaler
(E) inform the prescriber that Vanceril (beclomethasone) is a prophylactic drug that should be taken regularly

53. A common name for the antidiuretic hormone elaborated by the posterior pituitary gland is

(A) ACTH
(B) renin
(C) luteotropic hormone
(D) vasopressin
(E) secretin

54. Which of the following is true of lithium carbonate (Eskalith, Lithane)?

I. It is used to treat manic depressive illness.
II. Baseline liver function tests must be performed prior to initiating therapy.
III. It should not be used within one hour of pyridoxine (B_6).

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

55. Patients on lithium carbonate therapy should be advised

(A) not to restrict their normal dietary salt intake
(B) to stop taking the drug if they experience drowsiness
(C) to limit water intake
(D) to take the medication as a single dose in the morning
(E) not to take the drug with food

56. Hemolytic anemia due to erythrocyte deficiency of glucose-6-phosphate dehydrogenase (G6PD) would most likely be precipitated by

(A) phenytoin (Dilantin)
(B) primaquine
(C) isoniazid (INH)
(D) pyridoxine HCl
(E) gentamicin (Garamycin)

57. The anticoagulant action of heparin is quantified by using the

(A) complete blood count
(B) activated partial thromboplastin time (APTT)
(C) prothrombin time (PT)
(D) International Normalization Ratio (INR)
(E) antiplatelet clotting time

58. Two hours after receiving the last dose of heparin (9000 units IV), a male patient begins bleeding from the gums after brushing his teeth. What is the most appropriate clinical action?

(A) inject 10 mg of phytonadione (Aqua-MEPHYTON) IV
(B) inject 10 mg of phytonadione (Aqua-MEPHYTON) IM

(C) inject 30 mg of protamine sulfate IM
(D) swab a small amount of epinephrine 1:100 onto the gum tissue to produce local vasoconstriction
(E) discontinue heparin administration and wait for the anticoagulant effect to subside

59. A 40-year-old woman with a history of deep-vein thrombosis (DVT) is stabilized on 5 mg of warfarin daily. The administration of which of the following medications to this patient would increase the risk of hemorrhage?

(A) acetaminophen (Tylenol) 650 mg q4h
(B) captopril (Capoten)
(C) Milk of Magnesia 30 mL hs
(D) cimetidine (Tagamet) 300 mg QID
(E) diazepam (Valium) 5 mg QID

60. A blood sugar concentration within normal limits for a fasting adult is

(A) 100 mg/dL
(B) 200 mg/dL
(C) 300 mg/dL
(D) 400 mg/dL
(E) 500 mg/dL

61. Which of the following agents can interfere with the diagnosis of pernicious anemia?

(A) folic acid
(B) pyridoxine
(C) thiamine
(D) ascorbic acid
(E) phytonadione

62. Which of the following is (are) true of clomiphene citrate (Clomid)?

I. used to treat polycystic ovary disease
II. has antiestrogenic effects
III. promotes the secretion of gonadotropin-releasing hormone

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

63. Which of the following are appropriate agents to administer in treating severe hyperkalemia?

I. calcium gluconate
II. insulin
III. sodium polystyrene sulfonate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

64. A patient who has recently suffered a myocardial infarction (MI) will most likely have elevated serum levels of

(A) catechol-*O*-methyltransferase
(B) amylase
(C) acid phosphatase
(D) creatine kinase (CK)
(E) alkaline phosphatase

65. The hematocrit (HCT) measures the

(A) total number of blood cells per volume of blood
(B) weight of red blood cells per volume of blood
(C) number of red blood cells per volume of blood
(D) weight of hemoglobin per volume of blood
(E) percentage of red blood cells per volume of blood

66. Which of the following is NOT a white blood cell (or leukocyte)?

(A) basophil
(B) lymphocyte
(C) monocyte
(D) eosinophil
(E) reticulocyte

67. The best product to use in a seven-year-old child with otitis media (and no history of drug allergies) is

(A) tetracycline HCl
(B) gentamicin sulfate
(C) trimethoprim–sulfamethoxazole
(D) vancomycin
(E) bacitracin

68. Which of the following agents is (are) capable of producing an antipyretic action in humans?

I. acetaminophen
II. acetylsalicylic acid
III. ibuprofen

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

69. Patients receiving clozapine (Clozaril) must be monitored for the development of

(A) pseudomembranous enterocolitis
(B) agranulocytosis
(C) hyperlipidemia
(D) congestive heart failure
(E) hepatocellular necrosis

70. Zollinger–Ellison syndrome can be best treated with

(A) lithium products
(B) antimetabolites
(C) cytoprotectants
(D) HMG-CoA reductase inhibitors
(E) proton pump inhibitors

71. Intermittent IV therapy is used to

I. avoid anticipated or potential stability or compatibility problems
II. reduce the potential of thrombophlebitis
III. promote better diffusion of some drugs into the tissues because of a greater concentration gradient

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

72. Which of the following drugs are classified as mitotic inhibitors?

I. methotrexate
II. zalcitabine
III. vinblastine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

73. Which of the following statements is (are) true of aspirin?

I. High doses of aspirin may decrease plasma uric acid levels.
II. Low doses of aspirin may increase plasma uric acid levels.
III. Aspirin should not be used during the last trimester of pregnancy.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

74. Which of the following reference sources would be appropriate to use to find an American equivalent of a British drug?

(A) *Martindale's Extra Pharmacopoeia*
(B) *The Royal Compendium*
(C) *USPDI*
(D) *AHFS Drug Information*
(E) *Facts and Comparisons*

75. Which of the following is (are) classified as a debriding agent?

I. collagenase
II. fibrinolysin
III. lipase

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

76. Which of the following cephalosporins would be appropriate to use in treating a CNS infection?

I. cefotetan (Cefotan)
II. ceftriaxone (Rocephin)
III. cefotaxime (Claforan)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

77. Generally, the presence of impaired renal function or overt renal failure in a patient reduces the requirement(s) for

I. all drugs
II. drugs that are reabsorbed from the kidney tubules
III. drugs that are directly excreted or whose active metabolites are excreted by the kidneys

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

78. A patient who is a slow acetylator of isoniazid is characterized by

(A) a predisposition to beta-lactam hypersensitivity
(B) slow metabolism but normal therapeutic response
(C) slow metabolism and reduced therapeutic response
(D) slow metabolism and enhanced therapeutic response
(E) peripheral neuropathy that is resistant to pyridoxine therapy

79. A patient with fungal blepharitis should be treated with

(A) idoxuridine (Herplex)
(B) natamycin (Natacyn)
(C) gentamicin (Garamycin)
(D) cyclopentolate (Cyclogyl)
(E) sulfacetamide sodium (Bleph-10)

80. Patients receiving doses of plantago (psyllium) should be advised to

(A) take the product with lots of water
(B) take the medication with food
(C) mix the product with water and let stand for 30 minutes before administering
(D) avoid driving or operating heavy machinery within 1 hour of taking the medication
(E) avoid dairy products

81. The cation most prevalent in the extracellular fluid of the human body is

(A) potassium
(B) chloride
(C) phosphate
(D) sodium
(E) magnesium

82. A child who swallows an overdose of a fluoride-containing product should be treated with a gastric lavage containing

(A) EDTA
(B) sodium chloride
(C) castor oil
(D) neostigmine bromide
(E) calcium hydroxide solution

83. The blood concentration of which of the following cations would normally rise if a patient became hypophosphatemic?

(A) phosphorus
(B) magnesium
(C) calcium
(D) iron
(E) potassium

84. Products containing nicotine polacrilex should be avoided in

I. smokers
II. patients with severe angina
III. pregnant women

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

85. Large overdoses of acetaminophen are likely to cause

(A) tinnitis
(B) seizures
(C) hepatic necrosis
(D) renal tubular necrosis
(E) pseudomembranous enterocolitis

86. An adult patient who ingested 30 acetaminophen tablets (325 mg/tab) 6 hours ago should be treated with/by

(A) EDTA infusion
(B) ipecac syrup
(C) activated charcoal
(D) *N*-acetylcysteine
(E) probenecid

87. Which of the following is (are) a correct description of sulfasalazine (Azulfidine)?

I. used in treating ulcerative colitis and regional enteritis
II. poorly absorbed from the GI tract
III. available as oral tablets and IM injection

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

88. Asthmatic patients with a documented allergy to aspirin should NOT receive

(A) ibuprofen (Motrin)
(B) acetaminophen (Tylenol)
(C) salmeterol (Serevent)
(D) pentazocine (Talwin)
(E) albuterol (Proventil)

89. Nonselective beta-adrenergic blocking agents should be used with caution in patients with

I. asthma
II. type I diabetes mellitus
III. sinus bradycardia

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

90. Which of the following agents would be most dangerous to use in a patient already receiving high doses of gentamicin?

(A) tetracycline HCl
(B) torsemide (Demadex)
(C) fosinopril (Monopril)
(D) HydroDIURIL
(E) temazepam (Restoril)

91. A patient arriving in a hospital emergency room suffering from severe hypertensive crisis would most likely be treated initially with

(A) guanethidine (Ismelin)
(B) methyldopa (Aldomet)
(C) nitroprusside sodium (Nitropress)
(D) minoxidil (Loniten)
(E) benazepril (Lotensin)

92. A patient with left ventricular failure is likely to exhibit

I. peripheral edema
II. dyspnea
III. orthopnea

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

93. A value of less than 200 mg/dL is desirable when measuring a patient's level of

I. total cholesterol
II. triglyceride
III. LDL cholesterol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

94. Food containing tyramine should NOT be part of the diet of patients taking

(A) phenelzine (Nardil)
(B) hydralazine (Apresoline)
(C) cefixime (Suprax)
(D) methyldopa (Aldomet)
(E) clonidine (Catapres)

95. Which of the following symptoms would be LEAST likely to be exhibited by a patient suffering from diabetes mellitus?

(A) weight loss
(B) excessive thirst
(C) urinary retention
(D) glycosuria
(E) weakness

96. Hyperphosphatemia assocated with hypoparathyroidism can be effectively treated by administering

(A) calcium salts
(B) potassium chloride
(C) ascorbic acid
(D) dextrose
(E) mannitol

97. Which of the following therapeutic agents is specifically contraindicated for use in patients who have bronchial asthma?

(A) sotalol (Betapace)
(B) quinapril (Accupril)
(C) procainamide (Pronestyl)
(D) digoxin
(E) tolcapone (Tasmar)

98. Which of the following are uses for bupropion HCl?

I. antidepressant
II. smoking deterrent
III. antihypertensive

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

99. Which of the following potential adverse effects of the phenothiazines is thought to be irreversible?

(A) akathisia
(B) muscular rigidity
(C) tardive dyskinesia
(D) orthostatic hypotension
(E) tremor

100. Which of the following agents can be classified as an antagonist of angiotensin II receptors?

I. labetalol (Trandate)
II. trandolapril (Mavik)
III. irbesartan (Avapro)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

101. The antiemetic effect of which of the following drugs is the result of increased gastric emptying?

(A) promethazine (Phenergan)
(B) benzotropine (Cogentin)
(C) olsalazine (Dipentum)
(D) baclofen (Lioresal)
(E) metoclopramide (Reglan)

102. Which of the following agents is (are) indicated for the treatment of Parkinson's disease?

I. amantadine (Symmetrel)
II. bromocriptine (Parlodel)
III. selegiline (Eldepryl)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

103. Patients diagnosed with Alzheimer's disease may be treated with

I. gabapentin (Neurontin)
II. donepezil (Aricept)
III. tacrine (Cognex)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

104. Patients receiving metformin (Glucophage) for the treatment of diabetes mellitus should be monitored for the development of

(A) agranulocytosis
(B) hearing loss
(C) ankylosing spondylitis
(D) respiratory alkalosis
(E) lactic acidosis

105. A pharmacist tells a young mother about clinical (fever) thermometers and advises her to report to the pediatrician both the degrees of temperature and whether the temperature was taken rectally or orally. This is good advice because

(A) oral temperature is about 1° Fahrenheit (1° F) higher than rectal temperature
(B) oral thermometers have degree calibrations that differ from rectal thermometers
(C) the normal temperature (marked with an arrow) is 99.6° F on the rectal thermometer and 98.6° F on the oral one
(D) rectal temperature is about 1° F higher than oral temperature
(E) the bulb on the rectal thermometer is round and contains more mercury than in the thin cylindrical bulb of the oral thermometer

106. The best emergency advice that a pharmacist could give an individual who has just suffered a minor burn is to

(A) apply butter to the burn
(B) immerse the burned area in warm water followed by cold water
(C) contact a physician immediately
(D) immerse the burned area in cold water
(E) apply Vaseline to the burn

107. A patient who is to use montelukast sodium (Singulair) should be advised to

I. use one inhalation at the onset of an asthma attack
II. stop using bronchodilator drugs
III. take the drug daily as prescribed, even when they are asymptomatic

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

108. Which of the following is an effect associated with the use of pilocarpine ophthalmic products?

I. mydriasis
II. cholinergic agonism
III. pupillary constriction

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

109. Patients using amiodarone (Cordarone) should be monitored for

I. pulmonary toxicity
II. visual changes
III. intestinal polyp formation

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

110. Which of the following should NOT be administered to a patient being treated for narrow-angle glaucoma?

(A) latanoprost
(B) dorzolamide
(C) homatropine
(D) phospholine iodide
(E) carbachol

111. Advantage(s) of levobunolol (Betagan) over pilocarpine for the reduction of elevated intraocular pressure include(s)

I. longer duration of activity
II. little or no effect on visual acuity or accommodation
III. little or no effect on pupil size

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

112. Which of the following is true of GoLYTELY?

I. contains bisacodyl
II. ingredients are enzymatically converted to active form in colon
III. must be reconstituted before use

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

113. Which of the following is true of orlistat (Xenical)

I. It inhibits absorption of dietary fats.
II. Patient should consume a diet that contains about 30% of calories from fat.
III. Not more than one dose should be taken in any 24-hour period.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

114. Scabies is a contagious skin disease caused by a

(A) herpes virus
(B) fungus
(C) flea
(D) mite
(E) tick

115. Psoriasis is characterized by

(A) granulomatous lesions
(B) silvery gray scales
(C) small, water-filled blisters
(D) small red vesicles
(E) pustules

116. A patient with a documented allergy to morphine should NOT receive

(A) codeine
(B) meperidine (Demerol)
(C) pentazocine (Talwin)
(D) methadone (Dolophine)
(E) butorphanol (Stadol)

117. Which of the following agents are classified as immunosuppressive agents?

I. fluconazole
II. tacrolimus
III. cyclosporine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

118. Patients using alendronate should be advised to

I. lie down for 30 minutes after taking each dose
II. take each dose with food
III. take each dose first thing in the morning

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

119. Which of the following antihypertensive agents is available as a transdermal dosage form?

(A) penbutolol
(B) guanethidine
(C) clonidine
(D) lisinopril
(E) terazosin

120. Ideally, an antacid should raise the pH of the stomach contents to a value of approximately

(A) 5.5
(B) 3.5
(C) 6.5
(D) 7.5
(E) 9.5

121. Which of the following is an indication for the use of epoetin alfa (Epogen, Procrit)?

I. treatment of anemia associated with chronic renal failure
II. treatment of anemia associated with cancer chemotherapy
III. treatment of severe chronic neutropenia

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

122. A patient with Parkinson's disease has been receiving levodopa (1 g four times daily) with fairly good response but excessive side effects. The patient's physician wishes to switch from levodopa to Sinemet. An appropriate dose of Sinemet would be

(A) one 10/100 tablet daily
(B) one 10/100 tablet four times daily
(C) one 25/250 tablet daily
(D) four 25/250 tablets four times daily
(E) one 25/250 tablet four times daily

123. A patient is being treated effectively for Parkinson's disease with levodopa. Suddenly, all therapeutic benefits of the levodopa are lost and the adverse effects also disappear. Which one of the following facts obtained from a medication history would most likely explain this phenomenon?

(A) The patient has forgotten to take two doses of the medication.
(B) The patient began using an OTC multivitamin product.
(C) Selegiline was added to the drug regimen for 1 week.
(D) Antacids were taken occasionally.
(E) The patient regularly consumed alcoholic beverages.

124. Patients receiving miglitol (Glyset) should be advised to

I. expect some flatulence and diarrhea to occur
II. take each dose on an empty stomach
III. expect to use a higher insulin dose while on the medication

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

125. Which of the following drugs is associated with the "gray-baby syndrome" in infants?

(A) demeclocycline
(B) ciprofloxacin
(C) chloramphenicol
(D) amphotericin B
(E) kanamycin

126. Stomatitis refers to an inflammation of the

(A) eyelid
(B) oral mucosa
(C) stoma formed by intestinal surgery
(D) stomach wall
(E) tongue

127. An obese individual would most likely be suffering from

(A) polymorphism
(B) hypotonia
(C) nystagmus
(D) polyhydrosis
(E) polyphagia

128. Hypertrophy refers to

(A) an abnormal increase in the number of cells in a tissue
(B) an enlargement or overgrowth of an organ
(C) excessive perspiration
(D) increased motor activity
(E) excessive sensitivity of the skin

129. Which of the following is true of misoprostol?

I. in pregnancy category X
II. a prostaglandin analog
III. available in inhalation form

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

130. All of the following terms relate directly to body muscles EXCEPT

(A) myalgia
(B) myopia
(C) myoclonus
(D) myocardia
(E) myositis

131. Patients taking lithium products should be advised to

I. reduce their salt intake
II. drink 8 to 12 glasses of water each day
III. stop taking the medication if tremors or diarrhea occur

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

132. Stenosis refers to

(A) hardening of tissues with a loss of elasticity
(B) inflammation of the sternum
(C) inflammation of the vertebrae
(D) stoppage of blood flow to an area of the body
(E) narrowing or stricture of a duct or canal

133. When dispensing methylphenidate, the patient should be told

I. to take the medication at bedtime
II. that it may cause weight gain
III. that it may cause palpitations

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

134. A 60-year-old patient with congestive heart failure who has been stabilized for 3 months on digoxin, furosemide, and potassium chloride is gradually placed on the following additional medicines. Which of these drugs is most likely to cause a problem?

(A) quinidine
(B) temazepam (Restoril)
(C) meperidine HCl (Demerol)
(D) aspirin
(E) nitroglycerin

135. Which of the following diuretics would be LEAST likely to produce a hypokalemic effect in a patient?

(A) ethacrynic acid (Edecrin)
(B) torsemide (Demadex)
(C) chlorthalidone (Hygroton)
(D) furosemide (Lasix)
(E) amiloride (Midamor)

136. Mannitol is used therapeutically primarily as a (an)

(A) cardiac stimulant
(B) sucrose substitute
(C) antianginal agent
(D) osmotic diuretic
(E) plasma expander

137. Which of the following drugs are indicated for the treatment of enuresis?

I. imipramine (Tofranil)
II. desmopressin (DDAVP)
III. isosorbide (Ismotic)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

138. In monitoring acute MI patients who are using warfarin sodium (Coumadin), their INR should ideally be between

(A) 0.1–0.2
(B) 2–3
(C) 4–5.5
(D) 9–14
(E) 80–120

139. Patients using phenytoin should be monitored for the development of

I. pseudomembranous enterocolitis
II. nystagmus
III. gingival hyperplasia

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

140. A potential problem of using nalbuphine (Nubain) in a patient who is dependent on codeine is

(A) additive respiratory depression
(B) increased tolerance to codeine
(C) precipitation of narcotic withdrawal symptoms
(D) impaired renal excretion of codeine
(E) excessive CNS stimulation

141. The advantage of nalmefene (Revex) over naloxone (Narcan) is

(A) its longer duration of action
(B) it is not addictive
(C) its availability as sublingual tablets
(D) that it does not have to be reconstituted immediately before use
(E) its more rapid onset of action

142. Which of the following would be appropriate for the treatment of candidal vulvovaginitis?

I. miconazole
II. nystatin
III. clotrimazole

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

143. Polycythemia refers to an elevated number of

(A) reticulocytes
(B) leukocytes
(C) thrombocytes
(D) erythrocytes
(E) granulocytes

144. In treating heparin toxicity with protamine sulfate, caution must be exercised to avoid using more protamine than is necessary because

(A) protamine sulfate is toxic in small amounts
(B) protamine sulfate is a cardiotoxic agent
(C) the production of endogenous heparin will be stimulated
(D) the strongly basic protamine will produce alkalosis
(E) protamine sulfate is also an anticoagulant

145. Which of the following agents has the longest duration of effect as a bronchodilator?

(A) isoetharine
(B) albuterol
(C) salmeterol
(D) terbutaline
(E) bitolterol

146. Which of the following anticoagulants would be the best choice for use in a pregnant patient near the anticipated time of delivery?

(A) ticlopidine (Ticlid)
(B) heparin
(C) aspirin
(D) warfarin (Coumadin, Panwarfin)
(E) dipyridamole (Persantine)

147. The use of sumatriptan (Imitrex) is contraindicated in patients

I. with angina pectoris
II. using MAO inhibitors
III. who have received an ergotamine derivative within the past 24 hours

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

148. The most likely causative organism in an acute uncomplicated urinary tract infection is

(A) *E. coli*
(B) *Staph. aureus*
(C) *Candida albicans*
(D) *Staph. epidermidis*
(E) *H. influenza*

149. The Schilling test is useful for the detection of pernicious anemia. This test utilizes orally administered, radiolabled

(A) folic acid
(B) intrinsic factor
(C) iron
(D) vitamin B_{12}
(E) pyridoxine

150. Lipodystrophy experienced by patients using insulin can be avoided by recommending

(A) the use of longer-acting insulin
(B) the use of shorter-acting insulin
(C) the rotation of injection sites
(D) the use of protamine-containing insulins
(E) the avoidance of protamine-containing insulins

151. Insulin lispro (Humalog) is generally administered

(A) one hour after the morning meal
(B) one hour after dinner
(C) at bedtime
(D) 15 minutes before a meal
(E) in a commercial mixture with NPH insulin

152. Which of the following insulins would be expected to exert the longest duration of action?

(A) Semilente
(B) NPH
(C) protamine zinc
(D) Lente
(E) Regular

153. The most common cause of diabetic ketoacidosis and coma in the diagnosed and treated diabetic is

(A) glucose overload
(B) excessive physical activity
(C) electrolyte depletion
(D) use of the wrong type of insulin
(E) failure of the patient to use insulin properly

154. Patients receiving analgesic doses of morphine should be monitored for the development of

I. diarrhea
II. respiratory depression
III. nausea

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

155. Which of the following is true of combination oral contraceptive products?

I. They suppress FSH and LH.
II. They decrease viscosity of cervical mucus.
III. Most contain medroxyprogesterone and ethinyl estradiol.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

156. Which one of the following benzodiazepines would be preferred as an anxiolytic drug for an elderly patient with a history of cirrhosis?

(A) chlordiazepoxide (Librium)
(B) oxazepam (Serax)
(C) clorazepate (Tranxene)
(D) diazepam (Valium)
(E) prazepam (Centrax)

157. Which of the following drugs is particularly useful for the treatment of acute hypoglycemic reactions when oral or IV administration of glucose is not possible?

(A) insulin lispro
(B) glucocorticoids
(C) glucagon
(D) pancreatin
(E) glimepiride (Amaryl)

158. Doses of 6-mercaptopurine (Purinethol) should be reduced in patients taking allopurinol (Zyloprim) because allopurinol

(A) enhances the absorption of 6-mercaptopurine
(B) inhibits the renal excretion of 6-mercaptopurine
(C) releases 6-mercaptopurine from protein-binding sites
(D) inhibits tubular secretion of 6-mercaptopurine
(E) inhibits the metabolism of 6-mercaptopurine

159. A patient is admitted to the emergency room (ER) with marked hypotension and appears to be in shock. The drug of choice to treat the condition is probably

(A) dobutamine (Dobutrex)
(B) dopamine HCl (Intropin)
(C) epinephrine HCl (Adrenalin)
(D) milrinone (Primacor)
(E) nitroprusside (Nitropres)

160. Which of the following agents is (are) progestin-only oral contraceptive products?

I. Modicon
II. Ovrette
III. Micronor

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

161. The erythrocytes of an iron-deficient patient would be described as

(A) macrocytic and hypochromic
(B) microcytic and hyperchromic
(C) normocytic and hyperchromic
(D) macrocytic and hyperchromic
(E) microcytic and hypochromic

162. Which one of the following is a drug commonly used to treat trigeminal neuralgia (tic doloureux)?

(A) procainamide (Pronestyl)
(B) moexipril (Univasc)
(C) epoprostenol sodium (Flolan)
(D) carbamazepine (Tegretol)
(E) zolpidem (Ambien)

163. Which of the following is (are) NOT typical signs or symptoms of Parkinson's disease?

I. rigidity
II. posture disturbances
III. visual impairment

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

164. Lomotil should NOT be given to patients taking oral clindamycin because

(A) the antimicrobial action of clindamycin will be impaired
(B) aplastic anemia may be more likely to occur
(C) an insoluble complex will be formed
(D) the rate of hydrolytic destruction of clindamycin in the GI tract will increase
(E) toxic effects of clindamycin may be enhanced

165. An advantage of loperamide (Imodium) over diphenoxylate (Lomotil) as an antidiarrheal is the fact that loperamide

(A) does not cause drowsiness or dizziness
(B) has a direct effect on the CNS and therefore works more rapidly than does diphenoxylate
(C) is available in a parenteral form
(D) does not appear to have opiate-like effects
(E) has significant adsorbent action

166. Itraconazole (Sporanox) should NOT be used in patients who are

I. also using theophylline
II. under the age of 16
III. type 1 diabetics

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

167. Side effects of cyclobenzaprine (Flexeril) would be expected to be most similar to the side effects of

(A) methocarbamol (Robaxin)
(B) amitriptyline (Elavil)
(C) diazepam (Valium)
(D) meprobamate (Equanil)
(E) dantrolene (Dantrium)

168. A patient under the influence of crack cocaine is brought to an acute-care facility. The symptoms of cocaine intoxication are most similar to

(A) dextroamphetamine
(B) heroin
(C) ethanol
(D) tetrahydrocannabinol (THC)
(E) morphine

169. The initiation of therapy with which one of the following agents would be LEAST likely to cause therapeutic problems in a patient already taking warfarin (Coumadin)?

(A) metronidazole
(B) acetaminophen
(C) phenytoin
(D) aspirin
(E) cimetidine

170. Which of the following is true of zanamivir (Relenza)?

I. It is indicated for the treatment of AIDS.
II. It is administered orally.
III. The drug is usually taken in a five-day regimen.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

171. A nutritional product is said to contain 14 g of protein, 18 g of carbohydrate, and 10 g of fat in each 100-mL serving. The caloric content of a serving would be

(A) 238 kcal
(B) 198 kcal
(C) 218 kcal
(D) 168 kcal
(E) 378 kcal

172. Patients experiencing toxicity as a result of methotrexate administration should be given

(A) EDTA
(B) sodium bicarbonate
(C) leucovorin calcium
(D) bioflavinoids
(E) para-aminobenzoic acid

173. An electrolyte supplement used to replenish electrolytes lost as a consequence of a diarrheal condition is

(A) Lyphocin
(B) K-Lyte
(C) Isomil
(D) Pedialyte
(E) Kayexalate

174. Parenteral administration of 1 L of 5% dextrose in water provides the patient with approximately how many kilocalories of energy?

(A) 100 to 125 kcal
(B) 170 to 200 kcal
(C) 450 to 500 kcal
(D) 800 to 850 kcal
(E) 1000 kcal

175. Which of the following is true of hepatitis B vaccine?

I. administered intradermally
II. will also protect against hepatitis A
III. must be stored in a refrigerator

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

176. A patient is said to have a significantly elevated PSA level. This could be indicative of

(A) a thyroid tumor
(B) a parathyroid tumor
(C) a prostate tumor
(D) a recent myocardial infarction
(E) poor liver function

177. Which of the following would be (a) good alternative(s) to penicillin V in a pregnant patient allergic to penicillins?

I. erythromycin (Ilotycin)
II. trimethoprim (Trimpex)
III. demeclocycline (Declomycin)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

178. Which one of the following sulfonamides is best suited for topical prophylactic treatment of burns?

(A) sulfacetamide (Sulamyd)
(B) sulfamethoxazole (Gantanol)
(C) sulfisoxazole (Gantrisin)
(D) mafenide (Sulfamylon)
(E) sulfasalazine (Azulfidine)

179. Which of the following drugs would be most appropriate to use for the treatment of an uncomplicated gonorrhea infection in a poorly compliant patient?

(A) ceftriaxone (Rocephin)
(B) pipericillin (Pipracil)
(C) tetracycline (Achromycin V)
(D) clindamycin (Cleocin)
(E) itraconazole (Sporanox)

180. Which of the following drugs used in the treatment of acute gouty arthritis does (do) NOT affect urate metabolism or excretion?

I. allopurinol (Zyloprim)
II. probenecid (Benemid)
III. indomethacin (Indocin)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

181. A pharmacist wishes to dispense cromolyn sodium 4% ophthalmic solution (Crolom) for use by a patient. Which one of the following statements is true of this drug product? This product is usually used to treat

(A) vernal keratoconjunctivitis
(B) herpes simplex keratitis
(C) open-angle glaucoma
(D) bacterial infections
(E) cytomegalovirus (CMV)

182. Thiazides may produce

(A) increased intraocular pressure
(B) hyperkalemia
(C) impaired glucose tolerance
(D) hypernatremia
(E) increased renal excretion of ammonia

183. An important advantage of using dopamine (Intropin) in cardiogenic shock is that dopamine

(A) will not cross the blood–brain barrier and cause CNS effects
(B) has no effects on alpha and beta receptors
(C) can be given orally
(D) will not increase blood pressure
(E) produces dose-dependent increases in cardiac output and renal perfusion

184. A patient is experiencing signs of acute chlordiazepoxide (Librium) toxicity after having consumed approximately 15 doses in a suicide attempt. An appropriate agent to administer is

(A) naloxone (Narcan)
(B) flumazenil (Romazicon)
(C) lorazepam (Ativan)
(D) naltrexone (ReVia)
(E) physostigmine (Antilirium)

185. A male patient who has been stabilized on 300 mg of Dilantin Kapseals once daily is having difficulty swallowing capsules. His physician writes a new prescription for Dilantin suspension 300 mg once daily. This change is likely to

(A) reduce the phenytoin level because of decreased bioavailability from the suspension
(B) increase the phenytoin level because of increased bioavailability from the suspension
(C) have no impact on the phenytoin level
(D) decrease the phenytoin level because the 300-mg dose of suspension contains less of the active form of the drug
(E) increase the phenytoin level because the 300-mg dose of suspension contains more of the active form of the drug

186. A terminally ill hospice patient is experiencing severe pain associated with metastatic colon cancer. Which of the following would be an appropriate regimen to treat his pain?

(A) morphine sulfate PO, 15 mg prn pain
(B) codeine sulfate 30 mg PO qid
(C) Duragesic-50 applied q72h
(D) meperidine 50 mg PO qid
(E) acetaminophen 500 mg PO q4h

187. A patient for whom you dispensed a new prescription for amitriptyline (Elavil 25 mg TID) 4 days ago returns to your pharmacy and complains that the drug is causing drowsiness, dry mouth, and that the drug has not improved symptoms of depression. The pharmacist should

(A) inform the prescribing physician that the drug is not effective in this patient
(B) inform the prescribing physician that an anticholinergic agent must be prescribed for this patient
(C) explain to the patient that these are expected effects of early treatment of the drug
(D) contact the prescribing physician and report the adverse effects experienced by the patient
(E) question the patient about apparent noncompliant behavior

188. Patients who are about to use metronidazole (Flagyl) should be advised that

I. the drug should be taken on an empty stomach
II. they should avoid alcohol while using the medication
III. their urine will be discolored by the drug

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

189. A male diabetic patient reports that he is planning a 4-week trip to Europe and will not have continued access to a refrigerator in which to store insulin. What information would you give him?

(A) Store the insulin in a small styrofoam box that can be kept cold with several ice cubes.
(B) Be sure that insulin is available wherever you travel and purchase a fresh vial at least every third day.
(C) Increase your insulin dose by 10% to compensate for any deterioration.
(D) The insulin will remain stable at room temperature during the time period in which a single vial will be used.
(E) See your doctor to prescribe a mixture of insulins that will be more stable.

190. Which of the following are true of isotretinoin (Accutane)?

I. vitamin D derivative
II. likely to cause cheilitis
III. pregnancy category X

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

191. Peripheral veins are seldom used for the administration of total parenteral nutrition (TPN) fluids because

(A) TPN fluids tend to infiltrate surrounding tissue
(B) the blood flow in peripheral vessels is not great enough to protect the peripheral vessels from irritation
(C) large-bore needles must be used
(D) the hypotonic solution causes local hemolysis
(E) the vessels are easily occluded

192. The use of angiotensin-converting enzyme (ACE) inhibitors is associated with

I. chronic cough
II. angioedema
III. pseudomembranous enterocolitis

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

193. A patient who began using Procardia XL a week ago calls to complain of the appearance of the tablet in his stool. You should tell the patient that

(A) he should crush or chew the tablet before swallowing
(B) if he takes the medication with an alkaline food such as milk, the problem will not occur
(C) he should return the remaining tablets to the pharmacy for replacement
(D) if he takes the medication with an acidic food such as orange juice, the problem will not occur
(E) he should not be concerned because this is a normal occurrence

194. Which of the following complications associated with the administration of TPN solutions is most likely to occur after the infusions have been discontinued?

(A) hypoglycemia
(B) hyperchloremic metabolic acidosis
(C) hyperosmotic nonketotic hyperglycemia
(D) alkalosis
(E) pulmonary edema

195. Which one of the following provides the greatest number of calories per gram?

(A) ethanol
(B) proteins
(C) anhydrous dextrose
(D) fats
(E) hydrous dextrose

196. A patient requires several administrations of high-dose cisplatin (Platinol) therapy for the treatment of advanced bladder cancer. During the first cisplatin administration, the patient develops severe nausea and vomiting. Which of the following drugs would be appropriate to administer to control these symptoms for future administrations?

(A) granisetron (Kytril)
(B) buspirone (BuSpar)
(C) danazol (Danocrine)
(D) amantadine (Symmetrel)
(E) triazolam (Halcion)

197. The mechanism of action of amiloride (Midamor) is most similar to that of

(A) spironolactone (Aldactone)
(B) hydrochlorothiazide (HydroDIURIL)
(C) metolazone (Zaroxolyn)
(D) triamterene (Dyrenium)
(E) chlorthalidone (Hygroton)

198. A 50-year-old hypertensive patient has been maintained on spironolactone with hydrochlorothiazide (Aldactazide), methyldopa (Aldomet), and potassium (K-Tabs). The patient is admitted to the hospital for elective surgery and is found to be hyperkalemic (serum K of 6.4 mEq/L; normal range is 3.5 to 5.5 mEq/L) with no symptoms and a normal electrocardiogram. This patient should be treated with

(A) IV calcium
(B) IV sodium bicarbonate
(C) IV normal saline
(D) rectal sodium polystyrene sulfonate
(E) oral EDTA

199. A 55-year-old patient is to receive dalteparin sodium (Fragmin) for the prevention of deep-vein thrombosis. Which of the following is true of dalteparin sodium?

I. It is administered by IV infusion.
II. It should not be used if the patient is allergic to pork products.
III. It is a low molecular weight heparin.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

200. Which of the following drug products are indicated for use in Type 2 diabetes mellitus patients?

I. miglitol (Glyset)
II. repaglinide (Prandin)
III. rosiglitazone (Avandia)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

201. Which of the following agents is NOT employed in the treatment of depression?

(A) zolpidem (Ambien)
(B) nefazodone (Serzone)
(C) paroxetine (Paxil)
(D) sertraline (Zoloft)
(E) venlafaxine (Effexor)

202. The use of olsalazine (Dipentum) is contraindicated in patients with a history of hypersensitivity to

(A) sulfonamides
(B) imidazolines
(C) phenothiazines
(D) salicylates
(E) beta-adrenergic blocking agents

203. A patient has been receiving 50 mg of hydrocortisone (Solu-Cortef) by IV every 6 hours for an acute exacerbation of ulcerative colitis. After several days of IV therapy, the physician wishes to switch the patient to an equivalent dose of oral prednisone. The equivalent total daily dose of prednisone would be

(A) 50 mg
(B) 100 mg
(C) 200 mg
(D) 400 mg
(E) 600 mg

204. A 50-year-old patient with congestive heart failure is stabilized on digoxin 0.25 mg daily, hydrochlorothiazide 50 mg daily, and a low-sodium, potassium-rich diet. The patient then develops polyarteritis, which requires corticosteroid therapy. Which of the following glucocorticoids would be most appropriate for this patient?

(A) hydrocortisone
(B) cortisone
(C) prednisolone
(D) dexamethasone
(E) prednisone

205. An asthmatic patient is stabilized to a therapeutic theophylline level on an IV aminophylline (dihydrate) infusion of 50 mg/h. The physician wishes to put the patient on an equivalent amount of sustained-release anhydrous theophylline (eg, Theo-Dur). An appropriate total daily dose of Theo-Dur would be

(A) 1500 mg
(B) 1200 mg
(C) 900 mg
(D) 600 mg
(E) 300 mg

206. A 20-year-old asthmatic patient has been treated with zileuton (Zyflo) 600 mg QID. While the patient seems to tolerate the drug well, she has brief episodes of bronchospasm several times a week. Which of the following drugs would NOT be appropriate to recom-

mend for the treatment of acute bronchospasm in this patient?

I. zafirlukast (Accolate)
II. triamcinolone acetonide (Azmacort)
III. salmeterol (Serevent)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

207. A patient with rheumatoid arthritis cannot swallow tablets or capsules. Which of the following salicylates is available in an oral liquid dosage form?

(A) choline salicylate
(B) magnesium salicylate
(C) salsalate
(D) sodium salicylate
(E) salicylic acid

208. A prescriber wishes to prescribe Lanoxicaps for a patient who has been receiving Lanoxin 0.25-mg tablets. The pharmacist should recommend which strength of Lanoxicaps?

(A) 0.05 mg
(B) 0.1 mg
(C) 0.2 mg
(D) 0.3 mg
(E) 0.5 mg

209. A secondary means of contraception should be recommended to patients using oral contraceptives when which of the following drugs is (are) also to be taken?

I. rifampin
II. cetirizine (Zyrtec)
III. acetaminophen

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

210. Which of the following agents are used as an aid to smoking cessation?

I. nicotine
II. bupropion
III. disulfiram

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

Answers and Explanations

1. **(D)** When administered parenterally, lorazepam (Ativan) is a rapidly acting anticonvulsant with fewer tendencies to produce respiratory depression than the barbiturates. It has become a common choice for initial therapy of status epilepticus. *(3)*

2. **(C)** Chronic (longer than 6 months) high-dose administration of hydralazine (Apresoline) may produce an acute rheumatoid state in approximately 10% of patients taking the drug. A syndrome clinically indistinguishable from disseminated lupus erythematosus develops in a smaller percentage of users. This lupus-like syndrome (fever, arthralgia, splenomegaly, edema, and the presence of lupus erythematosus cells in the peripheral blood) has also been associated with procainamide use. *(3)*

3. **(C)** Vitamin B_6 (pyridoxine) use by patients using levodopa may decrease the effectiveness of levodopa by promoting the peripheral decarboxylation of levodopa. *(3)*

4. **(E)** Atenolol (Tenormin) blocks beta-adrenergic receptors. It differs from pindolol (Visken) primarily in that it has some preferential effect on $beta_1$-adrenoreceptors, which are located chiefly in cardiac muscle. This preferential effect is not absolute and, at higher doses, atenolol may also inhibit $beta_2$-adrenoreceptors, which are located chiefly in bronchial and vascular musculature. Although the mechanism of its antihypertensive effect is not known, the drug is indicated in the management of hypertension either alone or in combination with other antihypertensive drugs. *(3)*

5. **(D)** Terazosin (Hytrin) is an $alpha_1$-adrenergic blocker that causes peripheral vasodilation. Side effects of therapy may include a precipitous fall in blood pressure, possibly accompanied by tachycardia and syncope following the first dose. The initial dose of terazosin is usually 1 mg at bedtime and may be increased slowly to 20 mg daily if required. *(3)*

6. **(A)** CD_4 cells are a type of T lymphocytes whose primary role is to stimulate other cells in the immune response. The lower the level of these cells in the patient's blood, the more susceptible the patient becomes to the development of opportunistic infections such as *Pneumocystis carinii* pneumonia. *(3)*

7. **(E)** Nitroprusside has marked antihypertensive activity when given by IV infusion. It appears to lower blood pressure by relaxing vascular smooth muscle, thereby dilating peripheral arteries and veins. Solutions of nitroprusside must be protected from light. Discolored solutions or those with visible particulate matter should be discarded. *(3)*

8. **(A)** Dirithromycin (Dynabac) should not be used to treat bacteremias because its use does not achieve sufficiently high serum levels to provide antimicrobial coverage of the blood stream. *(3)*

9. **(E)** Tobramycin sulfate (Nebcin) is the salt of a weak base and a strong acid. Combining such a drug with alkaline drugs such as those listed will result in a chemical incompatibility. *(3)*

10. **(D)** All of the agents listed, except itraconazole, are employed in the treatment of *Helicobacter pylori*–related peptic ulcer disease. Itraconazole (Sporanox) is an antifungal agent. *(3)*

11. **(C)** Cholestyramine is a basic anion exchange resin. This quaternary ammonium chloride compound exchanges the chloride ion for the negatively charged bile acids, thereby preventing their reabsorption. Cholestyramine binds many organic acids, including warfarin and levothyroxine. *(3)*

12. **(C)** If drug B has a greater affinity (ie, higher association constant) for specific protein-binding sites than does drug A, it will have a tendency to displace drug A from these sites. Further, if drug B is given in large doses, the degree of this displacement will increase because there will be a greater amount of drug B competing with drug A for the binding sites. *(3)*

13. **(B)** Dalteparin sodium (Fragmin) is a low-molecular-weight heparin compound used for the prevention of deep-vein thrombosis (DVT). It is only administered by deep subcutaneous injection. *(3)*

14. **(E)** Acetylsalicylic acid (aspirin), dipyridamole (Persantine), and clopidogrel (Plavix) each exhibit antiplatelet action. *(3)*

15. **(C)** Penetration of the cornea by *Pseudomonas aeruginosa* will often lead to destruction of the cornea and interior portions of the eye. Blindness may result. This organism is a common contaminant in water. The need for sterility of ophthalmic products is well recognized. *(3)*

16. **(E)** Boils caused by *Staphylococcus* organisms form in the anterior portion of the external auditory meatus. They are usually self-limiting, and treatment with antibiotic ointments prevents spreading. *(3)*

17. **(A)** Idoxuridine (Stoxil) is an antimetabolite that selectively inhibits the replication of viral DNA. It is used primarily in the treatment of herpes simplex keratitis, a disease of viral origin that can cause blindness. *(3)*

18. **(D)** Although tolnaftate (Tinactin) is effective against several types of fungi, it is ineffective against *Candida* organisms. Miconazole (Micatin), clotrimazole (Lotrimin), and ciclopirox olamine (Loprox) are relatively broad-spectrum antifungal agents with activity against some species of *Candida*. *(3)*

19. **(B)** Permethrin (Nix) is a scabicide and pediculocide. It acts on the parasites' nerve cell membrane, causing paralysis. It is only for external use. *(3)*

20. **(E)** Complications of corticosteroid therapy are usually related to the length of time that they have been administered and the dosage used. Corticosteroids suppress normal tissue responses to infection (increasing susceptibility to infection) and allow further dissemination of existing infections. Because tissue responses to infection are suppressed, the subjective, objective, and laboratory manifestations of infection may be masked. *(3)*

21. **(C)** Although the NSAIDs are structurally different, they all possess similar pharmacological properties and all inhibit prostaglandin synthesis. Furthermore, these drugs produce similar adverse effects, including gastrointestinal (GI) intolerance. Oxaprozin (Daypro) has the longest half-life of the group (approximately 42 to 50 hours) and is recommended to be given on a once-a-day basis. *(3)*

22. **(D)** Celecoxib (Celebrex) is a cyclooxygenase-2 (COX-2) inhibitor. It is, therefore, less likely to cause GI upset than most other NSAIDs. *(3)*

23. **(A)** When dispensing isotretinoin (Accutane) to a woman of childbearing potential, the pharmacist should advise the patient of the dangers of becoming pregnant during therapy. In addition, the patient should be advised that the lesions will initially appear worse, but then improve, and that prolonged

exposure to sunlight or sunlamps should be avoided while using the drug. *(3)*

24. **(E)** In the condition known as hypoprothrombinemia, there is a reduction in the levels of prothrombin in the blood. This substance is essential in the blood-clotting mechanism. *(3)*

25. **(A)** Rapid reversal of warfarin-induced hypoprothrombinemia can be accomplished by discontinuing warfarin therapy and, if necessary, the administration of phytonadione (vitamin K_1). Phytonadione, when used for this purpose, is best administered IM or SC in a single dose. The dose may be repeated if the patient does not adequately respond within six to eight hours. *(3)*

26. **(D)** Phenazopyridine (Pyridium) is a red dye that commonly causes discoloration of the urine. It is used primarily as a urinary tract analgesic. *(3)*

27. **(B)** Menotropins (Pergonal, Humegon) is an agent that has moderate follicle-stimulating hormone (FSH) and luteinizing hormone (LH) activity. It has been used successfully to induce ovulation in many patients with amenorrhea and other conditions that cause anovulatory cycles. *(3)*

28. **(A)** Amiloride (Midamor) is a potassium-sparing diuretic. Patients should be advised to avoid large quantities of potassium-rich foods because their use with this drug product could cause serious hyperkalemia. *(3)*

29. **(A)** Animal testing of a new drug is completed before the investigational new drug (IND) status is obtained for clinical testing. In Phase I of the study, healthy volunteers are tested to determine drug tolerance, dosing schedules, side effects, and pharmacokinetic data. This is followed by Phase II, in which actual patients suffering from the disease are tested with the drug. Drug efficacy is observed, and side effects not evident in healthy volunteers may occur. Phase III involves administration of the drug to large numbers of patients by private practitioners. Phase IV is the continuous investigation or monitoring of the drug after marketing. *(3)*

30. **(E)** Hypoparathyroidism usually presents itself as a disorder of calcium metabolism in which serum calcium levels of the patient decrease while levels of phosphate increase in an inversely proportional manner. Low-serum calcium levels may precipitate a potentially serious condition known as tetany. To prevent the development of this disorder and to treat the hypoparathyroidism, calcium supplements such as calcium gluconate, calcium carbonate, or calcium lactate may be prescribed. *(3)*

31. **(E)** Raloxifene (Evista) is a selective estrogen receptor modulator (SERM). It is generally used to prevent osteoporosis in postmenopausal women. *(3)*

32. **(E)** The hypothyroid state is characterized by marked retardation of mental and physical activity; hoarseness; dry sparse hair; thickening of the skin and subcutaneous tissues; constipation; cold intolerance; anemia; and dry, pale, coarse skin. However, because of the nature of the general symptoms, hypothyroidism is usually recognized and treated before all of the previously mentioned symptoms develop. Patients with hypothyroidism frequently develop enlargement of the thyroid glands (goiter) and may have elevated TSH levels. Hashimoto's disease (autoimmune thyroiditis) is a common cause of hypothyroidism in adults. *(5:1257)*

33. **(B).** *(5:1051)*

34. **(A)** Fiorinal is the only agent listed that contains aspirin. *(3)*

35. **(C)** Hemochromatosis is an iron storage disorder characterized by excessive amounts of iron in parenchymal tissues with resultant tissue damage. Such a condition may be caused by a number of factors, one of which is the prolonged use of excessive doses of iron preparations. *(5:1537)*

36. **(B)** Cholestatic hepatitis is a syndrome that may occur when erythromycin estolate is given to susceptible individuals for more than 10 to 14 days. It is more common after multiple exposures to the drug, although full recovery usually follows discontinuation of the medication. The reaction is unpredictable and is apparently due to individual hypersensitivity. It has not been observed with the use of erythromycin free base or with other derivatives of erythromycin. Because there is no established clinical superiority of the estolate salt, there is little justification for using it in light of the possibility of this potential toxicity. *(3)*

37. **(C)** Metronidazole (Flagyl) is active against anaerobic bacteria and protozoa. Patients using the drug should be advised to avoid alcohol because the drug may produce a disulfiram-like effect. They should also be advised that their urine may turn a red–brown color. In addition, the drug should be taken with food to reduce the likelihood of GI upset. *(3)*

38. **(B)** Lansoprazole (Prevacid) and omeprazole (Prilosec) reduce gastric acidity by inhibiting the "proton pump" within the gastric mucosa. They are commonly used in the treatment of peptic ulcer disease, gastroesophageal reflux disease (GERD) or pathological hypersecretory conditions. *(3)*

39. **(D)** Patients with chronic inflammatory bowel disease may use olsalazine sodium (Dipentum) or mesalamine (Asacol, Pentasa, Rowasa) if they are allergic to sulfa drugs because these drugs do not contain a sulfa component. Sulfasalazine (Azulfidine) does contain a sulfa component. *(3)*

40. **(B)** Metoclopramide (Reglan) is an oral GI prokinetic agent. It exerts a cholinergic action that increases gastric motility. It is commonly employed in the treatment of gastroesophageal reflux disease (GERD) since the drug promotes gastric emptying and reduces pressure on the lower esophageal sphincter. *(3)*

41. **(B)** Didanosine is a reverse transcriptase inhibitor approved for the treatment of HIV infection. Its major adverse reactions include peripheral neuropathy and pancreatitis. Ifosfamide is an antineoplastic alkylating agent and cytarabine is an antineoplastic antimetabolite. *(3)*

42. **(E)** Patients with sinus headaches generally experience pain in the periorbital area. Pain is usually greatest on awakening because of the accumulation of fluid in the sinus cavities. *(5:1028)*

43. **(C)** Combined drug treatment is usually required because of the rapid development of resistant organisms when a single agent is used. It has also been demonstrated that combined drug therapy enhances the tuberculostatic effects of the individual drugs. For example, a combination of streptomycin and isoniazid is significantly more tuberculostatic than is either agent used alone. *(5:1724)*

44. **(C)** The color change imparted to urine and sweat is a predictable and harmless side effect. Patients should be told to expect this effect so that they are not alarmed by it. *(3)*

45. **(C)** Ticlopidine (Ticlid) is a platelet aggregation inhibitor used to reduce the risk of thrombotic stroke. While using this drug the patient may be at higher risk for abnormal bleeding. *(3)*

46. **(D)** Mezlocillin (Mezlin) is an extended-spectrum penicillin that is active against both gram-positive and many gram-negative microorganisms. *(3)*

47. **(A)** Pseudomembranous colitis is a severe and occasionally fatal complication of antibiotic therapy. One etiology appears to be the presence of an exotoxin produced by overgrowth of *Clostridium difficile* in the bowel. Clindamycin, lincomycin, and ampicillin have been the most commonly implicated antibiotics, although other antibiotics have also been implicated. Treatment is directed against the offending organism and its exotoxin. Oral metronidazole (Flagyl) 250 mg to 500 mg three to four times daily for ten days is most commonly used. *(5:1742)*

48. **(D)** Cushing syndrome is a condition characterized by adrenal hyperplasia caused by overproduction of ACTH by the pituitary gland. Patients with this disease will often have obesity, hypertension, and gonadal dysfunction. *(5:1267)*

49. **(B)** The aminoglycosides have activity against a wide range of microorganisms. After parenteral administration, they are excreted unchanged in the urine. Because of their well-established nephrotoxicity and ototoxicity, they are not suitable for long-term treatment of chronic tract infections. *(3)*

50. **(E)** All of these infectious disorders are associated with HIV infection. *(5:1940)*

51. **(A)** For the prophylactic treatment of asthma, cromolyn sodium is available in several forms: powder-filled capsules for inhalation, a solution for use with a nebulizer, and an aerosol spray. Cromolyn is used to prevent asthma attacks, not to treat acute attacks. *(3)*

52. **(E)** A major advance in steroid therapy for asthma has been the development of corticosteroid aerosols such as beclomethasone (Vanceril). Like cromolyn (Intal), beclomethasone is a prophylactic agent that must be used regularly. It is not suitable for an acute asthmatic attack. The primary value of steroid therapy by inhalation is to avoid systemic side effects in patients who require steroids for the first time or to permit significant dosage reductions of oral steroids in patients on maintenance therapy. *(3)*

53. **(D)** Vasopressin, which is a purified preparation of antidiuretic hormone, is used therapeutically in the treatment of diabetes insipidus, a disease of pituitary origin. When administered in any one of a number of available dosage forms (IM, IV, SC, and nasal insufflation or spray), vasopressin usually reverses the symptom of excessive urination (polyuria), which is the primary symptom of patients suffering from this disease. The initially observed action of the hormone was vasoconstriction, which led to the name vasopressin; this is still the official USP designation. *(3)*

54. **(A)** Lithium carbonate (Lithane, Eskalith) is primarily indicated for treating manic episodes in patients with manic–depressive illness. It is administered orally in daily divided doses of 600 mg to 1.8 g and generally should not be administered with diuretics, because retention of lithium may occur. *(3)*

55. **(A)** The rate of excretion of lithium carbonate is generally independent of urine flow and dietary sodium. However, in the presence of sodium deficiency, the excretion of lithium is markedly decreased and toxic levels can accumulate rapidly. Conversely, high sodium intake enhances lithium excretion. *(3)*

56. **(B)** Glucose-6-phosphate dehydrogenase (G6PD) controls the initial step in the pentose–phosphate pathway, bringing about the oxidation of glucose-6-phosphate to 6-phosphogluconate, which reduces NADP to NADPH. Many oxidant drugs (eg, primaquine, sulfisoxazole, probenecid) increase the rate of oxidation of glutathione. This increases the intracellular demand for NADPH to maintain glutathione in the reduced form. In patients with a deficiency in erythrocyte G6PD, oxidized glutathione accumulates and, by an unknown mechanism, disrupts erythrocyte membrane integrity with subsequent hemolysis. *(3)*

57. **(B)** The anticoagulant effect of heparin is quantified by measuring the activated partial thromboplastin time (APTT). The usual therapeutic goal is to prolong the APTT to 2 to 2.5 times that of the laboratory control. *(5:1551)*

58. **(E)** Because of heparin's brief duration of action, mild hemorrhaging is usually treated by simply withdrawing the drug. In the presence of severe hemorrhage, the use of a specific heparin antagonist (eg, protamine sulfate) is imperative. Usually, 1 mg of protamine sulfate IV will neutralize 100 units of

heparin. However, after the IV administration of heparin, the quantity of protamine required decreases rapidly with time. Only 0.5 mg of protamine is required to neutralize 100 units of heparin 30 minutes after IV administration of heparin. *(3)*

59. **(D)** Cimetidine potentiates the effects of warfarin by decreasing its rate of hepatic metabolism. Cimetidine administration causes a reversible but significant increase in plasma warfarin concentration and, consequently, in the prothrombin time. In this case, it is necessary to recognize this interaction and decrease the dose of warfarin or use a safer alternative to cimetidine. *(3)*

60. **(A)** Normal fasting blood sugar values for adults range from 80 to 120 mg/dL (or 80 to 120 mg%). When the fasting blood sugar levels exceed 120 mg/dL, diabetes mellitus should be suspected. Levels below 60 mg/dL may suggest insulin overdosage, glucagon deficiencies, and/or hypoactivity of various endocrine glands. *(5:1222)*

61. **(A)** The administration of pharmacologic doses (0.4 mg/day or more) of folic acid can stimulate reticulocytosis and improve the anemia associated with vitamin B_{12} deficiency. However, folic acid administration does not prevent the development or progression of the neurologic manifestations of pernicious anemia. *(3)*

62. **(D)** Clomiphene citrate (Clomid) is a nonsteroidal estrogen agonist–antagonist that causes the hypothalamus to release gonadotropin-releasing hormone. This increases the peripheral concentrations of FSH and LH and promotes ovulation. *(5:1317)*

63. **(E)** Initial therapy of severe hyperkalemia should be the administration of calcium gluconate since this will rapidly reverse the arrhythmias caused by hyperkalemia. Since calcium administration does not lower potassium levels, measures must be taken to lower extracellular levels of potassium. This can be accomplished with the use of insulin, which promotes the passage of potassium into cells. Sodium polystyrene sulfonate (Kayexalate), a cation-exchange resin may also be given orally or rectally to bind potassium in the GI tract. *(5:901)*

64. **(D)** Creatine kinase (CK) is an enzyme that is found primarily in muscle tissue. It is released into the blood in response to muscle injury. Serum concentrations of CK are elevated in disorders involving muscle damage such as myocardial infarction, muscular dystrophy, muscle trauma, and muscular inflammation. *(5:214))*

65. **(E)** Whole blood treated with anticoagulant is centrifuged in a calibrated hematocrit tube. The volume ratio of the packed red blood cells to total blood volume is determined. The hematocrit is normally 39 to 49 for men and 33 to 43 for women. The hematocrit value provides some indication of both the number and size of the red blood cells present in an individual. *(5:1534)*

66. **(E)** A reticulocyte is an immature erythrocyte (red blood cell). *(5:1519)*

67. **(C)** Trimethoprim–sulfamethoxazole (Bactrim, Septra) is an effective combination for the treatment of otitis media. The other choices are either unlikely to be active against organisms that commonly cause otitis media or they are too toxic to use in young children. *(5:1673)*

68. **(E)** Aspirin, the NSAID, and acetaminophen are capable of reducing elevated body temperature by altering the hypothalamic setpoint. *(3)*

69. **(B)** Clozapine (Clozaril) is an antipsychotic agent that is used to treat patients with severe schizophrenia who do not respond to standard antipsychotic treatment. The drug is capable of causing agranulocytosis, a potentially life-threatening adverse drug reaction. Patients who are to receive the drug should have a baseline white blood cell and differential count performed before initiation of treat-

ment. Once therapy has begun, a white blood cell count should be performed every week throughout treatment and for four weeks after the drug has been discontinued. *(3)*

70. **(E)** Zollinger–Ellison syndrome is a condition characterized by gastric acid hypersecretion and recurrent peptic ulceration. It is generally the result of a gastrin-producing tumor. The proton pump inhibitors such as omeprazole (Prilosec) and lansoprazole (Prevacid) are effective in managing the acid secretion in this condition. *(5:566)*

71. **(E)** The administration of a drug by intermittent (rather than continuous) IV injection is accomplished over a period of minutes (rather than hours). Stability and/or compatibility problems are less likely to occur because the drug does not remain in contact with a large-volume IV fluid for long periods of time. The potential for thrombophlebitis is reduced because the drug is not in constant contact with the blood vessel tissue at the site of the injection. Finally, the greater concentration gradient produced by a more rapid injection may promote better diffusion of some drugs into tissues. *(3)*

72. **(B)** Vinblastine (Velban) and other vinca alkaloids, such as vincristine and vinorelbine, are considered to be mitotic inhibitors. *(5:1982)*

73. **(E)** Aspirin should be avoided during the last trimester of pregnancy. Aspirin exerts a dose-dependent action on uric acid excretion. *(3)*

74. **(A)** *Martindale's Extra Pharmacopoeia* is probably one of the most comprehensive, international, single-volume references on drugs and drug products. *Martindale's* is divided into three parts: The first part consists of monographs on drugs and ancillary substances. (Although drugs that are manufactured in the United Kingdom are stressed, generic and proprietary products from many other countries are included.) The monographs include chemical data, storage, incompatibilities, uses, doses, and toxic effects. The second part contains a supplementary discussion of new drugs, obsolete drugs, and miscellaneous substances. The third part lists formulas of OTC products sold in the United Kingdom. There is also a directory of worldwide pharmaceutical manufacturers.

75. **(C)** A debriding agent is one that helps to remove necrotic material from a wound. Most debriding agents are proteolytic or fibrinolytic enzymes. *(5:1693)*

76. **(D)** Ceftriaxone (Rocephin) and cefotaxime (Claforan) are 3rd-generation cephalosporins whereas cefotetan is a 2nd-generation cephalosporin. Third-generation cephalosporins are more effective in treating CNS infections such as meningitis because they penetrate the CNS better than 1st- or 2nd-generation agents. *(3)*

77. **(B)** Although the presence of impaired renal function or renal failure does not contraindicate the use of drugs that are directly excreted or the active metabolites of which are excreted by the kidney, it does modify the dose required to produce a given therapeutic effect. Renal impairment or renal failure allows these drugs or their metabolites to accumulate in the blood. Drug accumulation in these situations can be avoided by reducing the dose and/or the dosage schedule of the drug. Careful monitoring of drug concentrations in the blood and of remaining renal function should also be done. *(3)*

78. **(B)** No significant difference in clinical response can be identified between patients who acetylate isoniazid slowly and those who do so rapidly. Although slow acetylators of isoniazid are more likely to develop peripheral neuropathy from the drug, they respond as well to pyridoxine therapy as rapid acetylators. *(3)*

79. **(B)** Natamycin (Natacyn) is an antibiotic that has antifungal activity. It is used as an intraocular suspension for the treatment of fungal blepharitis, conjunctivitis, and keratitis. *(3)*

80. **(A)** Plantago (psyllium) is a bulk-forming laxative agent. Patients using it should mix

the dose with a glass of cool water or other fluid and drink it down quickly. This should be followed with more fluids. *(3)*

81. **(D)** The relative concentration of different anions and cations varies considerably between intracellular and extracellular fluids of the body. Intracellular body fluids contain high concentrations of potassium (a cation) and phosphate (an anion), whereas extracellular fluid contains high concentrations of sodium (a cation) and chloride (an anion). *(3)*

82. **(E)** Acute fluoride ingestion is generally treated by using a gastric lavage containing dilute calcium hydroxide solution. The calcium reacts with the unabsorbed fluoride and prevents its absorption. It also prevents the development of hypocalcemia in the patient. *(3)*

83. **(C)** There is a reciprocal relationship between the concentration of calcium and phosphorus in the blood. For example, hypoparathyroidism is characterized by low serum calcium and high serum phosphorus, whereas hyperparathyroidism is characterized by low serum phosphorus and high serum calcium. *(5:745)*

84. **(D)** Nicotine polacrilex contains nicotine bound to an ion exchange resin in a chewing gum base. It is used to assist smokers in their withdrawal from cigarette use. The drug may cause peripheral vasoconstriction, tachycardia, and high blood pressure, so it should be avoided in patients with severe angina. The drug is also classified in pregnancy category X, meaning that it should not be used in pregnant women. *(3)*

85. **(C)** Acetaminophen is metabolized in the liver primarily by conjugation to glucuronide or sulfate metabolites. A small percentage is metabolized by the hepatic cytochrome P-450 mixed-function oxidase system to a toxic intermediate metabolite. Normally, this metabolite is preferentially conjugated to glutathione and excreted in the urine. When large doses of acetaminophen are ingested, the glucuronide and sulfate pathways become saturated, and stores of glutathione become inadequate to conjugate the amount of toxic metabolite that is produced. The metabolite binds covalently to hepatocytes and produces hepatic necrosis. *(3)*

86. **(D)** Because the drug was ingested 6 hours ago, the likelihood of removing a large amount of drug from this patient's stomach with ipecac syrup is small. Activated charcoal effectively binds acetaminophen if given soon after ingestion, but its use here is also unlikely to be of value because of the elapsed time. N-acetylcysteine serves as a glutathione substitute that effectively binds the toxin and permits it to be excreted in the urine. N-acetylcysteine is given orally or by lavage tube. *(5:78)*

87. **(C)** Because of sulfasalazine's poor absorption from the GI tract, its localized activity is valuable as one of the first-line treatments for various forms of colitis and enteritis. The drug is available as oral tablets and as a suspension. *(3)*

88. **(A)** Aspirin allergy in association with asthma is cause for serious concern. Asthma, rhinorrhea, and nasal polyps usually accompany this type of aspirin intolerance, which occurs in about 4 to 20% of asthmatic patients. These patients appear to exhibit a high degree of cross-reactivity to other NSAIDs, such as ibuprofen. *(3)*

89. **(E)** Nonselective beta-adrenergic blocking agents may cause further bradycardia and may cause bronchoconstriction. In addition, the drugs may mask the effects of hypoglycemia, thereby placing Type 1 diabetic patients at risk. *(3)*

90. **(B)** Torsemide (Demadex) is a loop diuretic that is capable of producing ototoxicity, which would enhance the similar toxicity produced by gentamicin. *(3)*

91. **(C)** Nitroprusside sodium (Nitropress) is a drug administered by IV infusion in the emergency treatment of acute hypertensive crisis. It causes a rapid fall in blood pressure

that can be controlled by adjusting the infusion rate of the drug. *(3)*

92. **(D)** Left ventricular failure is associated with bronchial edema, increased airway resistance and dyspnea. In addition, orthopnea (dyspnea that occurs while the patient is in the supine position) also often occurs. *(5:159)*

93. **(C)** Values of < 200 mg/dL are considered desirable levels of total cholesterol and triglycerides. A value of < 130 mg/dL is a desirable level for LDL cholesterol. *(5:358)*

94. **(A)** Phenelzine (Nardil) is a monoamine oxidase (MAO) inhibitor that may interact with pressor amines such as tyramine in some cheeses, wines, beers, etc, to produce a hypertensive crisis that may be life-threatening. *(3)*

95. **(C)** Frequent urination (polyuria) is a common symptom of diabetes mellitus. *(5:1219)*

96. **(A)** Hyperphosphatemia associated with hypoparathyroidism can be effectively treated by administering calcium salts. Initially, IV calcium administration will correct the hypocalcemia these patients often experience. Oral calcium or aluminum compounds may also be administered to decrease GI absorption of phosphate. *(5:913)*

97. **(A)** Sotalol (Betapace) is used primarily for its ability to block beta-adrenergic activity, and is therefore useful in treating patients suffering from ventricular arrhythmias. However, because beta-adrenergic blockade also tends to increase airway resistance, the drug is usually contraindicated for use in patients suffering from asthma or severe allergies. *(3)*

98. **(C)** Bupropion (Wellbutrin) is indicated for the treatment of depression. The product Zyban, which also contains bupropion, is used as a smoking deterrent in smoking cessation programs. *(3)*

99. **(C)** Tardive (late-occurring) dyskinesia (involuntary muscular movements) is a drug-induced neurologic disorder that appears to be irreversible and unresponsive to drug treatment. It is characterized by involuntary movement of the lips, tongue, or jaw and is commonly observed as a smacking of the lips, rhythmical movement of the tongue, or facial grimaces. This disorder may be due to hypersensitivity of dopaminergic receptors to endogenous dopamine after long-term blockade by antipsychotic drugs. Akathisia is a feeling of restlessness or a compelling need for movement. *(5:1383)*

100. **(B)** Irbesartan (Avapro) is an angiotensin II receptor antagonist. It is employed in the treatment of hypertension. *(3)*

101. **(E)** Metoclopramide (Reglan) exerts a potent anti-emetic effect by inhibiting the chemoreceptor trigger zone (CTZ). It also stimulates GI motility and increases the rate of gastric emptying. This enhances the antiemetic activity by eliminating stasis that precedes vomiting. All of the other drugs listed decrease the rate of gastric emptying. *(3)*

102. **(E)** Most antiparkinson agents act by increasing dopaminergic activity. *(3)*

103. **(D)** Tacrine (Cognex) and donepezil (Aricept) are centrally acting cholinesterase inhibitors that increase acetylcholine levels in cortical neurons and may, therefore, slow progression of Alzheimer's disease symptoms. *(3)*

104. **(E)** Metformin (Glucophage) is a biguanide that, in rare cases, may cause lactic acidosis. This is a condition that may be fatal in 50% of cases. *(3)*

105. **(D)** A satisfactory approximation of the temperature of the internal organs can be made by inserting a clinical thermometer into either the mouth or rectum. These are both closed cavities with good blood supply. The accepted average oral temperature is 98.6° F, with recognition that both individual and diurnal variations occur regularly. The rectum is about 1° F warmer. Rectal and oral thermometers have the same temperature scales

and markings, differing only in the shape of the bulb. To avoid the potential confusion and errors in subtracting or adding degrees from readings, physicians prefer that the actual temperature and the method be reported; for instance, 102.5° F taken rectally.

106. **(D)** Immediate treatment of the burn is recommended. Application of cold water will often reduce the severity of the burn. The burn area should be kept in cold water until no further pain is experienced whether in or out of the water. If necessary, a physician may then be contacted.

107. **(B)** Montelukast sodium (Singulair) is an orally active leukotriene receptor antagonist used to provide prophylaxis and chronic treatment of asthma. It should be taken daily to prevent asthma attacks, even when the patient is asymptomatic. If required, bronchodilator drugs may be used to control acute attacks. *(3)*

108. **(D)** Pilocarpine is a cholinergic drug that produces a miotic effect (pupillary constriction). *(3)*

109. **(C)** Amiodarone (Cordarone) is a Class III antiarrhythmic agent that can produce a number of serious adverse effects including visual impairment, pulmonary toxicity, and proarrhythmic effects. *(3)*

110. **(C)** Homatropine will produce mydriasis, which will further aggravate the patient's condition and possibly lead to blindness. The other agents are all useful in glaucoma treatment. *(3)*

111. **(E)** Pilocarpine is a relatively short-acting drug that causes accommodative spasm and miosis. Levobunolol (Betagan), a beta-receptor antagonist, is believed to reduce elevated intraocular pressure by decreasing the production of aqueous humor. Levobunolol exerts its maximal effect within 1 to 2 hours and maintains significant effects for as long as 24 hours following a single topical dose. There seems to be little or no effect on pupil size, visual acuity, or accommodation. *(3)*

112. **(B)** GoLYTELY is a bowel evacuant product that is used to cleanse the bowel prior to GI examination. It contains polyethylene glycol and a mixture of electrolytes that must be reconstituted with water before it is administered. The usual dose is four liters of reconstituted solution consumed in doses of 240 mL every ten minutes until the contents of the container have been consumed or the rectal effluent is clear. *(3)*

113. **(C)** Xenical (orlistat) is a lipase inhibitor that inhibits the absorption of dietary fats. It is used in the management of obesity by having patients take one 120-mg capsule of the drug three times daily with each main meal containing fat. A dose may be skipped if a meal is low in fat or if a meal is skipped. *(3)*

114. **(D)** Scabies is a disorder caused by the mite *Sarcoptes scabeii*. The mite burrows into the skin. Its droppings cause a hypersensitivity reaction characterized by intense itching. *(3)*

115. **(B)** The distinctive lesion of psoriasis is a vivid red macule, papule, or plaque covered by silvery lamellated scales. Usually the scalp, elbows, knees, and shins are affected first. *(3)*

116. **(A)** If morphine allergy is present, codeine should also be avoided because both codeine and morphine are structurally similar phenanthrene derivatives. Also, codeine is partially (10%) demethylated to morphine. *(3)*

117. **(D)** Tacrolimus (Prograf) and cyclosporine (Sandimmune, Neoral) are immunosuppressive drugs that are used to reduce organ rejection in patients who have received an organ transplant. *(3)*

118. **(B)** Alendronate (Fosamax) is a biphosphonate compound that inhibits normal and abnormal bone resorption. It is used for the treatment and prevention of osteoporosis in postmenopausal women. Patients should be

advised to take their daily dose first thing in the morning, at least 30 minutes before the first food, beverage, or medication of the day is consumed. The drug should be taken with a full glass of plain water. The patient should be advised not to lie down for at least 30 minutes following administration of the drug to reduce the chance of esophageal irritation. *(3)*

119. **(C)** Clonidine is a central alpha-adrenergic stimulant that reduces peripheral vascular resistance and heart rate. Patients who use oral clonidine are susceptible to rebound hypertension if they discontinue their use of the tablets. The transdermal dosage form (Catapres TTS) releases clonidine at a constant rate for about 7 days, thereby improving compliance and reducing the likelihood of rebound hypertension. *(3)*

120. **(B)** Raising the intragastric pH from 1.5 to 3.5 neutralizes 99% of the acid and greatly reduces the proteolytic activity of pepsin, thus ameliorating the two primary factors known to overwhelm gastric mucosal resistance. Buffering to a higher pH serves no useful purpose. *(3)*

121. **(C)** Epoetin alfa (Epogen, Procrit) is a glycoprotein that stimulates red blood cell production. It is not effective in treating patients with neutropenia (inadequate white blood cells). *(3)*

122. **(E)** Sinemet is a combination product containing carbidopa and levodopa in a ratio of 1:4 or 1:10. Because carbidopa inhibits the peripheral decarboxylation of levodopa, much smaller doses of levodopa can be used. This, in turn, generally reduces the peripheral side effects associated with high doses of levodopa. Dosage levels of levodopa can be decreased by approximately 75%. *(3)*

123. **(B)** The administration of pyridoxine, even in the small doses (5 mg or more) contained in ordinary vitamin preparations, is equivalent to a reduction in dosage of levodopa. Pyridoxine is believed to be a cofactor for the enzyme dopa decarboxylase, which is responsible for the peripheral metabolism of levodopa. The decarboxylated metabolic product cannot enter the brain, which is the desired site of action. *(3)*

124. **(A)** Miglitol (Glyset) is an alpha-glucosidase inhibitor that delays the digestion of ingested carbohydrates. This results in a smaller increase in blood glucose concentration after meals and permits better control of Type 2 diabetic patients who cannot control their hyperglycemia with diet alone. *(5:1227)*

125. **(C)** The gray-baby syndrome occurs in premature and term newborn infants when chloramphenicol is administered during the first few days of life. The syndrome results from the inability of the infant to metabolize the drug because of a deficient enzyme, glucuronyl transferase, which is required to detoxify the drug by changing it to the glucuronide. Symptoms consist of cyanosis, vascular collapse, and elevated chloramphenicol levels in the blood. *(3)*

126. **(B)** Inflammation of the eyelid is blepharitis. Gastritis is an inflammation of the stomach wall. Inflammation of the tongue would be known as glossitis. *(5)*

127. **(E)** Polyphagia is defined as an excessive craving for food. *(27)*

128. **(B)** An abnormal increase in cell number in a tissue is hyperplasia. Excessive sweating is hyperhidrosis. Increased motor activity (excessive movement) is called hyperkinesia. Excessive sensitivity to stimulation is hyperesthesia. *(27)*

129. **(C)** Misoprostol is a synthetic prostaglandin E_1 analog that inhibits gastric acid secretion. It is used orally to prevent NSAID-induced gastric ulcers. The drug is in pregnancy category X. *(3)*

130. **(B)** Myopia is the condition of nearsightedness. Myalgia is pain in a muscle. Myocardia pertains to the heart muscle. Myoclonus is muscular twitching or contraction. Myositis is inflammation of a voluntary muscle. *(27)*

131. **(D)** Lithium products are used for the maintenance treatment of manic episodes of manic-depressive illness. Since lithium decreases renal sodium reabsorption, patients should be advised to maintain a normal salt and fluid intake. Anything that depletes the patient of sodium (eg, sweating, diarrhea, use of diuretics, etc) may increase lithium toxicity. Signs of lithium toxicity include the development of diarrhea and/or tremors. *(3)*

132. **(E)** Aortic stenosis, for example, is the narrowing of the aortic orifice of the heart. Pyloric stenosis is obstruction of the pyloric orifice of the stomach, caused by hypertrophy of the pyloric muscle. Sclerosis (hardening of tissues with a loss of elasticity) is generally caused by overgrowth of fibrous tissue. Inflammation of the vertebrae refers to spondylitis. Stoppage of blood flow to an area of the body refers to stasis.

133. **(B)** Methylphenidate (Ritalin) is a CNS stimulant with actions similar to the amphetamines. Patients should be advised to take the medication early in the day to avoid insomnia and that the drug may cause palpitations. With prolonged use, methylphenidate is likely to cause weight loss. *(3)*

134. **(A)** Although digoxin and quinidine may be used together, it is well documented that administering quinidine to a patient previously stabilized on digoxin will cause serum digoxin levels to rise an average 2- to 2.5-fold. The mechanism of this interaction may involve both a displacement of digoxin from tissue-binding sites and a reduction in renal clearance of digoxin. Even though the significance of this interaction remains controversial, many clinicians suggest reducing the dose of digoxin by 50% when adding quinidine. In any case, the patient should be monitored carefully for signs of digoxin toxicity. *(3)*

135. **(E)** Under normal circumstances, diuresis induced by amiloride (Midamor) is accompanied by either no appreciable difference or only a slight increase in potassium excretion. However, a sharp reduction in potassium output is observed when either amiloride or triamterene (Dyrenium) is given with other natriuretic drugs. This potassium-sparing action is the rationale for concomitant drug therapy with amiloride. Because of the possibility of inducing serious hyperkalemia, potassium supplements should not be given to patients being treated with amiloride or triamterene. Spironolactone (Aldactone) is an aldosterone antagonist also used to decrease the potassium loss that occurs secondary to the use of other diuretics. *(3)*

136. **(D)** Mannitol is usually administered by IV as a hypertonic 10 to 25% solution (an isotonic solution is about 5.5%). The introduction of a hypertonic solution provokes urine flow. Mannitol solutions are used to prevent acute renal failure, in the evaluation of acute oliguria, and for the reduction of the pressure and volume of the intraocular and cerebrospinal fluids. *(3)*

137. **(C)** Imipramine (Tofranil) is a tricyclic antidepressant that is used routinely to treat nocturnal enuresis, especially in children. It is not recommended for children younger than 6 years of age. Doses of imipramine range from 25 to 75 mg, lower than those used for treatment of depression. Desmopressin (DDAVP) is a posterior pituitary hormone that has an antidiuretic effect. It is administered once daily as a nasal spray. *(3)*

138. **(B)** The International Normalization Ratio (INR) is used to monitor anticoagulant efficacy for patients using warfarin sodium (Coumadin). For patients who have had an acute MI, the INR should ideally be between 2 and 3. *(3)*

139. **(D)** Use of phenytoin (Dilantin) is associated with a number of adverse effects, including nystagmus (oscillation of the eyeball) and gingival hyperplasia (excessive gum growth). *(5:967)*

140. **(C)** Nalbuphine (Nubain) is a mixed narcotic agonist–antagonist capable of relieving moderate to severe pain. In subjects dependent on such narcotics as morphine and codeine, nal-

buphine precipitates a withdrawal syndrome. Although it is capable of producing euphoria similar to morphine, its effect on respiration seems to exhibit a ceiling effect, such that doses higher than 30 mg produce no further respiratory depression. *(3)*

141. **(A)** Nalmefene (Revex) is a pure opioid antagonist that is used to reverse opioid effects. It has a longer duration of effect than naloxone (Narcan) and is, therefore, more effective in reversing the effects of long-acting opioid compounds. *(3)*

142. **(E)** Each of these agents exerts an antifungal action against *Candida* (yeast) organisms. *(3)*

143. **(D)** Mild polycythemia is normal in persons who exercise excessively and in persons who live at high altitudes. Polycythemia vera is a state in which the rate of red cell production is far greater than normal, even though there is no apparent physiologic need for the increased production. It is believed that this disease may result from a malignancy of the bone marrow stem cells. Phlebotomy whenever the hematocrit rises higher than 55% may suffice as the only treatment for patients who do not have severe thrombocytosis. Drugs used to treat polycythemia include busulfan (Myleran) and radioactive phosphorus ($_{32}P$). *(5:1527)*

144. **(E)** Protamine is a strongly basic substance that combines with the strongly acidic heparin to produce a stable salt and a loss of anticoagulant activity. Because protamine itself possesses anticoagulant properties, it is unwise to administer more than 50 mg of protamine over a short period of time unless it is known that there is a definite need for a larger amount. *(3)*

145. **(C)** Salmeterol (Serevent) is the longest acting of these $beta_2$-adrenergic agonists. It has a duration of action of greater than 12 hours. Isoetharine has the shortest duration (1/2 to 2 hr), while the others have an intermediate duration of approximately 4 to 8 hours. *(5:446)*

146. **(B)** Although the risk of hemorrhage in the fetus can be minimized by monitoring the prothrombin time of the mother closely, it is probably best to use heparin if anticoagulant therapy is necessary under these circumstances. Because heparin is a high-molecular-weight mucopolysaccharide, it does not cross the placenta. *(5:1303)*

147. **(E)** Sumatriptan (Imitrex) is contraindicated in patients with angina pectoris, previous myocardial infarction and/or uncontrolled hypertension. It should also not be used if a patient has used an ergotamine derivative within the past 24 hours or within two weeks after discontinuing MAO inhibitor use. *(5:1031)*

148. **(A)** Acute uncomplicated urinary infections are most commonly caused by *E. coli*. Such infections are most common in women and are characterized by the presence of dysuria, urinary urgency, and suprapubic discomfort. *(5:1784)*

149. **(D)** In normal individuals, more than 50% of an oral dose of vitamin B_{12} is absorbed from the GI tract. This absorption occurs only in the presence of the intrinsic factor of Castle, with which the vitamin must presumably combine in order to pass through the intestinal walls. By means of radioactive cobalt–labeled cyanocobalamin, it has been shown that more than one-half of an oral dose soon appears in the blood. Normally, only a small amount of radioactivity appears in the urine. However, if a large "flushing" dose (1000 mcg) of vitamin B_{12} is given parenterally within an hour of the tagged oral dose, the renal threshold for B_{12} is exceeded and radioactivity is observed in the urine. In patients with pernicious anemia, there is a deficiency in intrinsic factor that results in poor absorption of the radioactive B_{12}. Most of the radioactivity in these patients will be detected in the feces. *(5:1536)*

150. **(C)** Lipodystrophy is either the breakdown or accumulation of subcutaneous fat at the insulin injection site. It can best be avoided by having the patient rotate the site of insulin

injection so that the same site is not used any more frequently than once every 30 days. *(3)*

151. **(D)** Insulin lispro (Humalog) is the most rapidly acting insulin available. Its onset of action is about 15 minutes and its peak action occurs within 30 to 90 minutes. This form of insulin is generally given 15 minutes before a meal to permit effective utilization of the glucose that is absorbed. *(3)*

152. **(C)** Protamine zinc insulin exerts an action for as long as 24 to 36 hours. The shortest duration is exhibited by Regular insulin, which may act for only 6 to 8 hours. *(3)*

153. **(E)** Diabetic ketoacidosis is a direct result of the lack of insulin. The omission of insulin doses or errors in adjusting the insulin dosage in response to changes in food intake or physical activity is probably the most common cause of diabetic ketoacidosis. Other common causes include infection or myocardial infarction. *(5:1237)*

154. **(D)** Morphine and its chemical derivatives commonly cause respiratory depression, nausea, and constipation. *(5:1018)*

155. **(A)** Combination oral contraceptive products usually contain norethindrone (a progestin) and ethinyl estradiol (an estrogen). The estrogen component suppresses the production of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) and thereby prevents ovulation. The progestin component increases the viscosity of cervical mucus and makes the endometrial lining of the uterus less receptive to implantation of fertilized ovum. *(3)*

156. **(B)** Chlordiazepoxide (Librium), diazepam (Valium), clorazepate (Tranxene), and prazepam (Centrax) are all metabolized by oxidation in the liver to desmethyldiazepam, an active metabolite with a very long half-life. This process is impaired in the elderly and in the presence of liver disease (eg, cirrhosis), resulting in drug accumulation and the risk of oversedation. Oxazepam (Serax) and lorazepam are metabolized by glucuronidation, a process that is much less dependent on liver function than on oxidation. Furthermore, the metabolites of oxazepam and lorazepam are inactive. *(3)*

157. **(C)** The usual method of treating an acute hypoglycemic reaction is to give glucose orally or, in unconscious patients, by IV in concentrated solutions. However, if these routes cannot be used, 0.5 to 1 mg of glucagon may be given SC or IM as well as by IV. Glucagon is an endogenous hormone produced by the alpha cells of the pancreatic islets of Langerhans. Glucagon increases blood glucose by stimulating hepatic gluconeogenesis and glycogenolysis. *(3)*

158. **(E)** Because 6-mercaptopurine (Purinethol) is metabolized by the enzyme xanthine oxidase, concomitant administration of allopurinol, which is an xanthine oxidase inhibitor, will decrease the rate of metabolism of 6-mercapto-purine. This will potentiate the effects and toxicity of 6-MP unless the dose of 6-MP is reduced to 25 to 30% of its usual therapeutic level. *(3)*

159. **(B)** Dopamine exerts a positive inotropic effect by direct action on beta-adrenergic receptors and causes a release of norepinephrine from storage sites. A major advantage of the drug is that controlling the infusion rate can vary its hemodynamic effects. *(3)*

160. **(D)** Modicon is a monophasic combination oral contraceptive containing estrogen and progestin. *(3)*

161. **(E)** In the iron-deficient state, the iron storage compartment becomes depleted. This is followed by a reduction in plasma transferrin saturation. Subsequently, the number and size of the erythrocytes as well as their hemoglobin content will be decreased. The lack of hemoglobin causes the erythrocytes to become smaller (microcytic) and paler (hypochromic) in color. *(5:1538)*

162. **(D)** Trigeminal neuralgia is a disorder characterized by sudden attacks of severe pain along the distribution of the fifth cranial nerve. Attacks are often precipitated by stimulation of a "trigger zone" in the area of the pain. Carbamazepine (Tegretol) is remarkably effective in both relieving and preventing the pain of trigeminal neuralgia. Anticonvulsants such as phenytoin (Dilantin) may also be beneficial in some cases. Other drugs that have been effective are vitamin B_{12} in massive doses (1 mg) and injection of alcohol into the ganglion or the branches of the trigeminal nerve. *(3)*

163. **(B)** While rigidity, disturbances of posture, bradykinesia, decreased dexterity, and dysphagia are often seen in patients with Parkinson's disease, visual impairment is not a characteristic of this disease. *(5:1004)*

164. **(E)** The development of inflammatory conditions of the colon (eg, nonspecific colitis, or a more severe pseudomembranous colitis) has been associated with antibiotic therapy. Although many antibiotics have been implicated, there have been a disproportionate number of reports specifically involving clindamycin and lincomycin. Colitis has been associated with both oral and parenteral administration of these drugs, and no clear predisposing conditions have been identified. Because antiperistaltic drugs (eg, diphenoxalate) used to treat the resulting diarrhea seem to prolong the disease, they should not be used. *(3)*

165. **(D)** Loperamide (Imodium) inhibits peristaltic activity by a direct effect on the musculature of the intestinal wall. Loperamide appears to be devoid of opiate-like effects. *(3)*

166. **(A)** Using itraconazole (Sporanox) with theophylline is contraindicated because itraconazole is a potent inhibitor of the cytochrome P450 enzyme system and may raise the plasma concentration of theophylline. *(3)*

167. **(B)** Cyclobenzaprine (Flexeril), an analogue of amitriptyline (Elavil), is available for the treatment of acute voluntary muscle spasm. Because they are so alike in chemical structure, cyclobenzaprine and amitriptyline have essentially the same side effects and toxicity. *(3)*

168. **(A)** Cocaine, like the amphetamines, is a potent CNS stimulant. The other agents listed are CNS depressants. *(3)*

169. **(B)** Acetaminophen will not displace warfarin from its protein-binding sites or interfere with warfarin metabolism. It is less likely, therefore, to cause a therapeutic problem in this patient. All of the other choices either have a high affinity for plasma proteins or may alter warfarin metabolism. *(3)*

170. **(B)** Zanamivir (Relenza) is an antiviral agent used in the treatment of uncomplicated acute illness caused by influenza virus in adults and adolescents who are 12 and older and who have been symptomatic for two days or less. The drug is administered by oral inhalation using the *Diskhaler* device that comes with the product. *(3)*

171. **(C)** Each gram of protein supplies about 4 kcal, each gram of carbohydrate supplies about 4 kcal, and each gram of fat supplies about 9 kcal. It is obvious, therefore, that strictly on a weight basis, fats are better caloric sources than are other nutrients.

172. **(C)** Leucovorin calcium (Wellcovorin) is a derivative of folic acid used as an antidote for drugs used as folic acid antagonists such as methotrexate. *(6)*

173. **(D)** Pedialyte is an orally administered electrolyte solution containing dextrose; potassium chloride; and sodium, calcium, and magnesium salts. It is used to supply water and electrolytes in a balanced proportion in order to prevent serious deficits from occurring in patients suffering from mild to moderate fluid loss. The product does not contain protein or fat. *(3)*

174. **(B)** Each gram of carbohydrate supplies 4 kcal of energy to a patient. Because a liter of dextrose 5% solution contains 50 g of dex-

trose, the administration of the liter will supply the patient with approximately 200 kcal.

175. **(B)** Hepatitis B vaccine is used to immunize people of all ages against all known subtypes of hepatitis B virus. It must be stored in a refrigerator and is usually administered intramuscularly (IM). *(3)*

176. **(C)** Prostate-specific antigen (PSA) is a glycoprotein produced only by prostate cells. Levels of PSA are used for prostate cancer screening. PSA levels may also be elevated in men with acute prostatitis and benign prostatic hyperplasia. *(5:2096)*

177. **(A)** Of the drugs listed, erythromycin (Ilotycin) has the lowest degree of toxicity and the spectrum of action most similar to penicillin. Demeclocycline may inhibit skeletal growth in the fetus. Deposition of tetracyclines in the teeth of the fetus has been associated with enamel defects and staining of the teeth. Trimethoprim is a teratogenic drug. *(3)*

178. **(D)** Mafenide (Sulfamylon) cream applied topically to burns has been found to be effective in inhibiting the invasion of the affected site by both gram-positive and gram-negative bacteria. The cream is usually applied to a thickness of about 1/16 inch twice daily over the entire burned surface. Silver sulfadiazine is also used topically for the same purpose. *(3)*

179. **(A)** The drug of choice in treating most forms of gonorrhea is ceftriaxone (Rocephin). The drug is generally given in a single 125-mg IM dose. In patients who cannot tolerate a beta-lactam antimicrobial agent, ciprofloxacin (Cipro) 500 mg PO once or ofloxacin (Floxin) 400 mg PO once may be given instead. *(5:1799)*

180. **(B)** Indomethacin (Indocin) and other NSAIDs are effective agents in the treatment of acute gouty arthritis. They act by reducing joint inflammation responsible for the excruciating pain associated with the disease. While colchicine may also be used for this purpose, colchicine is much more likely to produce serious adverse effects. *(5:1463)*

181. **(A)** Cromolyn sodium 4% ophthalmic solution (Crolom) is used to treat ocular allergic disorders such as vernal conjunctivitis. It is effective only if it is used at regular intervals. Cromolyn acts to inhibit degranulation of sensitized mast cells that occurs after exposure to specific antigens. *(3)*

182. **(C)** Glucose tolerance is impaired by the thiazides, even though certain other sulfonamide derivatives are hypoglycemic agents. The degree of hyperglycemia induced by the thiazides is unimportant in patients with normal carbohydrate tolerance, but may intensify the hyperglycemia of diabetes or precipitate glycosuria in persons predisposed to diabetes. *(3)*

183. **(E)** Dopamine (Intropin) is a sympathomimetic drug that acts directly on alpha- and beta-receptors and produces indirect effects due to release of norepinephrine. Dopamine also dilates renal and mesenteric vessels through a dopamine receptor effect. The hemodynamic effects of dopamine are dose-related. At low infusion rates (1 to 5 mg/kg/min), dopamine increases renal blood flow without much change in cardiac output or total peripheral resistance. In higher doses (5 to 20 mg/kg/min), cardiac output and heart rate increase, the increase in renal perfusion persists, and total peripheral resistance is variable. At higher infusion rates, renal vasoconstriction occurs, total peripheral resistance rises, and blood pressure increases. Consequently, the infusion rate must be adjusted and monitored carefully to achieve the desired response. *(3)*

184. **(B)** Flumazenil (Romazicon) is a specific benzodiazepine antagonist used to reverse the toxic effects of benzodiazepine intoxication. It should not be used in patients also using tricyclic antidepressants because it may increase the risk of seizures in such patients. *(5:1097)*

185. **(E)** Although there are no reported differences in bioavailability between phenytoin capsules and suspension, this patient's phenytoin level is most likely going to increase because the milligram-for-milligram conversion is equivalent to an increase in dose. The capsule form of Dilantin is the sodium salt and as such contains only 92% phenytoin. The suspension is the free acid and contains 100% phenytoin. In this situation, the patient would be going from a daily dose of 276-mg phenytoin (as 300-mg phenytoin sodium) to 300-mg phenytoin. *(3)*

186. **(C)** Fentanyl (Duragesic) patches are effective in treating chronic severe pain. They are applied every 72 hours and provide a continuous release of analgesic during that period. PRN treatment is not advisable in treating severe pain because it may cause patient anxiety. Codeine, oral meperidine, and acetaminophen are generally not effective enough to control chronic severe pain. *(3)*

187. **(C)** The full therapeutic effect of the tricyclic antidepressants often takes several weeks to develop. During this period, many patients subjectively feel that their depression has worsened. However, the side effects of these drugs, sedation and anticholinergic effects, usually begin shortly after therapy is initiated. The pharmacist should discuss these anticipated effects with the patient. The pharmacist should also consult with the prescribing physician if it is apparent that an intensified depression may be serious enough to lead to suicide. *(3)*

188. **(D)** Metronidazole (Flagyl) is a drug that has antiprotozoal and antimicrobial action. Patients on this drug should be advised to avoid alcohol because a disulfiram-like reaction may occur. In addition, metronidazole use will darken the urine of most patients. *(3)*

189. **(D)** In general, all insulin products currently available are reasonably stable at room temperature (ie, 59° to 85° F). Traveling diabetics should be advised to avoid prolonged exposure of their insulin to very high temperatures, and told that it is not necessary to refrigerate the vial in use. Insulin vials stored in pharmacies are required to be refrigerated because they may be kept in stock for a long period of time. *(3)*

190. **(D)** Isotretinoin (Accutane) is a vitamin A derivative indicated for the treatment of recalcitrant cystic acne in patients who do not respond to more conservative therapy. Approximately 90% of patients using this product experience cheilitis, a cracking around the margin of the lips. *(3)*

191. **(B)** Fluids employed in TPN are generally very hypertonic and hyperosmotic. Until the technique of subclavian vein catheterization was perfected, it was too irritating and inflammatory to use the usual sites of IV administration. Peripheral veins are seldom used in the administration of hypertonic nutrient solutions because blood flow is insufficient to provide the necessary dilution of the fluid to protect the intima of the vessel. The exception occurs when the slightly hypertonic amino acid solutions containing limited amounts of dextrose are administered. *(3)*

192. **(C)** Angiotensin-converting enzyme (ACE) inhibitors are primarily employed in the treatment of hypertension and heart failure. Patients using these drugs may develop chronic cough and/or angioedema. Use of an angiotensin II receptor antagonist such as losartan (Cozaar) or irbesartan (Avapro) is less likely to cause these adverse effects. *(3)*

193. **(E)** Use of sustained-release nifedipine products may cause the appearance of an empty tablet in the stool. This is the plastic matrix from which the drug diffused and does not contain the active drug. *(3)*

194. **(A)** Suddenly discontinuing dextrose solution may cause a rebound hypoglycemia in response to the sudden elimination of the sustained glucose load of the TPN solution. It is best to maintain the patient on a nominal amount of dextrose such as D_5W or to wean the patient slowly from the TPN solution.

Hyperchloremic metabolic acidosis may occur during TPN therapy when the total chloride ion content is high. The amino acids in the protein salts are usually chloride or hydrochloride salts. Additional amounts of chloride are obtained when sodium or potassium chlorides are added to the TPN solutions. It may be useful to supply either sodium or potassium as acetate salts. Hyperosmotic nonketotic hyperglycemia is a result of infusing an overload of glucose. Causes include an overly rapid infusion rate, dextrose solutions that are too concentrated, and malfunction of pancreatic secretion of insulin.

195. **(D)** Fats provide approximately 9 kcal/g. Because of their isotonicity, fat emulsions can be administered safely through peripheral or central veins. Commercial examples of fat emulsion products are Intralipid and Liposyn II or III. Ethanol provides 7 kcal/g. Disadvantages associated with ethanol are the fact that excessively rapid infusion can cause heartburn and/or intoxication, and the fact that it cannot be used in patients with GI disease such as pancreatitis. Hydrous dextrose provides 3.4 kcal/g. It is the usual source of calories in TPN formulations because of its safety, economy, and availability to the body. Proteins provide 3 to 4 kcal/g. *(3)*

196. **(A)** Granisetron (Kytril) is a selective 5-HT_3-receptor antagonist used to prevent nausea and vomiting associated with cancer chemotherapy. It is particularly useful in treating nausea and vomiting accompanying cisplatin therapy. Granisetron is administered orally or by IV infusion beginning 30 minutes prior to initiating emetogenic chemotherapy. An additional dose of the oral form may be given 12 hours after the first dose on the day of chemotherapy treatment. *(3)*

197. **(D)** Amiloride (Midamor) is a potassium-sparing diuretic with a mechanism of action similar to that of triamterene (Dyrenium). Both drugs exert a diuretic effect by promoting the exchange of sodium for potassium in the distal portion of the renal tubule. In contrast to spironolactone (Aldactone), neither of these drugs inhibits aldosterone. Metolazone (Zaroxolyn) and chlorthalidone (Hygroton) are thiazide-like diuretics. *(3)*

198. **(D)** Treatment of hyperkalemia can be approached by three methods. First, in the presence of ECG changes, calcium should be given to counteract the effects of excess potassium on the heart. Secondly, bicarbonate or glucose plus insulin can be used to shift potassium rapidly from extracellular to intracellular fluid compartments. Thirdly, exchange resins (eg, sodium polystyrene sulfonate) or dialysis can be used to remove potassium from the body. In this case, because there are no symptoms of ECG changes, the rectal administration of sodium polystyrene sulfonate (Kayexalate) enemas containing 50 g in 70% sorbitol solution is the most appropriate option. *(5:901)*

199. **(D)** Dalteparin sodium (Fragmin), ardeparin sodium (Normiflo), and enoxaparin sodium (Lovenox) are low-molecular-weight heparin products prepared from porcine (pork) heparin. They are administered subcutaneously only. *(3)*

200. **(E)** Miglitol (Glyset) is an alpha-glucosidase inhibitor. Repaglinide (Prandin) lowers blood glucose by stimulating the release of insulin from the pancreas. Rosiglitazone (Avandia) enhances insulin receptor sensitivity. All are indicated for the treatment of Type 2 diabetes mellitus. *(3)*

201. **(A)** Zolpidem (Ambien) is a nonbarbiturate, nonbenzodiazepine hypnotic. *(3)*

202. **(D)** Olsalazine (Dipentum) is a salicylate compound that is converted to 5-aminosalicylic acid in the gut. This agent produces an anti-inflammatory effect in the gut. *(3)*

203. **(A)** Prednisone is approximately four times more potent than hydrocortisone (Solu-Cortef). Because this patient was receiving a total daily dose of 200 mg of hydrocortisone, an equivalent anti-inflammatory dose of prednisone would be 50 mg/day. *(3)*

204. **(D)** Glucocorticoids associated with a lesser degree of mineralocorticoid activity (eg, dexamethasone, triamcinolone, methylprednisolone, and betamethasone) should be used in patients with conditions such as congestive heart failure in which sodium retention can be an aggravating factor. Because all glucocorticoids induce potassium loss regardless of their mineralocorticoid activity, even dexamethasone should be used with caution in this patient. *(3)*

205. **(C)** At the infusion rate of 50 mg/hr, the patient is receiving a total daily dose of 1200 mg (50 mg/hr × 24 hr) of aminophylline dihydrate. Because aminophylline dihydrate contains the equivalent of 79% anhydrous theophylline, this patient is receiving a total daily dose of 948-mg anhydrous theophylline (0.79 × 1200 mg/day). The most practical dose of Theo-Dur would be 900 mg/day given in doses of 300 mg every 8 hours. *(3)*

206. **(E)** None of these agents would be appropriate for the treatment of acute bronchospastic attacks because they are only indicated for prophylaxis of attacks. *(3)*

207. **(A)** Choline salicylate (Arthropan) is a liquid salicylate dosage form that has a fishy odor. *(3)*

208. **(C)** Lanoxicaps contain digoxin in a more bioavailable form than in digoxin tablets. A 20% reduction in dosage is generally required to achieve a comparable therapeutic response with Lanoxin tablets. *(3)*

209. **(A)** Rifampin is a potent microsomal enzyme inducer and may reduce effectiveness of hormones supplied by oral contraceptive products. *(3)*

210. **(C)** Bupropion (Zyban) and nicotine (Habitrol, Nicoderm, Nicotrol, ProStep) are products used to aid in smoking cessation programs. *(3)*

CHAPTER 7

Patient Profiles

The pharmacist, whether practicing in a community or an institutional setting, must constantly refer to patient profiles for information regarding the medical history of a specific patient. Analysis of profile data requires a strong knowledge base in the pharmacy disciplines already reviewed in this book.

In this section, there are 30 patient medication profiles. Some are related to community pharmacy practice and some to institutional practice.

Questions

PROFILE NO. 1

Community Pharmacy Medication Record

Patient Name: Wilhelmina Carlson
Address: 17 Walton Avenue
Age: 55 Height: 5′2″
Sex: M Weight: 150 lb
Allergies: aspirin, ragweed

DIAGNOSIS

Primary	Secondary
1. Essential Hypertension	1.
2.	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 7/21	34325	Jimes	HydroDiuril 25 mg	#30	1 daily	2
2. 8/20	34325	Jimes	refill	#30	1 daily	1
3. 9/18	37334	Jimes	HydroDiuril 25 mg	#30	1 daily	2
4. 9/18	37335	Jimes	Lotensin 10 mg	#30	1 daily	2

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
9/24	Dimetapp Tablets #24 OTC

DIRECTIONS (Questions 1a through 1k): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

1a. A drug product that is most similar in action to HydroDiuril is

(A) indapamide (Lozol)
(B) furosemide (Lasix)
(C) torsemide (Demadex)
(D) diltiazem (Cardizem)
(E) ethacrynic acid (Edecrin)

1b. Lotensin can best be described as a (an)

(A) calcium-channel-blocking agent
(B) angiotensin II receptor antagonist
(C) ACE inhibitor
(D) alpha$_1$-adrenergic blocker
(E) HMG-CoA reductase inhibitor

1c. When using HydroDiuril (hydrochlorothiazide) the patient should be advised to

I. take the dose at bedtime
II. restrict their intake of fluids while using the medication
III. take the dose with food or milk

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

1d. Which of the following may be caused by the chronic use of HydroDiuril?

I. hypomagnesemia
II. hypercalcemia
III. hypokalemia

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

1e. Patients who exhibit hypersensitivity to HydroDiuril should avoid the use of

(A) aspirin
(B) acetaminophen
(C) sulfa drugs
(D) MAO inhibitors
(E) selective serotonin reuptake inhibitors

1f. The pharmacist should advise Ms. Carlson to

(A) take the Dimetapp three times a day
(B) avoid the use of Dimetapp
(C) avoid the use of potassium-rich foods
(D) avoid the concomitant use of HydroDiuril and Lotensin
(E) avoid vigorous exercise

1g. A possible adverse effect this patient may experience while using Lotensin is

(A) diminished thirst
(B) chronic cough
(C) agranulocytosis
(D) increased intraocular pressure
(E) hearing loss

1h. Angioedema has been reported as an adverse effect caused by Lotensin. Angioedema is characterized by

(A) swollen ankles
(B) enlargement of the heart
(C) swollen lips
(D) swelling of the joints
(E) cardiac arrhythmia

1i. In reviewing the profile provided, one can conclude that the patient has

(A) been noncompliant
(B) experienced an adverse reaction to HydroDiuril
(C) not responded adequately to the HydroDiuril
(D) severely elevated blood pressure
(E) pulmonary hypertension

1j. Uncontrolled chronic hypertension may contribute to the development of

I. renal failure
II. retinopathy
III. left ventricular hypertrophy

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

1k. The best choice for a pregnant woman who needs to be treated for essential hypertension is

(A) methyldopa (Aldomet)
(B) hydrochlorothiazide (HydroDiuril)
(C) benazepril (Lotensin)
(D) propranolol (Inderal)
(E) nifedipine (Adalat CC)

PROFILE NO. 2

Community Pharmacy Medication Record

Patient Name: Sylvia Jackson
Address: 137 Rosebud Lane
Age: 76 Height: 5′4″
Sex: F Weight: 235 lb
Allergies: codeine

DIAGNOSIS

Primary	Secondary
1. rheumatoid arthritis	1.
2. hypertension	2.
3. angina	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 4/12	34094	Till	HCTZ 25 mg	#30	1 qd	5
2. 4/12	34095	Till	Micro-K 10 mEq	#30	1daily	3
3. 5/23	37844	Wasser	Tylenol/Cod. No. 3	#60	1 t.i.d.	1
4. 5/28	38248	Till	Norvasc 5 mg	#30	1 daily	2

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 4/21	Maximum Strength Dexatrim (OTC)

DIRECTIONS (Questions 2a through 2l): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

2a. Which of the following products would be equivalent to the HCTZ prescribed?

I. Diuril
II. Zaroxolyn
III. Oretic

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

2b. Which of the following best describes Micro-K?

(A) microencapsulated potassium chloride
(B) microcrystalline potassium chloride
(C) enteric-coated potassium chloride
(D) quick-release potassium chloride
(E) potassium chloride in a wax matrix

2c. Each Micro-K dosage unit contains 10 mEq of potassium as potassium chloride. How many mg of potassium chloride are in each Micro-K dosage unit? (Atom. wt. K = 39; Cl = 35)

(A) 1090 mg
(B) 390 mg
(C) 1130 mg
(D) 872 mg
(E) 740 mg

2d. Norvasc (amlodipine) can best be described as a (an)

(A) calcium-channel blocker
(B) alpha$_1$-adrenergic blocker
(C) nonspecific beta-adrenergic blocker
(D) angiotensin-converting enzyme inhibitor
(E) direct-acting vasodilator

2e. Dexatrim is used for the same purpose as

(A) Amerge
(B) BuSpar
(C) Norflex
(D) Meridia
(E) Motrin

2f. When requesting Dexatrim, the patient should be informed that Dexatrim

(A) may interact with the Micro-K
(B) is contraindicated in patients with rheumatoid arthritis
(C) is contraindicated in patients allergic to codeine
(D) is contraindicated in hypertensive patients
(E) may not be sold without a prescription

2g. When Norvasc is added to this patient's regimen, there is an increased likelihood of

(A) hyperkalemia
(B) hypoglycemia
(C) peripheral edema
(D) photosensitivity
(E) hypocalcemia

2h. Norvasc is in the same pharmacological class as

I. Sular
II. Plendil
III. Cozaar

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

2i. Pruritis is a reported adverse effect related to the use of Norvasc. Pruritis can best be defined as

(A) enlargement of the gum tissue
(B) hearing difficulty
(C) drooling
(D) taste impairment
(E) itching

2j. The dose of codeine found in each dose of Tylenol/Codeine No. 3 is

(A) 3 mg
(B) 30 mg
(C) 120 mg
(D) 180 mg
(E) 60 mg

2k. An advantage of Norvasc over HCTZ in this patient is that Norvasc

I. is less expensive
II. reduces angina attacks
III. is less likely to deplete electrolytes

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

2l. An adverse effect expected with the use of Tylenol/Codeine No. 3 is

(A) diarrhea
(B) urinary urgency
(C) respiratory stimulation
(D) constipation
(E) CNS stimulation

PROFILE NO. 3

Community Pharmacy Medication Record

Patient Name: Lillian Riley
Address: 145 Nascar St.
Age: 27 Height: 5′3″
Sex: F Weight: 120 lb
Allergies: aspirin

DIAGNOSIS

Primary	Secondary
1. generalized tonic–clonic seizures since age 8	1. constipation
2.	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 2/2	34568	Mazur	Ovrette			5
2. 3/1	34568	Mazur	Refill			
3. 3/21	35908	Wilson	Dilantin Kapseals. 0.1	#C	3 daily	2
4. 4/2	38998	Mazur	Theragran-M	#C	1 daily	2

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 4/2	Koromex Cream 1 pk (OTC)
2. 4/9	Colace 100 mg #100 (OTC)

DIRECTIONS (Questions 3a through 3m): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

3a. Ovrette can best be described as a (an)

(A) triphasic oral contraceptive
(B) progestin-only oral contraceptive
(C) biphasic oral contraceptive
(D) ovulation inducer
(E) vaginal deodorant product

3b. Koromex Cream is employed as a

(A) spermicide
(B) lubricant
(C) antifungal
(D) antibacterial
(E) herpes treatment

3c. A synonym for generalized tonic–clonic seizures is

(A) Jacksonian seizures
(B) absence seizures
(C) focal seizures
(D) status epilepticus
(E) grand mal seizures

3d. The Dilantin product prescribed may be administered

I. in three divided daily doses
II. as a single daily dose
III. on a p.r.n. basis

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

3e. In the course of receiving Dilantin the patient develops nystagmus. This is a disorder of the

(A) gums
(B) cardiac rhythm
(C) eye
(D) hematological system
(E) liver

3f. The generic name of the Dilantin product prescribed is

(A) phenytoin sodium
(B) ethotoin
(C) phensuximide
(D) phenytoin
(E) mephenytoin

3g. A plasma phenytoin determination reveals a plasma concentration of 5 μg/mL. This indicates that

(A) hepatic impairment may exist
(B) the patient may be taking more doses than prescribed
(C) the concentration is within the therapeutic range
(D) the patient may have renal impairment
(E) the patient may not be taking all prescribed doses

3h. The prescriber should be called because of

(A) cross-sensitivity between Colace and Dilantin
(B) carcinogenicity with Dilantin
(C) reduction in Dilantin effectiveness
(D) reduction in Ovrette effectiveness
(E) improper Dilantin dose prescribed

3i. Which of the following is true of parenterally administered Dilantin?

I. Dilantin parenteral solutions must be kept refrigerated until just prior to administration.
II. Precipitation is likely to occur when Dilantin is combined with promethazine HCl in an IV admixture.
III. IM administration should generally be avoided.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

3j. Patients receiving Dilantin may develop a morbilliform rash. Morbilliform refers to

(A) measles-like
(B) marble-like
(C) unilateral
(D) symmetrical
(E) multicolored

3k. The active ingredient of Koromex Cream is

(A) hexachlorophene
(B) nonoxynol-9
(C) oxyquinoline sulfate
(D) sodium lauryl sulfate
(E) benzalkonium chloride

3l. The active ingredient in Colace is a (an)

(A) non-ionic surfactant
(B) coprecipitated laxative
(C) cationic surfactant
(D) osmotic laxative
(E) anionic surfactant

3m. Which of the following is true of Theragran-M?

(A) It is only available as a liquid.
(B) It is a sustained-release capsule product.
(C) Its use should be avoided in patients on Dilantin.
(D) Its use should be avoided in patients on Ovrette.
(E) It is available without a prescription.

PROFILE NO. 4

Community Pharmacy Medication Record

Patient Name: William Garry
Address: 217 Dreyfus Dr.
Age: 66 Height: 5′11″
Sex: M Weight: 185 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. Parkinson's disease	1.
2.	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 2/3	56445	Tillman	Sinemet 10/100	#C	1 t.i.d.	2
2. 3/1	56445	Tillman	Refill			
3. 3/19	59008	Tillman	Sinemet 25/250	#C	1 t.i.d.	2
4. 3/19	59009	Tillman	Cogentin 0.5 mg	#90	1 b.i.d.	2
5. 4/15	59008	Tillman	Refill			
6. 4/15	61122	Tillman	Symmetrel 100 mg	#60	1 b.i.d.	3

DIRECTIONS (Questions 4a through 4l): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

4a. The function of carbidopa in the Sinemet formulation is to

(A) act as a precursor for levodopa
(B) act as a xanthine oxidase inhibitor
(C) act as a microsomal enzyme inhibitor
(D) inhibit decarboxylation of peripheral levodopa
(E) increase the absorption of levodopa from the GI tract

4b. Patients receiving levodopa should avoid using vitamin supplements that contain

(A) folic acid
(B) riboflavin
(C) ascorbic acid
(D) pyridoxine
(E) thiamine

4c. A patient using Sinemet complains of an appreciable darkening of the urine beginning about 3 days after starting Sinemet therapy. The pharmacist should tell the patient to

(A) avoid the use of alkaline foods while on Sinemet
(B) check the expiration date on the Sinemet container to make sure it has not expired
(C) immediately stop taking the Sinemet and call the prescriber
(D) avoid the use of acidic foods while on Sinemet
(E) disregard the discoloration because it is not harmful

4d. Cogentin (benztropine mesylate) has been prescribed because of its action as a (an)

(A) centrally acting skeletal muscle relaxant
(B) sedative
(C) peripheral vasodilator
(D) memory enhancer
(E) anticholinergic

4e. Which of the following is NOT employed in the treatment of Parkinson's disease?

(A) tolcapone (Tasmar)
(B) selegiline (Eldepryl)
(C) pergolide (Permax)
(D) bromocriptine (Parlodel)
(E) venlafaxine (Effexor)

4f. In addition to its antiparkinson action, Symmetrel (amantadine) is also employed in the treatment of

(A) gout
(B) psychoses
(C) viral infections
(D) hypertension
(E) bronchial asthma

4g. Diplopia is an adverse effect related to the use of levodopa. This can best be described as

(A) loss of taste sensation
(B) impaired muscular coordination
(C) hearing loss
(D) double vision
(E) a cardiac tachyarrhythmia

4h. When a patient on levodopa is to be switched to Sinemet, which of the following is (are) true?

I. Reduce the dose of levodopa by 75%.
II. Permit at least 8 hours to elapse between the last dose of levodopa and the first dose of Sinemet.
III. Plasma levodopa levels must be measured each day for the first 5 days of Sinemet therapy.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

4i. Levodopa can best be described as a (an)

(A) dopamine precursor
(B) dopamine antagonist
(C) skeletal muscle relaxant
(D) neurotransmitter
(E) cholinergic agonist

4j. Which of the following products may be used to provide individual doses of carbidopa?

(A) Tegretol
(B) Dopar
(C) Larobec
(D) Lodosyn
(E) Permax

4k. The prolonged use of which of the following drugs is associated with the development of Parkinson-like symptoms?

(A) rosiglitazine
(B) encainide
(C) chlorpromazine
(D) enalapril maleate
(E) bupropion

4l. A patient with Parkinson's disease is likely to exhibit which of the following symptoms?

I. muscle rigidity
II. Babinsky's sign
III. visual impairment

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 5

Community Pharmacy Medication Record

Patient Name: Henrietta Northwood
Address: 1721 Pauling St.
Age: 64 Height: 5′5″
Sex: F Weight: 155 lb
Allergies: pollen, penicillin

DIAGNOSIS

Primary	Secondary
1. open-angle glaucoma, primary	1.
2. emphysema	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 7/29	59083	Weber	Levobunolol 0.5%	10 mL	gtt 1 os daily	2
2. 8/20	59083	Weber	Refill			
3. 9/11	65002	Weber	Betoptic 0.5%	10 mL	gtt 1 os b.i.d.	2
4. 10/21	65002	Weber	Refill			

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 9/14	Ecotrin Maximum Strength (OTC)
2. 10/7	Visine Allergy Relief (OTC)

DIRECTIONS (Questions 5a through 5k): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

5a. The primary action of levobunolol in the treatment of glaucoma is as a (an)

I. mydriatic
II. cycloplegic
III. beta-adrenergic blocker

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

5b. Levobunolol is most similar in pharmacologic action to

(A) timolol
(B) carbachol
(C) physostigmine
(D) propafenone
(E) isoflurophate

5c. Several weeks after using levobunolol, the patient's intraocular pressure is measured as 14 mm Hg. This indicates that

(A) the dose of levobunolol should be increased
(B) the patient has narrow-angle glaucoma
(C) an error in measurement must have occurred

(D) the intraocular pressure is under control
(E) the dose of levobunolol should be decreased

5d. The levobunolol solution that this patient is using contains polyvinyl alcohol. In this product, this substance serves as a (an)

(A) preservative
(B) active ingredient
(C) buffering agent
(D) viscosity builder
(E) solvent

5e. Levobunolol has been reported to produce urticaria in some patients. Another name for urticaria is

(A) hair loss
(B) hives
(C) tooth decay
(D) gum enlargement
(E) hallucinations

5f. Betoptic is employed for the same purpose as

I. Ocupress
II. Timoptic
III. OptiPranolol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

5g. Betoptic labeling indicates that the solution contains EDTA. This is used in this formulation as a (an)

(A) viscosity builder
(B) surfactant
(C) buffer
(D) antiseptic
(E) chelating agent

5h. The Visine Allergy Relief purchased OTC by this patient contains

(A) doxylamine
(B) tropicamide
(C) oxymetazoline
(D) tetrahydrozoline
(E) ephedrine

5i. The pharmacist should contact the prescriber to discuss the possibility of

(A) blood dyscrasias
(B) interaction between levobunolol and Betoptic
(C) urinary retention
(D) respiratory distress
(E) interaction between levobunolol and Ecotrin

5j. The Ecotrin Maximum Strength formulation is most similar to which of the following?

(A) Easprin
(B) Bufferin
(C) Disalcid
(D) Dolobid
(E) Alka-Seltzer

5k. Patients with glaucoma should avoid drugs that are

(A) anticholinergics
(B) broad-spectrum antimicrobial agents
(C) sympathomimetics
(D) deplete serum potassium
(E) peripheral vasodilators

PROFILE NO. 6

Community Pharmacy Medication Record

Patient Name: Lori Masters
Address: 34 Orchard St.
Age: 21 Height: 5′2″
Sex: F Weight: 119 lb
Allergies: penicillin

DIAGNOSIS

Primary	Secondary
1. acne vulgaris—severe	1.
2.	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 6/7	45023	Thomas	Benzac 5 Gel	45 g	ut dict	3
2. 6/22	48399	Wilson	Retin-A liquid	28 mL	Apply p.r.n.	2
3. 7/13	45023	Thomas	Refill			
4. 8/24	45023	Thomas	Refill			
5. 9/17	57888	Wilson	Cleocin T Gel	30 g	Apply topically	3
6. 10/5	59778	Thomas	Accutane 20 mg	#60	1 b.i.d.	5

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 7/1	Brasivol Medium
2. 7/30	Pernox Scrub 60 mL

DIRECTIONS (Questions 6a through 6l): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

6a. The active ingredient in Benzac is

(A) Benadryl
(B) benzyl alcohol
(C) isotretinoin
(D) benzoyl peroxide
(E) benzalkonium chloride

6b. Patients using Retin-A should avoid

I. use of antimicrobial agents
II. excessive sunlight
III. having the product come in contact with their eyes

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

6c. Retin-A liquid contains butylated hydroxytoluene. The function of this ingredient is as a (an)

(A) viscosity builder
(B) solvent
(C) coloring agent
(D) chelating agent
(E) antioxidant

6d. Which of the following adverse effects is associated with the use of Cleocin?

(A) hepatic impairment
(B) renal impairment
(C) diarrhea
(D) ataxia
(E) aplastic anemia

6e. The Cleocin-T product contains 10 mg of clindamycin per milliliter and is available in a 30-mL package size. This means that the strength of clindamycin in the solution is

(A) 1%
(B) 3%
(C) 0.1%
(D) 10%
(E) 0.3%

6f. Accutane is most closely related to

(A) pantothenic acid
(B) vitamin C
(C) vitamin D
(D) vitamin A
(E) lactic acid

6g. Which of the following is (are) common adverse effects associated with the use of Accutane?

I. cheilitis
II. conjunctivitis
III. tinnitus

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

6h. On dispensing Accutane, the pharmacist must provide the patient with a (an)

(A) patient package insert
(B) neutralizing solution
(C) "REFRIGERATE" auxiliary label
(D) accurate liquid measuring device
(E) wooden applicator

6i. Prior to dispensing Accutane, the pharmacist should contact the prescriber to ascertain whether the patient is

(A) allergic to tetracycline
(B) allergic to penicillin
(C) a diabetic
(D) allergic to aloe
(E) pregnant

6j. Brasivol contains aluminum oxide. This ingredient is employed in this product as a (an)

(A) lubricant
(B) astringent
(C) vehicle
(D) abrasive
(E) desiccating agent

6k. Pernox scrub contains salicylic acid. This ingredient is employed in this product as a (an)

(A) antiseptic
(B) keratolytic
(C) antioxidant
(D) buffer
(E) astringent

6l. Patients with acne often secrete large amounts of

(A) cholesterol
(B) dihydrotachysterol
(C) cerumen
(D) sebum
(E) bilirubin

PROFILE NO. 7

Community Pharmacy Medication Record

Patient Name: Timothy Downs
Address: 1199 Main St.
Age: 38 Height: 6′1″
Sex: M Weight: 210 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. asthma	1.
2.	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 6/19	40098	Tisch	Serevent Diskus	#28	One bid	2
2. 7/7	40098	Tisch	Refill			
3. 8/1	46443	Tisch	Proventil Aero.	17g	ut dict	2
4. 8/1	46444	Tisch	Vanceril Aerosol	#1	ut dict	1

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1.	Patient smokes 2 packs of cigarettes daily.
2. 8/3	Nytol Tablets (OTC)
3. 9/1	Nicoderm Patches #14—1 box OTC

DIRECTIONS (Questions 7a through 7l): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

7a. The active ingredient in Serevent is salmeterol. This agent can best be described as a (an)

(A) nonselective alpha-adrenergic agonist
(B) selective $beta_2$-receptor agonist
(C) nonselective beta-adrenergic agonist
(D) selective alpha-adrenergic antagonist
(E) selective $beta_2$-adrenergic antagonist

7b. In an acute asthmatic attack, the patient uses one inhalation of Serevent and, after 5 minutes, still has not been relieved. The patient should be advised to

(A) go to the local emergency room immediately
(B) administer a second inhalation if relief is not evident
(C) use the Proventil Aerosol product instead of the Serevent
(D) breathe into a paper bag for 6 minutes to increase the respiratory concentration of carbon dioxide
(E) inhale steam in order to increase the penetration of the salmeterol into the respiratory tract

7c. The Serevent Diskus product contains

(A) a drug solution for inhalation
(B) a drug powder for inhalation

(C) a glass nebulizer device
(D) a drug suspension for inhalation
(E) a buffered theophylline solution

7d. The Proventil Aerosol product contains

(A) bitolterol
(B) terbutaline
(C) ipratropium bromide
(D) albuterol
(E) zafirlukast

7e. When using Proventil Aerosol in an elderly patient, it may be necessary to use a

(A) nasal baffle
(B) nasal cannula
(C) spacer device
(D) nebulizer
(E) Busher injector

7f. In addition to an aerosol product, Proventil is also available as a

I. powder for inhalation
II. oral liquid
III. oral tablets

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

7g. Rotacaps are

(A) sustained-release capsules
(B) oral capsules that must be emptied into food before use
(C) capsules that contain a powder for inhalation
(D) enteric-coated capsules
(E) capsules containing ingredients separated by a membrane

7h. The active ingredient in Vanceril can best be described as a (an)

(A) corticosteroid
(B) leukotriene receptor antagonist
(C) respiratory surfactant
(D) bronchodilator
(E) anticholinergic

7i. When Proventil Aerosol and Vanceril Aerosol have been prescribed to be used at the same time

(A) the Vanceril should be used first
(B) a spacer device must be used
(C) the Proventil should be used first
(D) a saline aerosol should be administered first
(E) the prescriber must be contacted to discuss the drug interaction that will occur

7j. Which of the following is true of Nicoderm Patches?

I. They are applied for a 24-hour period.
II. They contain the same active ingredient as ProStep.
III. The area to which they are to be applied should be moistened before use.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

7k. An advantage of albuterol over isoproterenol is

(A) availability in a parenteral as well as an inhalation dosage form
(B) more rapid onset of action when inhaled
(C) fewer cardiac effects
(D) no need for refrigeration prior to use
(E) asthmatic control with single daily dosing

7l. Vanceril is most similar to

(A) Atrovent
(B) Tornalate
(C) Sustaire
(D) Maxair
(E) Beclovent

PROFILE NO. 8

Community Pharmacy Medication Record

Patient Name: Carlos Bodega
Address: 134 Bluebird Lane
Age: 61 Height: 5′6″
Sex: M Weight: 190 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. angina pectoris	1.
2. chronic alcoholism	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 1/14	40952	Krajec	Nitrostat 0.4 mg	#C	p.r.n.	3
2. 1/30	42772	Krajec	Nitro-Dur 0.1	#30	apply daily	
3. 2/26	42772	Krajec	Refill			
4. 3/16	42772	Krajec	Refill			
5. 4/7	42772	Krajec	Refill			
6. 4/28	50632	Krajec	Nitrolingual Spray	#1	p.r.n.	2
7. 4/28	50633	Krajec	Tranxene 7.5 mg	#30	1 t.i.d.	2
8. 4/28	50634	Krajec	Persantine 25 mg	#90	1 t.i.d.	3

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1.	3/2 Dristan Tabs (OTC)

DIRECTIONS (Questions 8a through 8k): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

8a. An advantage of Nitrostat over many other sublingual nitroglycerin products is that it is

(A) available in color-coded tablets
(B) longer acting
(C) more rapidly absorbed
(D) effective when used orally as well as sublingually
(E) less subject to potency loss

8b. Nitrostat should be dispensed

I. with a "Refrigerate" auxiliary label
II. in quantities not greater than 25 tablets
III. in its original container

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

8c. The patient should be advised to apply the Nitro-Dur to

I. the distal parts of the extremities
II. the same application site each time it is applied
III. a hairless site

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

8d. When discontinuing therapy with Nitro-Dur

(A) the dosage and frequency of application should be reduced gradually over a 4- to 6-week period
(B) the dosage and frequency of application should be reduced gradually over a 3-day period
(C) the number of hours per day that it is applied should be reduced gradually over 7 days
(D) severe nausea and vomiting may occur
(E) the patient should be advised to take prophylactic aspirin doses for 2 weeks prior to discontinuation

8e. An antianginal product administered by inhalation is

(A) pentaerythritol tetranitrate
(B) Nitrolingual Spray
(C) erythritol tetranitrate
(D) isosorbide dinitrate
(E) amyl nitrite

8f. In addition to being employed in the treatment of angina, dipyridamole (Persantine) is also used as a (an)

(A) antiviral agent
(B) antiarrhythmic agent
(C) antiplatelet agent
(D) antihypertensive agent
(E) nonsteroidal anti-inflammatory agent

8g. The reason why nitroglycerin products are generally NOT administered orally is because nitroglycerin

(A) will decompose rapidly in stomach acid
(B) is very irritating to GI membranes
(C) is decomposed rapidly by pepsin
(D) undergoes rapid first-pass deactivation
(E) is poorly absorbed from the GI tract

8h. Patients using nitroglycerin should be advised to AVOID the use of

I. alcohol
II. sildenafil
III. antihypertensive drugs

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

8i. Solutions of nitroglycerin intended for IV administration should be

(A) refrigerated until 30 min prior to administration
(B) administered using the administration set provided by the manufacturer
(C) warmed for 15 min prior to infusion to dissolve crystalline material
(D) given only by rapid IV injection
(E) kept covered with an opaque shield to protect it from decomposition

8j. When nitroglycerin topical ointment is administered,

I. it should be rubbed into the skin until no further ointment is evident on the skin surface
II. the area to which it is applied should not be occluded
III. the dose is measured in inches

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

8k. The most rapid onset of action is likely to occur with the use of

(A) Nitro-Dur
(B) Nitrolingual Spray
(C) Minitran
(D) Nitrogard
(E) Nitrodisc

PROFILE NO. 9

Community Pharmacy Medication Record

Patient Name: Carla Masterson
Address: 1845 Grand Ave.
Age: 32 Height: 5′4″
Sex: F Weight: 145 lb
Allergies: tetracyclines

DIAGNOSIS

Primary	Secondary
1. Type I diabetes mellitus	1.
2.	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 9/11	29087	Madison	Humulin R 100 U	10 mL	24 U q AM	5
2. 9/11	29088	Madison	Humulin N 100 U	10 mL	30 U mixed with Humulin R q AM	5
3. 9/11	29089	Madison	B-D Lo-Dose Syringes	#100		5
4. 9/11	29090	Madison	Glucometer Elite	#1	as directed	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 9/1	Optilets-M-500 Filmtabs #100
2. 9/11	Glucometer Elite Reagent Strips
3. 9/20	Contac 12-Hour Caplets (OTC)

DIRECTIONS (Questions 9a through 9m): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

9a. The term "type 1 diabetes mellitus" is also referred to as

(A) diabetes insipidus
(B) brittle diabetes
(C) adult-onset diabetes
(D) insulin-resistant diabetes
(E) insulin-dependent diabetes

9b. Which of the following is (are) true of Humulin R?

I. It is prepared by recombinant DNA technology.
II. It is a clear solution.
III. It is long-acting.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

9c. In order to measure 24 U of Humulin R, the patient must withdraw what quantity of insulin from the vial?

(A) 0.024 mL
(B) 2.4 mL
(C) It depends on the volume of the syringe.
(D) 0.24 mL
(E) Precise measurement of 24 U cannot be made with an insulin syringe.

9d. In examining the patient, the physician notes that the patient complains of polydipsia. This refers to

(A) excessive thirst
(B) excessive appetite
(C) excessive weight gain
(D) excessive urination
(E) multicolored rash

9e. Which of the following would be considered a normal fasting blood glucose level for this patient?

(A) 100 mg/L
(B) 100 μg/L
(C) 100 μg/dL
(D) 1 μg/mL
(E) 100 mg/dL

9f. The only insulin that is suitable for administration by IV infusion is

(A) Lente
(B) globin
(C) Regular
(D) human
(E) NPH

9g. In mixing the insulins prescribed, the patient should be advised

(A) to draw up the Humulin N first
(B) that the mixture may be stored in the syringe for up to 1 month if kept frozen
(C) that the mixture may be stored in the syringe for up to 1 month if kept refrigerated
(D) to draw up the Humulin R first
(E) that mixing these insulins is not advisable and the prescriber should be notified

9h. Which of the following insulins has the most rapid onset of action?

(A) NPH
(B) Regular
(C) Lispro
(D) Lente
(E) Semilente

9i. To use the Glucometer Elite device properly, patients must also use

I. lancets
II. syringes
III. ascorbic acid tablets

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

9j. The patient's use of Contac 12-Hour Caplets may

(A) precipitate ketoacidosis
(B) decrease the patient's insulin requirement
(C) increase the chance of lipodystrophy
(D) increase the chance of lipoatrophy
(E) increase the patient's insulin requirement

9k. Lo-Dose syringes have a capacity of

(A) 2 mL
(B) 0.5 mL
(C) 1.0 mL
(D) 0.25 mL
(E) 5 mL

9l. Which of the following antidiabetic products can be classified as a second-generation sulfonylurea?

I. Amaryl
II. Glucotrol
III. Precose

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

9m. A serious potential complication in the use of metformin HCl (Glucophage) in the treatment of diabetes mellitus is

(A) hyperbilirubinemia
(B) pancreatitis
(C) lactic acidosis
(D) encephalopathy
(E) aplastic anemia

PROFILE NO. 10

Community Pharmacy Medication Record

Patient Name: Carla Adams
Address: 199 West Way
Age: 51 Height: 5′7″
Sex: F Weight: 155 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. venous thrombosis	1.
2. hypothyroidism	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 5/3	89322	Graves	Warfarin 5 mg	#10	1 daily	
2. 5/12	90109	Graves	Warfarin 7.5 mg	#30	1 daily	
3. 5/21	91202	Graves	Warfarin 7.5 mg	#30	1 daily	
4. 6/18	91202	Graves	Refill			2
5. 7/15	91202	Graves	Refill			
6. 8/1	94388	Wilson	Synthroid 100 µg	#60	1 daily	5
7. 8/29	99733	Waxman	Empirin/Cod No. 3.	#30	1 b.i.d.	

DIRECTIONS (Questions 10a through 10l): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

10a. Warfarin is most closely related chemically to

(A) heparin
(B) alteplase
(C) ticlopidine
(D) dicumarol
(E) streptokinase

10b. Administration of which of the following drugs is likely to increase warfarin activity in this patient?

I. rifampin
II. carbamazepine
III. cimetidine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

10c. An appropriate antidote for the treatment of warfarin overdose is

(A) phytonadione
(B) EDTA
(C) protamine
(D) phenazopyridine
(E) methylene blue

10d. This patient asks the pharmacist for a recommendation for an OTC analgesic for her tennis elbow. Which of the following agents would be appropriate to recommend?

I. Datril
II. Advil
III. Ecotrin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

10e. If the pharmacist wished to dispense a generic form of Synthroid, which of the following would be used?

(A) levothyroxine
(B) liothyronine
(C) liotrix
(D) thyroglobulin
(E) propylthiouracil

10f. A dose of 100 μg of Synthroid is approximately equivalent to

I. Thyroid USP 60 mg
II. Cytomel 25 mcg
III. Levothroid 0.1 mg

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

10g. Which of the following may be used to treat hyperthyroidism?

I. propylthiouracil
II. methimazole
III. sodium iodide ^{131}I

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

10h. The use of Synthroid by this patient is likely to

(A) increase the dosage requirement for warfarin
(B) prevent the oral absorption of warfarin
(C) increase the likelihood of renal damage
(D) decrease the dosage requirement for warfarin
(E) increase the likelihood of hepatic damage

10i. In a radiation emergency, which of the following would be appropriate to administer?

(A) propylthiouracil
(B) liothyronine
(C) liotrix
(D) thyroglobulin
(E) potassium iodide

10j. Thyroid hormone synthesis is controlled by

(A) human chorionic gonadotropin
(B) oxytocin from the posterior pituitary
(C) FSH from the anterior pituitary
(D) TSH from the anterior pituitary
(E) LH from the anterior pituitary

10k. The use of Empirin/Codeine No. 3 by this patient is likely to

(A) increase the action of Synthroid
(B) decrease the action of Synthroid
(C) decrease the action of warfarin
(D) increase the action of warfarin
(E) cause agranulocytosis

10l. Which of the following laboratory determinations may be used to monitor the patient's progress on warfarin?

(A) BUN
(B) bilirubin
(C) PTT
(D) INR
(E) creatine kinase

PROFILE NO. 11

Hospital Pharmacy Medication Record

Patient Name: Lilly Besto
Room Number: 742
Age: 24 Height: 5′1″
Sex: F Weight: 135 lb
Allergies: aspirin, codeine

DIAGNOSIS

Primary	Secondary
1. chronic UTI	1. migraines
2.	2. PMS
3.	3.

LAB TESTS

Date	Test & Results
1. 7/14	Urinalysis pyuria, C&S = 1×10^6 E coli
2.	
3.	

MEDICATION RECORD

Date	Drug & Strength	Sig	DC'd
1. 7/15	Cipro 200 mg IV	q12h x 7 days	
2. 7/15	Pyridium 200 mg	1 t.i.d.	
3. 7/23	TMP-SMX	1 q12h	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 7/25	Patient discharged with following Rxs: Septra DS #20 1 q12h When completed, use Mandelamine 0.5 g q.i.d. for 2 weeks

DIRECTIONS (Questions 11a through 11n): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

11a. The term "pyuria" indicates the presence of what substance in the urine?

(A) pyruvate
(B) pyridoxine
(C) pus
(D) red blood cells
(E) pyrogens

11b. *Escherichia coli* may be described as

(A) pneumococci
(B) a systemic fungal organism
(C) gram-positive bacilli
(D) gram-negative bacilli
(E) a virus

11c. Drugs of choice for a UTI due to *E. coli* include

I. trimethoprim–sulfamethoxazole
II. ofloxacin
III. spectinomycin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

11d. The physician's order for TMP–SMX may be filled using

I. Trimox
II. Bactrim
III. Septra

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

11e. Which of the following products are classified as fluoroquinolones?

I. Penetrex
II. Floxin
III. Kantrex

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

11f. Patients consuming drugs such as Septra should be advised to

I. drink a large amount of fluids
II. maintain a very acidic urine
III. avoid the use of folic acid–containing products

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

11g. A patient wishes to test her urine to determine the presence of bacteriuria. Which of the following products would be suitable for this purpose?

(A) Ketostix
(B) Azostix
(C) Microstix-3
(D) Diastix
(E) Chemstrip K

11h. The Pyridium ordered for this patient can most accurately be classified as a (an)

(A) urinary antiseptic
(B) antimicrobial agent
(C) buffer
(D) antispasmodic
(E) analgesic

11i. This patient should be advised that Pyridium may cause

(A) discoloration of the urine
(B) migraines
(C) temporary weight gain
(D) dizziness
(E) temporary infertility

11j. Pyridium should not be administered for longer than

(A) 2 days
(B) 5 days
(C) 10 days
(D) 14 days
(E) 30 days

11k. Symptoms of premenstrual syndrome (PMS) may include all of the following EXCEPT

(A) backache
(B) cramping
(C) edema
(D) irritability
(E) weight loss

11l. Which of the following ingredients is (are) included in over-the-counter (OTC) PMS products?

I. caffeine
II. pamabrom
III. HCTZ

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

11m. When Mandelamine (methenamine mandelate) is used, the active drug produced in the body is

(A) ofloxacin
(B) alcohol
(C) benzalkonium chloride
(D) formaldehyde
(E) glutaraldehyde

11n. On 7/16, the patient was catheterized. Which of the following are appropriate urinary catheters?

I. Foley
II. Broviac
III. Hickman

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 12

Hospital Pharmacy Medication Record

Patient Name: Harry Lessard
Room Number: 241-2
Age: 64 Height: 5′11″
Sex: M Weight: 188 lb
Allergies: none reported

DIAGNOSIS

Primary	Secondary
1. chronic myelocytic leukemia	1. oral candida
2.	2.
3.	3.

LAB TESTS

Date	Test & Results
1. 6/4	WBC ($\times 10^3$) = 180; K = 4.5; Na = 138
2. 6/6	WBC ($\times 10^3$) = 115; K = 3.18; Na = 136
3. 6/8	WBC ($\times 10^3$) = 75; K = 3.1; Na = 134
4. 6/10	WBC ($\times 10^3$) = 6.5; K = 2.6; Na = 128
5. 6/12	WBC ($\times 10^3$) = 0.9; K = 3.0; Na = 132

MEDICATION RECORD

Date	Drug & Strength	Sig	DC'd
1. 6/4	Colace 100 mg	1 or 2 daily	
2. 6/4	Dalmane 15 mg	1 hs	
3. 6/4	Daunorubicin	45 mg/m2/day on days 1 to 3	
4. 6/4	Cytarabine	100 mg/m²/day on days 1 to 7	
5. 6/4	Allopurinol	300 mg b.i.d. × 10 days	
6. 6/7	Mycostatin Liq.	q3h × 10 days	
7. 6/7	Mitrolan tabs chew	1 q4h p.r.n.	

DIRECTIONS (Questions 12a through 12n): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

12a. The patient's body surface area in square meters can best be determined with the use of a

(A) caliper
(B) tape measure
(C) picogram
(D) nomogram
(E) micrometer

12b. Daunorubicin is available in vials containing 20 mg of the drug. Assuming that the patient's body surface area was determined to be 1.85 m^2, how many vials of daunorubicin need to be supplied for each day's administration?

(A) 5
(B) 1
(C) 10
(D) 2
(E) 3

12c. Cytarabine (Ara-C) can best be described as a (an)

(A) antibiotic
(B) mitotic inhibitor
(C) antimetabolite
(D) alkylating agent
(E) antiestrogen

12d. From the laboratory data provided, it appears that the patient is experiencing

(A) hypokalemia
(B) infection
(C) hyperkalemia
(D) myelosuppression
(E) hypernatremia

12e. In which age range is acute lymphocytic leukemia (ALL) most prevalent?

(A) < 15 yrs
(B) 20–30 yrs
(C) 30–50 yrs
(D) 50–70 yrs
(E) > 70 yrs

12f. Chemotherapeutic drugs classified as antimetabolites include

I. cyclophosphamide
II. carmustine
III. methotrexate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

12g. Allopurinol is pharmacologically classified as a (an)

(A) beta-adrenergic agonist
(B) MAO inhibitor
(C) xanthine oxidase inhibitor
(D) antimetabolite
(E) alkylating agent

12h. Patients using allopurinol should be advised to

(A) drink adequate fluids
(B) avoid dairy products
(C) expect urine discoloration
(D) avoid bruising
(E) take at least 1 g of vitamin C daily

12i. In order to monitor the use of allopurinol, determinations should be made of

(A) serum potassium
(B) serum folate
(C) urinary glucose
(D) serum uric acid
(E) urinary 5-HT

12j. An appropriate instruction for the use of Mycostatin liquid would be to

(A) take with a large glass of water
(B) swish and swallow
(C) take on an empty stomach
(D) mix it with fruit juice before administration
(E) allow product to stand until it thickens

12k. If extravasation occurred with the administration of daunorubicin, which of the following would be recommended?

(A) Inject subcutaneous epinephrine into the area.
(B) Insert a catheter into the injection site.
(C) Apply a corticosteroid cream to the injection site.
(D) Inject sodium bicarbonate solution into the injection site.
(E) Apply cold compresses to the injection site.

12l. Which of the following are serious adverse effects associated with daunorubicin administration?

I. ocular degeneration
II. nephrotoxicity
III. cardiotoxicity

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

12m. Although he sleeps well at night, Mr. Lessard appears to be unstable during the day and has fallen several times. The pharmacist should suggest that the Dalmane order be switched to

I. temazepam (Restoril)
II. triazolam (Halcion)
III. zaleplon (Sonata)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

12n. Mr. Lessard has been purchasing products from his local health food store. Which of the following ingredients are claimed to be sleep aids?

I. melatonin
II. L-tryptophan
III. ginseng

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 13

Hospital Pharmacy Medication Record

Patient Name: Cynthia Masterson
Room Number: 708-A
Age: 20 Height: 5′4″
Sex: F Weight: 125 lb
Allergies: tetracyclines

DIAGNOSIS

Primary	Secondary
1. PUD	1. recurrent diarrhea since 6/5
2. iron-deficiency anemia	2.
3.	3.

LAB TESTS

Date	Test & Results
1. 6/4	Hgb = 7.5 g%, Hct = 32.4%, MCHC = 26%, MCV = 76 μm^3, serum iron 440 µg%, TIBC = 450 µg% 4+ stool guaiac
2.	
3.	

MEDICATION RECORD

Date	Drug & Strength	Sig	DC'd
1. 6/4	Maalox Susp.	30 mL 1 hr & 3 hr pc	
2. 6/4	Prilosec 20 mg	1 daily	
3. 6/4	Xanax 0.5 mg	1 t.i.d.	
4. 6/5	Feosol 200 mg	1 t.i.d	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1.	Patient has been on Xanax since age 19.

DIRECTIONS (Questions 13a through 13n): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

13a. After 6 months of iron therapy, the patient's hemoglobin level should ideally be

(A) 2–4 g/dL
(B) 5–7 g/dL
(C) 8–10 g/dL
(D) 12–13 g/dL
(E) 15–18 g/dL

13b. Which one of the following drugs is most useful for increasing erythropoiesis?

(A) Epogen
(B) Folex
(C) Neupogen
(D) Intron A
(E) Neumega

13c. A possible cause of this patient's diarrhea is the use of

(A) Maalox
(B) Tagamet
(C) Feosol
(D) Xanax
(E) Kaopectate

13d. Omeprazole (Prilosec) can best be described as a (an)

(A) anticholinergic
(B) prostaglandin
(C) histamine H_2 antagonist
(D) proton pump inhibitor
(E) antiflatulent

13e. A drug interaction is likely to occur with the concomitant use of

I. Feosol and Maalox
II. Prilosec and Maalox
III. Prilosec and Feosol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

13f. Iron absorption may be increased by administering which of the following agents to this patient?

(A) docusate sodium
(B) ascorbic acid
(C) benzalkonium chloride
(D) pyridoxine hydrochloride
(E) desferal mesylate

13g. Feosol contains

(A) ferrous gluconate
(B) ferrous fumarate
(C) ferric chloride
(D) ferrous sulfate
(E) ferric ammonium citrate

13h. Ferrous sulfate is available in all of the following dosage forms EXCEPT

(A) elixir
(B) oral drops
(C) oral liquid
(D) parenteral injection
(E) tablets

13i. Examination of this patient's red blood cells is likely to reveal cells that are

I. microcytic
II. hyperchromic
III. megaloblastic

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

13j. Which of the following is most similar in action to Prilosec?

(A) Zantac
(B) Prevacid
(C) Carafate
(D) Cytotec
(E) Xenical

13k. Causes of megaloblastic anemia include a deficiency of

I. iron
II. folic acid
III. cyanocobalamin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

13l. Dietary sources rich in vitamin B_{12} include

I. apples
II. broccoli
III. liver

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

13m. Which of the following statements concerning pernicious anemia is (are) true?

I. The condition is caused by a deficiency in folic acid.
II. Higher incidence occurs in women than in men.
III. Occurrence appears to be both genetically and geographically based.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

13n. When discharged from the hospital, Ms. Masterson has been advised to start a smoking cessation program. Which of the following products are available as an inhaler?

I. Nicorette
II. Habitrol
III. Nicotrol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 14

Community Pharmacy Medication Record

Patient Name: Harry Gaines
Address: 43 Pine St.
Age: 38 Height:
Sex: M Weight: 180 lb
Allergies: chocolate

DIAGNOSIS

Primary	Secondary
1. mild hypertension	1. depression
2. noninsulin-dependent diabetes	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 6/4	132887	Long	HCTZ 25 mg	#60	1 qd	5
2.	132888	Long	Inderal 40 mg	#120	1 b.i.d.	5
3.	132889	Long	Diabinese 250 mg	#60	1 b.i.d	5
4.	132890	Long	Slow-K 8 mEq	#60	1 qd	5

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1.	Harry is a beer drinker; be sure to warn about possible drug/alcohol interactions.
2. 6/12	Harry purchased some diet tablets (containing PPA). Check his progress next time in store.

DIRECTIONS (Questions 14a through 14o): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

Questions 14a through 14f: On June 15, Harry Gaines brings into the pharmacy a new prescription for Ceclor capsules 250 mg # 21 with a Sig: 1 capsule t.i.d. until gone. He has been instructed by his physician to soak his swollen and infected thumb in alternate solutions of pHisoHex and epsom salts every 2 hours.

14a. The prescriber probably prescribed Ceclor because an infection was suspected to have been caused by

(A) *Chlamydia*
(B) *Proteus*
(C) *Pseudomonas*
(D) *Streptococcus*
(E) a fungus

14b. The active ingredient in Epsom Salts is

(A) sodium chloride
(B) magnesium chloride
(C) potassium chloride
(D) magnesium sulfate
(E) ammonium nitrate

14c. pHisoHex is considered effective in preventing infections caused by

I. fungi
II. gram-negative microorganisms
III. gram-positive microorganisms

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

14d. The active ingredient in Hibiclens is

(A) benzalkonium chloride
(B) chlorhexidine gluconate
(C) glutaraldehyde
(D) hexachlorophene
(E) iodine

14e. Which one of the following pairings of active ingredient to product is INCORRECT?

(A) chlorhexidine–Hibistat
(B) chlorhexidine–Peridex
(C) iodine–Betadine
(D) iodine–Cidex
(E) benzalkonium chloride–Ionax

14f. The solubility of Epsom Salt in water is 1 g in 0.8 mL of water. How many grams of the salts should be added to 4 fluid ounces of water to make a saturated solution?

(A) 17 g
(B) 38 g
(C) 67 g
(D) 120 g
(E) 150 g

14g. Mr. Gaines requests a bottle of Percogesic. Which one of the following statements concerning Percogesic is true?

(A) The active ingredient is acetaminophen only.
(B) The active ingredients are acetaminophen and aspirin.
(C) One of the active ingredients is phenyltoloxamine citrate.
(D) A prescription is required for dispensing.
(E) One of the active ingredients is an antacid.

14h. Mr. Gaines and his wife are planning a trip to an area of Central America that has poor sanitary facilities. Which one of the following products may both prevent and treat travelers' diarrhea?

(A) Kaopectate
(B) metronidazole
(C) Mylanta
(D) Rolaids
(E) Pepto-Bismol

14i. Prescription drugs that are effective for travelers' diarrhea include

I. fluoroquinolones
II. trimethoprim and sulfamethoxazole
III. penicillins

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

14j. Mr. Gaines has returned from his trip with an infection of giardiasis. Which of the following drugs may successfully treat this condition?

I. cefadroxil
II. metronidazole
III. quinacrine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

14k. A week after deer hunting, Mr. Gaines exhibits symptoms of Lyme disease. Which of the following statements is (are) true of this condition?

I. Early signs are a skin rash and malaise.
II. Late stages often result in chronic arthritis.
III. The disease is caused by a protozoan.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

14l. Successful treatment of Lyme disease includes

I. doxycycline 100 mg b.i.d.
II. ceftriaxone 2 g IV daily
III. metronidazole 500 mg daily

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

14m. Mr. Gaines has read that aspirin will decrease the chance of heart attacks. How many 325-mg tablets should he be advised to take as a realistic dose?

(A) 1 or less tablets daily
(B) 1 or 2 tablets daily
(C) 1 tablet twice a day
(D) 1 tablet three times a day
(E) 1 tablet four times a day

14n. The active ingredient in Kaopectate liquid that acts as an absorbent is

(A) attapulgite
(B) bentonite
(C) kaolin
(D) charcoal
(E) simethicone

PROFILE NO. 15

Hospital Pharmacy Medication Record

Patient Name: Timothy Gurley
Room Number: 420-2
Age: 26 Height: 6′2″
Sex: M Weight: 142 lb
Allergies: pollen, dust

DIAGNOSIS

Primary	Secondary
1. duodenal ulcer	1. epilepsy (stabilized)
2. bipolar disorder	2.
3.	3.

MEDICATION RECORD

Date	Drug & Strength	Sig	DC'd
1. 2/4	Dilantin 100-mg capsules	3 daily	
2. 2/4	Brethaire Aero.	2 inhalations qid	
3. 2/4	Clarithromycin 500 mg	b.i.d.	
4. 2/6	Ranitidine bismuth citrate 400 mg	1 b.i.d.	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1.	

DIRECTIONS (Questions 15a through 15n): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

15a. In filling the order for ranitidine bismuth citrate the pharmacist should dispense

(A) Zantac
(B) Tritec
(C) Titralac
(D) Riopan
(E) Cytotec

15b. Mr. Gurley has poor muscle coordination. The medical term that corresponds to this condition is

(A) ataxia
(B) atresia
(C) aphasia
(D) dementia
(E) dysarthria

15c. Clarithromycin (Biaxin) is in the same pharmacological class as

I. Sporanox
II. Vancocin
III. Zithromax

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15d. Zollinger–Ellison syndrome is the result of adenomas in the

(A) gallbladder
(B) liver
(C) stomach
(D) pancreas
(E) sigmoid colon

15e. In administering the dose of Brethaire, the two inhalations provided in each dose should be separated by

(A) 1 minute
(B) 5 minutes
(C) 10 minutes
(D) 30 minutes
(E) 60 minutes

15f. If a physician decides to maintain Mr. Gurley on lithium therapy as an outpatient, which of the following guidelines should be followed?

I. an oral dosing range of 900 to 1500 mg daily
II. plasma lithium levels between 2 and 4 mEq/L
III. blood sampling 2 h after dosing

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15g. After 1 week of lithium therapy with a dosage regimen of 600 mg b.i.d., the patient is experiencing mild hand tremors and polyuria. The pharmacist should consult with the prescriber concerning the possibility of

(A) giving the drug on a 300 mg q.i.d. schedule
(B) increasing the dosage to 1500 mg daily
(C) decreasing the dosage to 600 mg daily
(D) giving the drug once a day in the morning
(E) discontinuing the drug

15h. Lithium is probably being prescribed

(A) to treat acute manic episodes
(B) as an anti-Parkinson drug
(C) as a hypnotic agent
(D) to treat status epilepticus
(E) to treat schizophrenia

15i. Five days after discharge from the hospital, Mr. Gurley brings an antibiotic prescription into the pharmacy. He asks for an explanation of the term "nosocomial infection." The pharmacist can best explain nosocomial as being

(A) communicable
(B) hospital-related
(C) drug-related
(D) unknown origin
(E) noncommunicable

15j. Mr. Gurley presents the pharmacist with a new prescription for Paxil 20 mg, which has the generic name of

(A) pramipexole
(B) promazine
(C) paraldehyde
(D) paroxetine
(E) phenelzine

15k. The antidepressant activity of Paxil is thought to be due to

(A) binding to beta-adrenergic receptors
(B) prevention of reuptake of serotonin
(C) blockage of reuptake of norepinephrine
(D) blockage of reuptake of dopamine
(E) being a dopamine antagonist

15l. Which of the following agents are classified in the same pharmacological group as Paxil?

I. Luvox
II. Celexa
III. Zyprexa

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15m. Patients using Dilantin occasionally develop gingival hyperplasia. This is a disorder of the

(A) reproductive organs
(B) liver
(C) hemopoietic system
(D) gums
(E) teeth

15n. Mr. Gurley is very apprehensive about using an antidepressant drug. The pharmacist may inform him that

I. the drug may not show beneficial effects for several weeks
II. the incidence of individuals becoming addicted or dependent on this class of drugs is very low
III. as soon as beneficial effects are observed, he will then be able to stop taking the drug

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 16

Community Pharmacy Medication Record

Patient Name: Paula Johnson
Address: 27 Green St.
Age: 38 Height: 5′8″
Sex: F Weight: 150 lb
Allergies: sulfa drugs, tartrazine, bee stings

DIAGNOSIS

Primary	Secondary
1. mild hypertension	1.
2. UTI	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 6/12	87773	Flynn	Ortho-Novum 1/35	3 pack	1 daily ut dict	2×
2. 6/12	87774	Flynn	HCTZ 25 mg	#100	1 daily	1×
3. 7/1	89940	Collins	Amoxil 250 mg	#30	1 q8h	1×

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 8/5	Ms. Johnson returns to the pharmacy and complains that her urinary tract infection has returned. She asks if she should take the remaining 20 capsules from her 7/1 prescription or call her doctor. She admits that the pills seemed to help.

DIRECTIONS (Questions 16a through 16n): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

16a. The pharmacist should advise Ms. Johnson to

(A) finish the remaining capsules
(B) call the doctor for an increase in the Amoxil dose
(C) ask the doctor for another, more effective drug
(D) get a partial refill of Amoxil and use a total of 30 capsules
(E) use up the remaining 30 capsules but drink cranberry juice at the same time

16b. Bacteriuria is considered present when the bacteria count in the urine exceeds _____ bacteria/mL.

(A) 100
(B) 1000
(C) 10,000
(D) 100,000
(E) 500,000

16c. Dr. Collins calls the pharmacy on Sept. 2 stating that Ms. Johnson has been noncompliant in completing regimens of therapy for her uncomplicated UTI. Which of the following single-dose regimens is (are) appropriate?

I. Amoxil 500 mg 6 capsules
II. Fosfomycin 3g
III. Cipro 250 mg 4 capsules

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

16d. Acidification of the urine may be accomplished by the oral ingestion of

I. ascorbic acid, 6 g/day
II. ammonium chloride, 2–3 g/day
III. calcium carbonate, 10 tab/day

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

16e. Ms. Johnson is concerned about the obesity of her 15-year-old daughter, Jenny, and requests a bottle of Dexatrim. Which of the following is (are) present in this OTC product?

I. benzocaine
II. caffeine
III. phenylpropanolamine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

16f. Obesity has been attributed to which of the following factors?

I. anxiety but not depression
II. derangement in the satiety center
III. genetic influences

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

16g. Which of the following drugs may be prescribed for the treatment of a patient with bulimia?

I. fluoxetine
II. risperidone
III. methylphenidate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

16h. Besides its use as an appetite suppressant, phenylpropanolamine is included in pharmaceutical products as a (an)

(A) antihistamine
(B) antihypertensive agent
(C) local anesthetic
(D) nasal decongestant
(E) sleep aid

16i. Side effects of phenylpropanolamine may include any of the following EXCEPT

(A) constipation
(B) dry mouth
(C) hypertension
(D) mydriasis
(E) sedation

Questions 16j through 16n are based on the following prescription presented to the pharmacist by Ms. Johnson.

Rx	
Menthol	
Camphor	aa qs 1%
LCD	2%
Lubriderm	qs 120 mL

16j. The physical form of the final compounded prescription is most likely to be a (an)

(A) ointment
(B) lotion
(C) topical solution
(D) gel
(E) paste

16k. The amount of menthol required for this prescription is

(A) 0.3 g
(B) 0.5 g
(C) 0.6 g
(D) 1.0 g
(E) 1.2 g

16l. When preparing this ointment, the pharmacist may choose to

I. make a eutectic of the menthol and camphor
II. add isopropyl alcohol to dissolve the menthol and camphor
III. add polysorbate 80 (Tween 80) to solubilize the LCD

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

16m. The previous prescription is most likely written for the treatment of

(A) dermatitis due to poison ivy
(B) insect bites
(C) acne
(D) localized abscesses
(E) psoriasis

16n. Patients using coal tar products should be cautioned that such products

I. may cause photosensitization
II. may have carcinogenic potential if placed on the rectal, genital, or groin area
III. should not be used as a shampoo

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 17

Hospital Pharmacy Medication Record

Patient Name: Leonard Coster
Room Number: 612-2
Age: 62 Height: 5′11″
Sex: M Weight: 122 lb
Allergies: NK

DIAGNOSIS

Primary	Secondary
1. CA colon	1. hypertension
2.	2. lung rales
3.	3.

LAB TESTS

Date	Test & Results
1. 10/6	WBC 8000
2.	Hemoglobin 15 g/dL Hematocrit 40%
3.	Glucose 100 mg/dL
4. 10/6	BUN 10 mg/dL
5.	Serum creatinine 1 mg/dL
6.	Albumin 4 g/dL
7. 10/7	Electrolytes: Na = 138 mEq; K = 4 mEq; Cl = 120 mEq/L

MEDICATION RECORD

Date	Drug & Strength	Sig	DC'd
1. 10/5	Digoxin 0.25 mg	1 qd p.o.	
2. 10/5	Propranolol 40 mg	1 b.i.d. p.o.	
3. 10/5	Colace 100 mg	p.r.n.	
4. 10/5	Dalmane 30 mg	1 hs p.r.n.	
5. 10/6	GoLytely	Bt 24 h pre- surgery	
6. 10/7	usual pre-op per Dr. Lachman		
7. 10/8	Start TPN 1 L post-op 1st day then 3 L daily; after 1st day start 500 mL Liposyn III 20% q.o.d		

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment	
1. 10/8	Start following TPN as directed	
	Amino acid sol. 8.5%	500 mL
	$D_{40}W$	500
	Calcium chloride	8.6 mEq
	Potassium Cl	40
	NaCl	40
	MVI	1 vial
	Insulin	10 units
	Rate—50 mL 1st hr then 100 mL per hour	

DIRECTIONS (Questions 17a through 17o): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

17a. Based on the reported lab tests, Mr. Coster is likely to have

(A) a systemic infection
(B) an anemic condition
(C) diabetes
(D) renal impairment
(E) none of the above

17b. Usually, antibiotic prophylaxis for surgical patients is started

(A) 4 hours before surgery
(B) 1–2 hours before surgery
(C) during surgery
(D) 1 hour after surgery
(E) 4 hours after surgery,

17c. Docusate sodium (Colace) can best be described as a (an)

(A) nonionic surfactant
(B) absorbent
(C) cationic surfactant
(D) adsorbent
(E) anionic surfactant

17d. The order for GoLYTELY (PEG/Electrolyte solution) is intended to

(A) supply additional electrolytes to the blood
(B) supply electrolytes to the GI tract
(C) cleanse the GI tract
(D) provide bulk in the GI tract
(E) supply carbohydrates to the body

17e. When selecting a commercial amino acid solution for the TPN order, the pharmacist would consider

I. Aminosyn
II. FreAmine
III. NephrAmine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

17f. Suitable route(s) of administration for Mr. Coster's TPN solution include(s)

I. peripheral infusion
II. enteral infusion
III. central infusion

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

17g. Before compounding the ordered TPN formula, the prescriber should be consulted concerning the

I. high level of chlorides
II. level of dextrose
III. amount of multivitamins desired

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

17h. The amount of nitrogen provided by each liter of the TPN formula will be approximately _____ g.

(A) 6.8
(B) 14
(C) 36
(D) 42.5
(E) 85

17i. The number of nonprotein calories present in each bottle will be approximately _____ kcal.

(A) 680
(B) 800
(C) 1200

(D) 1540
(E) 1800

17j. The target ratio of nonprotein calories to grams of nitrogen for TPN formulas in a nonstressed patient is approximately

(A) 1:1
(B) 50:1
(C) 150:1
(D) 250:1
(E) 500:1

17k. The administration of Liposyn III is intended to prevent

(A) agranulocytosis
(B) decubitus ulcers
(C) EFAD
(D) BEE
(E) phlebitis

17l. The number of calories provided by each bottle of Liposyn III will be

(A) 100
(B) 500
(C) 1000
(D) 1200
(E) 1500

17m. After 4 days, the patient's surgical scar has not healed and a bedsore has developed on the buttocks. Which one of the following ingredients has been shown to speed wound-healing processes?

(A) ascorbic acid
(B) folic acid
(C) iron
(D) selenium
(E) zinc

17n. On the fifth day, the patient exhibits symptoms of Legionnaires' disease. Which of the following statements is (are) true concerning this disease?

I. Causative agent is a fungus.
II. Transmission is by airborne inhalation.
III. Smokers are more susceptible than the general population.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

17o. The drug of choice in the treatment of Legionnaires' disease is

(A) cefaclor
(B) erythromycin
(C) gentamicin
(D) penicillin VK
(E) acyclovir

PROFILE NO. 18

Hospital Pharmacy Medication Record

Patient Name: Anthony Costello
Room Number: 621
Age: 42 Height: 5′4″
Sex: F Weight: 132 lb
Allergies: aspirin, hay fever

DIAGNOSIS

Primary	Secondary
1. Hodgkin's disease	1. Graves' disease
2.	2. essential hypertension (under control with diet)
3.	3. allergies

LAB TESTS

Date	Test & Results
1. 6/12	SMA-12

MEDICATION RECORD

Date	Drug & Strength	Sig	DC'd
1. 6/12	propylthiouracil 50 mg	2 b.i.d.	
2.	mechlorethamine	6 mg/m² on day 1	
3.	procarbazine	100 mg/m²	
4.	prednisone	40 mg daily	
5.	vincristine	2 mg on day 1	
6.	Dalmane 30 mg	1 hs p.r.n.	
7.	Colace 100 mg	1 qd	
8.	APAP	2 tabs p.r.n. fever	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 6/12	Start MOPP therapy on 6/14 if blood work results are normal.

DIRECTIONS (Questions 18a through 18l): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

18a. Which of the drugs used by this patient is indicated for the treatment of Graves' disease?

(A) mechlorethamine
(B) prednisone
(C) procarbazine
(D) propylthiouracil
(E) vincristine

18b. Which of the following drug(s) is (are) administered orally during MOPP treatment?

I. mechlorethamine (Mustargen)
II. procarbazine (Matulane)
III. prednisone

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

18c. Which one of the following forms of cancer is least responsive to chemotherapy?

(A) hepatocellular
(B) hodgkin's
(C) ovarian
(D) prostate
(E) testicular

18d. Vincristine is available under the trade name of

(A) Adriamycin
(B) Oncovin
(C) Platinol
(D) Blenoxane
(E) Novantrone

18e. The intern reports that Mrs. Costello is experiencing extravasation of the mechlorethamine (Mustargen). Which one of the following courses of treatment should be initiated?

(A) Apply warm compresses immediately.
(B) Infiltrate 1/6 molar sodium thiosulfate into area and apply ice compresses.
(C) Infiltrate epinephrine 1:1000 into area.
(D) Infuse heparin sodium 20,000 units into area.
(E) Withdraw infusion needle and apply compresses of sodium thiosulfate 10% W/V.

18f. How many grams of sodium thiosulfate USP ($Na_2S_2O_3 \cdot 5\ H_2O$; mol. wt. = 248) are needed to prepare 100 mL of 1/6 molar solution?

(A) 2.1 g
(B) 4.1 g
(C) 7.5 g
(D) 14.9 g
(E) 24.8 g

18g. The pharmacy has only the anhydrous form of the chemical mentioned in Question 18f. How many grams are needed to prepare the solution? ($Na_2S_2O_3 \cdot 5\ H_2O = 248$; $H_2O = 18$)

(A) 1.3 g
(B) 2.6 g
(C) 3.8 g
(D) 5.6 g
(E) 0 (because anhydrous form cannot be used)

18h. Adverse effects of chemotherapeutic agents, such as bone marrow depression, pass through three stages—onset, maximum depression, and recovery to normal. Which one of the following terms is used to indicate the time for maximum depression?

(A) climb
(B) lag time
(C) retention time
(D) nadir
(E) suppression time

18i. Which one of the following drugs can be included in chemotherapy with little expectation of bone marrow depression?

(A) cyclophosphamide
(B) ifosfamide
(C) cisplatin
(D) doxorubicin
(E) vincristine

18j. Which of the following agents would be appropriate to administer to a patient on chemotherapy with mechlorethamine?

I. Epogen (epoetin alfa)
II. Neupogen (filgrastim)
III. Plavix (clopidogrel)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

18k. The physician orders weekly injections of cyanocobalamin (vitamin B_{12}). Which of the following routes of administration are appropriate?

I. subcutaneous
II. intramuscular
III. intravenous

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

18l. Mr. Costello requires an antihistamine for the treatment of his allergies. Which of the following is an antihistamine suitable for Mr. Costello's needs?

I. Zyrtec (cetirizine)
II. Claritin (loratidine)
III. Allegra (fexofenadine)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 19

Hospital Pharmacy Medication Record

Patient Name: Jill Lattimer
Room Number: 604-2
Age: 48 Height: 5′10″
Sex: F Weight: 140 lb
Allergies: None known

DIAGNOSIS

Primary	Secondary
1. CA ovaries	1. essential hypertension
2.	2.
3.	3.

MEDICATION RECORD

Date	Drug & Strength	Sig	DC'd
1. 5/2	HCTZ 50 mg	1 qd	
2.	Colace 100 mg	1 every am	
3.	Lasix 40 mg	1 daily p.o.	
4.	Restoril 15 mg	1 hs p.r.n.	
5. 5/6	Start following therapy in morning and discharge patient: (1) Valium 10 mg p.o. 4 hr. pre-op (2) Doxorubicin 50 mg IV (3) Cisplatin 50 mg IV (4) Cyclophosphamide 700 mg IV		

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 5/7	Scheduled follow-up therapy every 4 weeks for total of five more sessions with usual blood work.

DIRECTIONS (Questions 19a through 19p): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

19a. Doxorubicin is available as

(A) Adriamycin
(B) CeeNU
(C) Cytosar-U
(D) Vepesid
(E) Cytoxan

19b. Ms. Lattimer should be warned of the possibility of alopecia when using which of the following drugs?

I. cisplatin
II. cyclophosphamide
III. doxorubicin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19c. Significant side effects of doxorubicin include

I. cardiomyopathy
II. leukopenia
III. hepatotoxicity

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19d. The dose of cyclophosphamide being administered to Ms. Lattimer is

(A) 5 mg/kg
(B) 11 mg/kg
(C) 24 mg/kg
(D) 700 mg/lb
(E) 700 mg/kg

19e. The pharmacist may wish to suggest the addition of granisetron (Kytril) to Ms. Lattimer's therapy. This drug is used as a (an)

(A) antiemetic
(B) antihistamine
(C) local anesthetic
(D) antidepressant
(E) antivesicant

19f. After two courses of therapy, Ms. Lattimer's serum creatinine level is 3 mg/dL. The physician should be consulted to

(A) increase Lasix dose
(B) decrease cisplatin dose
(C) decrease cyclophosphamide dose
(D) decrease doxorubicin dose
(E) decrease Lasix dose

19g. A toxic effect commonly observed in patients receiving cyclophosphamide (Cytoxan) therapy is

(A) diabetes mellitus
(B) hemorrhagic cystitis
(C) diabetes insipidus
(D) hepatotoxicity
(E) mental confusion

19h. Leucovorin (folinic acid) may be required after the administration of high doses of

(A) cisplatin
(B) doxorubicin
(C) cyclophosphamide
(D) methotrexate
(E) vincristine

19i. For which of the following drugs is the intrathecal route of administration acceptable?

I. thiotepa
II. methotrexate
III. vincristine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19j. A potential side effect(s) of long-term treatment with methotrexate is (are)

I. hepatotoxicity
II. rheumatoid arthritis
III. nephrotoxicity

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19k. Methotrexate is available in which of the following dosage forms?

I. oral solution
II. oral tablets
III. lyophilized powder for injection

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19l. Antiemetics available in both oral and injectable dosage forms include

I. dronabinol (Marinol)
II. granisetron (Kytril)
III. ondansetron (Zofran)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19m. Which of the following chemotherapeutic agents is (are) appropriate for the indicated disease?

I. etoposide (Vepesid) for testicular tumors
II. mercaptopurine (Purinethol) for leukemia
III. paclitaxel (Taxol) for breast cancer

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19n. Ms. Lattimer brings a new prescription into your pharmacy for Vasotec. The generic name for this drug product is

(A) fosinopril
(B) lisinopril
(C) labetalol
(D) captopril
(E) enalapril

19o. The mode of action of Vasotec for hypertension is as a (an)

(A) alpha-adrenergic blocking agent
(B) beta-adrenergic blocking agent
(C) angiotensin II antagonist
(D) calcium-channel-blocking agent
(E) angiotensin-converting enzyme (ACE) inhibitor

19p. When dispensing the Vasotec prescription, the pharmacist should counsel the client that the drug may cause

I. dry coughing
II. precipitous fall in blood pressure during initial dosing
III. reflex tachycardia

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 20

Community Pharmacy Medication Record

Patient Name: David Tralor
Address: RD4, Masterson, OH
Age: 75 Height:
Sex: M Weight:
Allergies: NK

DIAGNOSIS

Primary	Secondary
1. mild hypertension	1. arthritis left hand
2. suspected high cholesterol	2. peptic ulcer (under control)
3. CHF	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 2/2	43568	Lange	Digoxin 0.25 mg	#30	1 q AM	6 mos
2.	43569	Lange	Furosemide 20 mg	#60	1 q AM	6 mos
3.	43570	Lange	Slow-K 8 mEq	100	1 qd with food	1×
4. 3/1	44490	Lange	HCTZ 25 mg	#30	1 qd	6 mos
5.	refill	Lange	Digoxin 0.25 mg	#30	1 qd	
6.	45004	Lange	Colestipol	500 g	tsp daily ut dict	Refill
7. 4/5	44242	Levy	Zyloprim 100 mg	#100	b.i.d.	2×
8. 5/6	45037	Lange	Verapamil 80 mg	#100	1 qd	1×
9.	45038	Lange	Mevacor	#30	qd	1×

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 4/1	Client complained about difficulty in taking the colestipol. Suggest he talk to MD about another product. Also that he should have his swollen hand checked—acute gout?
2. 4/6	Patient purchased slow-release niacin 250 mg.

DIRECTIONS (Questions 20a through 20n): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

20a. The pharmacist should consult Dr. Lange concerning

I. Mr. Tralor's compliance with HCTZ
II. the desired strength of Mevacor
III. a potential interaction between digoxin and verapamil

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20b. Verapamil is best classified as a (an)

(A) adrenergic blocking agent
(B) calcium-channel blocker
(C) ganglionic blocking agent
(D) saluretic
(E) vasopressor

20c. Verapamil is indicated for the treatment of

I. hypertension
II. angina
III. atrial flutter

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20d. Oral doses of verapamil undergo significant first-pass effect. This fact can be deduced from which of the following true statements?

I. The dose required for parenteral administration is much lower than oral dosing.
II. The apparent volume of distribution is high (420 L).
III. The drug is approximately 90% protein bound in the blood.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20e. The pharmacist will counsel Mr. Tralor to consume the Mevacor

(A) before breakfast
(B) with breakfast
(C) after breakfast
(D) with any meal
(E) with the evening meal

20f. When selecting a generic source of furosemide tablets, the pharmacist reviews the following relationships between brands A, B, C, and D:

Disintegration times A > B > C > D
Dissolution times C < B < A < D

Which brand should the pharmacist select as probably having the greatest bioavailability?

(A) A
(B) B
(C) C
(D) D
(E) Either A or B

20g. Niacin (nicotinic acid) is probably being consumed

(A) to reduce stress
(B) to prevent or treat peripheral neuritis
(C) to prevent or treat beriberi
(D) to improve the absorption of digoxin
(E) to reduce cholesterol levels

20h. Patients receiving niacin may experience

I. constipation
II. GI disorders
III. flushing

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20i. A desirable and realistic level of total cholesterol in the blood for an adult is

(A) < 100 mg/dL
(B) < 200 mg/dL
(C) < 250 mg/dL
(D) < 300 mg/dL
(E) < 500 mg/dL

20j. A significant increased risk of heart disease occurs when which of the following is (are) elevated?

I. HDL
II. LDL
III. VLDL

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20k. Which one of the following antihyperlipidemic agents is considered the most potent?

(A) cholestyramine
(B) colestipol
(C) gemfibrozil
(D) lovastatin
(E) simvastatin

20l. Cholestyramine has the tendency to bind

I. components of bile
II. weakly acidic drugs
III. weakly basic drugs

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20m. Which of the following statements concerning alcohol are true?

I. Marked mental impairment occurs when blood levels are > 100 mg/dL.
II. Alcohol is oxidized to acetaldehyde in the body.
III. The metabolism of alcohol follows first-order kinetics exclusively.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

20n. Deficiencies in which of the following vitamins are especially dangerous in the alcoholic patient?

I. folic acid
II. thiamine
III. ascorbic acid

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 21

Community Pharmacy Medication Record

Patient Name: Laura Jackson
Address: 12 Comfort Lane
Age: 77 Height: 5′4″
Sex: F Weight: 112 lb
Allergies: sensitive to aspirin, sulfas; limit chocolates

DIAGNOSIS

Primary	Secondary
1. parkinsonism	1. mild anemia
2. glaucoma	2. stroke (1 yr ago)
3. CHF	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 8/4	82542	Puleo	Fe Sulfate 250 mg	60	1 q AM	2×
2.	82543	Puleo	Synthroid 50 mg	60	1 q AM	2×
3.	82544	Puleo	Digoxin 0.25 mg	100	1 qd	1×
4. 9/28	82543	Puleo	Synthroid 50 μg	60	1 q AM	1×
5.	89680	Puleo	Fe Sulfate 250 mg	100	2 q AM	2×
6. 10/4	89890	Collins	Amantadine Syr	8 oz	2 tsp b.i.d.	1×

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1.	Do not use child-resistant closures.
2.	Laura is sometimes confused; explain all medicines to her. Whenever possible, suggest she take medications first thing in the AM with breakfast.
3.	OTCs—Mylanta 15 mL q AM and PM Tums—1 every night Vitamin C—500 mg q AM

DIRECTIONS (Questions 21a through 21n): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

21a. Synthroid was prescribed to control

(A) hypothyroidism
(B) hyperthyroidism
(C) Graves' disease
(D) hyperparathyroidism
(E) hypoparathyroidism

21b. If Mrs. Jackson misses a dose of Synthroid, she should be instructed to

(A) double the following morning's dose
(B) take 1½ tablets the following morning
(C) increase her intake of iodized salt
(D) call her physician for advice
(E) continue with normal dosing the following morning

21c. When questioned about her recent weight loss, Mrs. Jackson admitted that her breakfast and lunch consisted of two pieces of toast and herbal tea sweetened with Equal. The active ingredient in Equal is

(A) lactulose
(B) aspartame
(C) fructose
(D) saccharin
(E) sucrose

21d. Factors contributing to Mrs. Jackson's poor blood iron levels may be

I. consumption of herbal tea
II. antacid consumption
III. daily consumption of vitamin C

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

21e. Amantadine may have been prescribed

I. to protect against influenza B
II. to protect against influenza A
III. to treat parkinsonism

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

21f. Mrs. Jackson's daughter is worried that her mother is showing symptoms of Alzheimer's disease. Which one of the following is the earliest symptom of this disease?

(A) incontinence
(B) inability to learn new skills
(C) loss of recent memory
(D) loss of remote memory
(E) wandering

21g. Drugs currently in use for Alzheimer's include

I. selegiline (Eldepryl)
II. donepezil (Aricept)
III. tacrine Cognex)

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

21h. Most drugs currently used to treat Alzheimer's disease are

I. cholinesterase inhibitors
II. administered parenterally
III. able to reverse the progression of the disease if used regularly

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

21i. Which of the following would be appropriate to administer in treating a digoxin overdose?

I. digoxin immune FAB
II. potassium chloride
III. amiodarone

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

21j. For this patient, the evening dose of Tums is probably intended to

(A) decrease gastric secretions
(B) decrease gastroesophageal reflux
(C) prevent osteoporosis
(D) provide magnesium ions
(E) improve the absorption of digoxin

21k. Pharmacokinetic changes in the elderly often include increases in

I. proportional amount of body fat
II. plasma albumin levels
III. renal clearance

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

21l. Based on the following data, determine how many milliliters of digoxin elixir is needed to replace a daily 0.25-mg dose of digoxin tablets.

	Strength	**"F value"**
Digoxin tablet	0.25 mg	0.6
Digoxin elixir	0.05 mg/mL	0.75

(A) 3 mL
(B) 3.8 mL
(C) 4 mL
(D) 5 mL
(E) 6.4 mL

21m. An early sign of digoxin toxicity in Mrs. Jackson is likely to be

(A) hazy vision
(B) hearing impairment
(C) tinnitus
(D) yellowish skin
(E) increased appetite

21n. The pharmacist may need to suggest an adjustment in the dosing of digoxin if the patient is placed on

I. amiodarone
II. quinidine
III. verapamil

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 22

Hospital Pharmacy Medication Record

Patient Name: Paula Riley
Room Number: ER
Age: 28 Height: 5´6˝
Sex: F Weight: 145 lb
Allergies: penicillin, sulfas

DIAGNOSIS

Primary	Secondary
1. gravid	1. colitis
2. severe cramps	2. COPD (since childhood)
3.	3.

LAB TESTS

Date	Test & Results
1. 7/12	SMA-12
2.	blood profile
3.	blood typing

MEDICATION RECORD

Date	Drug & Strength	Sig	DC'd
1. 7/13	D_5W 1 L daily	KVO	
2.	Terbutaline 25 µg/min then 0.5 mg sc q4hr		
3.	Restoril	1 hs prn	
4.	Colace 100 mg	1 qd	
5.	APAP	2 tabs prn. fever	
6. 7/15	KCl 40 mEq in D_5NS	1 L tid.	
7.	Barium sulfate admin per usual/ Dr. Cooper orders		
8. 7/16	Atropine 4 mg chlorpromazine 12.5 mg preop		

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 7/13	Patient being transfered to room 434b. Continue tocolytic therapy.

DIRECTIONS (Questions 22a through 22n): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

22a. Terbutaline is being used as a tocolytic agent. The term tocolytic refers to a drug that

(A) increases GI tract tone
(B) reduces GI tract motility
(C) reduces uterine contractility
(D) prevents emesis
(E) dilates bronchioles

22b. A trade name product of terbutaline is

(A) Alupent
(B) Brethine
(C) Pamelor
(D) Proventil
(E) Terazol

22c. The pharmacist places 2 mL of terbutaline injection (1 mg/mL) into 250 mL of D_5W. How many drops per minute will be needed to deliver the terbutaline if the administration set delivers 15 drops to the mL?

(A) 6
(B) 11
(C) 23
(D) 46
(E) 120

22d. As prepared, how long will it take to administer the entire admixture in Question 22c?

(A) 40 min
(B) 80 min
(C) 100 min
(D) 160 min
(E) 480 min

22e. Provided that the concentration of drug solution is adjusted, which of the following devices may be used to infuse the terbutaline?

I. elastomeric bottle
II. syringe pump
III. PCA device

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

22f. Barium sulfate is best described as a (an)

(A) antacid
(B) antidiarrheal
(C) diagnostic agent
(D) cleansing laxative
(E) protectant against colitis

22g. Which of the following concerning barium sulfate is (are) true?

I. practically insoluble in water
II. administered by the oral route
III. administered by the rectal route

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

22h. The purpose of the pre-op atropine is to

(A) relieve the patient's anxiety
(B) reduce secretions
(C) cause vasoconstriction of small blood vessels
(D) constrict the bronchioles
(E) produce a state of "twilight sleep"

22i. The pharmacist should question the atropine/chlorpromazine order because of

I. an acid–base reaction between the two ingredients
II. the combination is irrational
III. the high dose of atropine requested

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

Questions 22j through 22n: Mrs. Riley is discharged from the hospital on 7/21 with prescriptions for a Foley catheter, ostomy pouches, translucent drain dressings, Slo-Bid 100 mg t.i.d., Valium 2 mg 1 tid prn, Metamucil plain 1 tbsp AM, and a multivitamin for pregnancy.

22j. For which of the following items is a prescription actually needed?

I. Foley catheter
II. ostomy pouches
III. translucent drain dressings

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

22k. Which of the following is an active ingredient in Metamucil?

I. docusate
II. polycarbophil
III. psyllium

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

22l. Mrs. Riley should be counseled to administer the Metamucil by

(A) mixing the granules with 8 oz of water, stirring, and drinking immediately
(B) mixing the granules with 1 pt of water, stirring, and drinking immediately
(C) mixing the granules with 8 oz water, stirring, letting mixture sit for 20 min before drinking
(D) swallowing the granules, then drinking 8 oz of water
(E) allowing the granules to effervesce in 8 oz of water before consuming

22m. Products with therapeutic activity similar to that of Slo-Bid include

I. Klor-Con
II. Slow-K
III. Theo-Dur

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

22n. If Mrs. Riley's physician decides to initiate antihypertensive therapy, which one of the following antihypertensive agents is probably the best choice for use during pregnancy?

(A) captopril
(B) enalapril
(C) hydrochlorothiazide
(D) methyldopa
(E) nifedipine

PROFILE NO. 23

Community Pharmacy Medication Record

Patient Name: Harriet Parker
Address: 3518 Central Blvd.
Age: 28 Height: 5′6″
Sex: F Weight: 135 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. vaginal infection	1. anemia
2. endometriosis	2. PMS (painful)
3.	3. anxiety

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 4/4	34765	Coughlin	Monistat-7 Insert	#30	1 qn	1×
2. 4/4	34766	″	Valium 5 mg	#30	1 bid p.r.n.	1×
3. 4/4	34767	″	Ovcon-50	#3×	ut dict	
4. 4/27	34765	″	Monistat-7		0	
5. 4/27	34766	″	Valium 5 mg	#30	0	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 4/27	Jane complains that the birth control pills made her nauseous, so she stopped taking them after 1 week
2. 6/14	Change records to Jane's new married name—Mrs. Frederick Nolan.

DIRECTIONS (Questions 23a through 23o): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

23a. The Monistat prescription is probably being used to treat

(A) aspergillosis
(B) candidiasis
(C) gonorrhea
(D) genital herpes
(E) syphilis

23b. The most common causative microorganism of non-gonococcal urethritis is

(A) *Candida cryptococcus*
(B) *Chlamydia trachomatis*
(C) *Klebsiella aerogenes*
(D) *Proteus mirabilis*
(E) *Treponema pallidum*

23c. The drug usually considered the first choice to treat all stages of syphilis is

(A) doxycycline
(B) erythromycin
(C) fluconazole
(D) penicillin G
(E) ciprofloxacin

23d. The drug(s) usually considered as first choice(s) in the treatment of *chlamydia* infections include

I. doxycycline
II. azithromycin
III. fluconazole

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

23e. Ms. Parker inquires about what form of contraception is as effective as oral contraceptive tablets. The pharmacist should mention

(A) condoms
(B) diaphragms
(C) IUDs
(D) rhythm method
(E) spermicidal jellies

23f. Which of the following are acceptable lubricants for use with a condom or diaphragm?

I. K-Y jelly
II. spermicidal cream
III. White Vaseline

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

23g. Which one of the following is inserted under the skin and offers up to 5 years of contraceptive protection?

(A) Depo-Provera
(B) Nonoxynol-9
(C) Norplant
(D) Mircette
(E) Progestasert

23h. Ms. Parker's endometriosis is best treated by the use of

(A) Danocrine
(B) Deltasone
(C) Naprosyn
(D) Sansert
(E) Clomid

Questions 23i through 23o: Jane's husband confides in you that he is concerned by his wife's recent behavior. Fearing that she is going to become infected by bacteria, she wears a mask around the house continuously, washes her hands every hour, and constantly checks to make sure all windows are closed.

23i. Jane's behavior is characteristic of persons suffering from

(A) generalized anxiety disorder (GAD)
(B) obsessive–compulsive disorder (OCD)
(C) panic disorder
(D) post-traumatic stress disorder
(E) social phobia

23j. A drug used in the treatment of OCD is

(A) Luvox
(B) Ativan
(C) Buspirone
(D) Haldol
(E) Orudis

23k. Benzodiazepines are often used to treat generalized anxiety disorders. Which one of the following is NOT a benzodiazepine?

(A) alprazolam (Xanax)
(B) chlordiazepoxide (Librium)
(C) zaleplon (Sonata)
(D) clorazepate (Tranxene)
(E) lorazepam (Ativan)

23l. The mechanism of action of the benzodiazepines is believed to be

(A) alpha$_1$ blockade
(B) beta-adrenergic blockade
(C) blockade of dopamine receptor sites
(D) blockade of the reuptake of dopamine
(E) potentiation of the inhibitory neurotransmitter GABA

23m. True statements concerning clozapine (Clozaril) include

I. The drug is a dopamine-receptor antagonist.
II. There is a lower incidence of extrapyramidal effects than with chlorpromazine.
III. The drug should be discontinued if white blood cell levels fall below 2000/mm^3.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

23n. Adverse effects associated with clozapine (Clozaril) include all of the following EXCEPT

(A) drowsiness
(B) hypersalivation
(C) weight gain
(D) tardive dyskinesia
(E) anticholinergic effects

23o. Which one of the following drugs is similar in action to clozapine?

(A) Clonazepam (Klonopin)
(B) Venlafaxine (Effexor)
(C) Nortriptyline (Aventyl)
(D) Risperidone (Risperdal)
(E) Paroxetine (Paxil)

PROFILE NO. 24

Community Pharmacy Medication Record

Patient Name: Harold White
Address: 869 Elm St.
Age: 3 Height: 36″
Sex: M Weight: 40 lb
Allergies: chocolate?, salicylates

DIAGNOSIS

Primary	Secondary
1. recurrent earaches	1. frequent colds
2. strep. throat	2. allergies?
3. colitis	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 9/2	83043	McLaughlin	Azulfidine Susp	0.5 tsp b.i.d.	Disp 6 oz	3×
2. 10/6	84665	McLaughlin	Pen Vee K Susp 250	200 mL	1 tsp q.i.d.	1×
3. 11/5	86956	Steen	Cromolyn sodium eye drops		2 gtts os t.i.d.	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1.	
2.	
3.	

DIRECTIONS (Questions 24a through 24o): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

24a. Causative organisms of otitis media include

I. *Helicobacter pylori*
II. *Hemophilus influenzae*
III. *Streptococcus pneumoniae*

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

24b. Drugs of choice for otitis media include

I. amoxicillin
II. trimethoprim–sulfamethoxazole
III. doxycycline

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

24c. When asked to suggest a drug to reduce Harold's fever and headache, the pharmacist could select products containing

I. aspirin
II. ibuprofen
III. acetaminophen

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

24d. Chemically, ibuprofen is a derivative of

(A) fibric acid
(B) phenylacetic acid
(C) propionic acid
(D) salicylic acid
(E) xanthines

24e. When used to reduce fever, ibuprofen should not be used

(A) for more than 3 days
(B) for more than 10 days
(C) for less than 3 days
(D) for less than 10 days
(E) if the fever is greater than 104°F

Questions 24f through 24h: The eye drop prescription filled on 11/5 reads as follows:

Rx
Cromolyn sodium 2.5% 30 mL
Dispense a sterile
isotonic solution

Sig: gtt ii OS TID

24f. The pharmacist dilutes the commercially available 4% cromolyn solution with purified water. How many milligrams of sodium chloride are needed to render the solution isotonic, assuming that the 4% solution was isotonic?

(A) 100 mg
(B) 170 mg
(C) 330 mg
(D) 540 mg
(E) 900 mg

24g. If the pharmacist decides to prepare the original prescription using cromolyn capsules and purified water, the final solution must be passed through a _____ micron filter into a sterile dropper bottle.

(A) .22
(B) .45
(C) 1.0
(D) 5.0
(E) 10

24h. The directions on the prescription label should include "OS," meaning

(A) single eye
(B) each eye
(C) left eye
(D) both eyes
(E) affected eye

24i. Cromolyn solutions are used in the eyes to

I. treat *Pseudomonas* infections
II. relieve glaucoma
III. treat conjunctivitis

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

24j. Which one of the following tricyclic antidepressants has been used successfully in treating nocturnal enuresis in children?

(A) Amitriptyline (Elavil)
(B) Doxepin (Sinequan)
(C) Imipramine (Tofranil)
(D) Nortriptyline (Pamelor)
(E) Trimipramine (Surmontil)

24k. Ms. White requests a mild sleep aid for herself. The pharmacist is likely to suggest products containing which one of the following ingredients?

(A) Flurazepam
(B) Dimenhydrinate
(C) Diphenhydramine
(D) Estazolam
(E) Triazolam

24l. When Ms. White asks how to administer the ophthalmic solution to Harold, the pharmacist may suggest

I. quickly place the 2 drops directly onto the cornea
II. place 1 drop into the lower inside lid of the eye then follow with the second drop after a few minutes
III. after instillation, gently squeeze inner corner of eye nearest the nose for a minute

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

24m. Which one of the following devices would allow the most convenient and accurate determination of Harold's body temperature in the clinic?

(A) tympanic thermometer
(B) scientific thermometer
(C) oral thermometer
(D) TENS device
(E) rectal thermometer

24n. Buildup of cerumen in the ear may be removed with the aid of which of the following OTC products?

I. Debrox
II. S.T. 37
III. Anbesol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

24o. The allergist believes that Harold may be sensitive to tartrazine. Tartrazine is present in some pharmaceuticals as a (an)

(A) antioxidant
(B) antimicrobial preservative
(C) antiseptic
(D) buffer
(E) coloring agent

PROFILE NO. 25

Nursing Home Pharmacy Medication Record

Patient Name: Maynard Meyers
Room Number: 312
Age: 68 Height: 6″
Sex: M Weight: 160 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. gout	1. recovering alcoholic
2. Parkinson's disease	2. smoker
3. borderline hypertension	3. asthma
4. ankylosing spondylitis	

MEDICATION RECORD

Date	Physician	Drug & Strength	Sig	DC'd
1. 2/6	Leader	Allopurinol 300 mg	1 daily	6 mos
2.	Leader	Slo-Phyllin 250 mg	b.i.d.	2 mos
3.	Leader	Brethaire	1 puff p.r.n.	2 mos
4.	Leader	Sinemet 10/100	1 t.i.d.	3 mos
5. 2/8	Leader/per phone	Give Mylanta Liq.	15 mL p.r.n.	
6. 2/20	Leader	Start IV aminophylline 0.6 mg/kg/h for 2 days		

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 2/9	Evaluated Mr. Meyers—asthma appears under control. Refuses to stop smoking.
2. 2/19	Patient appears to have difficulty breathing and is taking excessive amounts of Brethaire.

DIRECTIONS (Questions 25a through 25o): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

25a. The immediate prime goal(s) for the treatment of acute gout will be to

I. relieve the pain of the attack
II. administer high doses of a uricosuric agent
III. reduce uric acid levels

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25b. Drugs of choice for treating acute attacks of gout include

I. allopurinol
II. colchicine
III. NSAIDs

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25c. Drugs of choice for controlling hyperuricemia include

I. allopurinol
II. colchicine
III. prednisone

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25d. The nursing staff should be advised that the allopurinol

I. should be consumed with a large amount of fluid
II. may initially precipitate an attack of gout
III. must be taken on an empty stomach to assure absorption

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25e. The new order for Mylanta may result in

(A) increased absorption of Sinemet
(B) decreased absorption of Sinemet
(C) decreased absorption of Zyloprim
(D) increase risk of constipation
(E) binding of the Sinemet by calcium

25f. In addition to antacids, Mylanta Liquid also contains

(A) lactulose
(B) magnesium stearate
(C) alginic acid
(D) atropine sulfate
(E) simethicone

25g. A pharmacist wishes to identify a tablet brought into the institution by the patient. Which of the following reference sources contain a color guide for commercial tablets?

I. *USP DI* Volume I
II. *USP DI* Volume III
III. *Facts and Comparisons*

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25h. The patient wishes to use Minoxidil to reverse his loss of hair. This drug is available in which of the following dosage forms?

I. topical solution
II. tablets
III. topical ointment

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25i. Based on the order of 2/20, the pharmacist prepares an admixture of aminophylline 500 mg in 1 L D_5W. What flow rate (gtt/min) should be set if the administration set delivers 15 drops to the mL?

(A) 2
(B) 10
(C) 15
(D) 22
(E) 46

25j. When prescribing the dose for Question 25i, the prescriber took into consideration the fact that

I. smoking decreases the half-life of theophylline
II. aminophylline is more potent, mg for mg, than theophylline
III. the targeted theophylline serum level is 1 to 2 μg/mL

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25k. All of the following drugs will significantly increase the half-life of theophylline EXCEPT

(A) erythromycin
(B) cimetidine
(C) ciprofloxacin
(D) isoniazid
(E) ranitidine

25l. Theophylline's pharmacokinetics follow a two-compartment model when administered by IV bolus. Which of the following statements is (are) true?

I. The drug has faster initial distribution than elimination.
II. When graphed, there will be two slopes.
III. The half-lives of drugs following two-compartment modeling are longer than those following one-compartment modeling.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

25m. Early symptoms of theophylline toxicity include nausea, anorexia, and

(A) bradycardia
(B) bleeding gums
(C) hypotension
(D) tachycardia
(E) hypertension

25n. Drugs that significantly increase the clearance of theophylline in the body include

(A) interferon
(B) allopurinol
(C) phenytoin
(D) propranolol
(E) cimetidine

25o. Drugs that have the tendency to impart an orange color to urine, sweat, and tears include

(A) carbamazepine
(B) isoniazid
(C) verapamil
(D) phenolphthalein
(E) rifampin

PROFILE NO. 26

Community Pharmacy Medication Record

Patient Name: Donald Smythe
Address: 34 Webster Drive
Age: 45 Height: 5´10˝
Sex: M Weight: 180 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. manic–depressive illness	1.
2.	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 8/9	78977	Kramer	Celexa 20 mg	#30	1daily	3
2. 9/4	78977	Kramer	Refill			
3. 10/1	78977	Kramer	Refill			
4. 10/24	80434	Kramer	Lithobid 300 mg	#60	1 b.i.d.	4
5. 11/12	81773	Davis	HydroDIURIL 25 mg	#60	1 b.i.d.	
6. 11/24	82140	Davis	Azulfidine 500 mg	q.i.d.	#100	3
7. 11/24	82141	Kramer	Wellbutrin 100 mg	bid	#60	3

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 11/12	low-sodium diet, uses Ex-Lax & Mitrolan

DIRECTIONS (Questions 26a through 26r): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

26a. Which of the following drugs is most similar in action to Celexa (citalopram)?

(A) Loxitane
(B) Pamelor
(C) Nardil
(D) Zoloft
(E) Clozaril

26b. Wellbutrin is therapeutically classified as a (an)

(A) anxiolytic
(B) antipsychotic
(C) antidepressant
(D) anti-manic
(E) anticonvulsant

26c. Wellbutrin contains the same active ingredient as

(A) Zyban
(B) Cerebyx
(C) Lamictal

(D) Habitrol
(E) Sublimaze

26d. Patients receiving Lithobid should be advised to

(A) avoid taking the drug at bedtime
(B) avoid taking the drug with milk
(C) drink 8 to 12 glasses of water per day while on the drug
(D) consume a low-sodium diet
(E) consume a low-potassium diet

26e. In using lithium products, toxicity commonly occurs when serum lithium levels exceed

(A) 1.5 mEq/L
(B) 1.5 mg/dL
(C) 1.5 mg/L
(D) 15 mg/L
(E) 300 μg/mL

26f. The addition of hydrochlorothiazide to the patient's regimen is likely to

(A) increase serum lithium levels
(B) decrease serum lithium levels
(C) decrease the absorption of lithium
(D) increase the absorption of lithium
(E) have no effect on lithium action

26g. In monitoring serum lithium levels, blood samples are usually drawn

(A) in the morning
(B) at bedtime
(C) just prior to taking a dose
(D) 1 to 3 hours after taking a dose
(E) at the midpoint between two doses

26h. Lithobid 300-mg capsules contain how many milliequivalents (mEq) of lithium? [Li_2CO_3 = 74; Li = 7]

(A) 4 mEq
(B) 8 mEq
(C) 16 mEq
(D) 21 mEq
(E) 43 mEq

26i. HydroDIURIL can best be described as a (an)

(A) loop diuretic
(B) osmotic diuretic
(C) mercurial diuretic
(D) carbonic anhydrase inhibitor
(E) thiazide diuretic

26j. Which one of the following drugs has the greatest potential for causing new memory impairment (anterograde amnesia)?

(A) Flurazepam
(B) Temazepam
(C) Quazepam
(D) Estazolam
(E) Triazolam

26k. Mr. Smythe is having difficulty in falling asleep but doesn't wake up during the night. Which one of the following is probably the best choice of hypnotic?

(A) Estazolam (Prosom)
(B) Temazepam (Restoril)
(C) Molindone (Moban)
(D) Flurazepam (Dalmane)
(E) Zolpidem (Ambien)

26l. The Azulfidine (sulfasalazine) received by Mr. Smythe is used in the treatment of

(A) respiratory infection
(B) constipation
(C) systemic infection
(D) colitis
(E) impotence

26m. A therapeutic substitute for sulfasalazine (Azulfidine) is

(A) Bentyl
(B) BuSpar
(C) Dipentum
(D) Imodium
(E) Lomotil

26n. Which of the following diuretics would be a good therapeutic alternative to HydroDIURIL in order to reduce lithium accumulation?

I. amiloride
II. Esidrix
III. Oretic

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

26o. Diphenhydramine should not be suggested if an elderly patient is suffering from

I. incontinence
II. diarrhea
III. prostatitis

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

26p. A lab test that aids in the diagnosis of cancer of the prostate is

(A) ESR
(B) GGT
(C) ABG
(D) SGOT
(E) PSA

26q. Mitrolan is prescribed for which of the following effects?

I. antacid
II. antidiarrheal
III. treat constipation

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

26r. The active ingredient in Ex-Lax is

(A) calcium polycarbophil
(B) phenolphthalein
(C) methylcellulose
(D) sennosides
(E) bisacodyl

PROFILE NO. 27

Community Pharmacy Medication Record

Patient Name: Nora Cajole
Address: 233 Adler Court
Age: 64 Height: 5′3″
Sex: F Weight: 155 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. osteoarthritis	1.
2.	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 2/27	34987	Garth	Oxaprozin 600 mg	#60	2 b.i.d.	5
2. 3/15	35875	Garth	Piroxicam 20 mg	#40	1 q.i.d.	5
3. 3/26	37091	Garth	Vioxx 12.5 mg	#30	1 daily	5

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 3/6	Advil Tablets (OTC)
2. 3/17	Anacin Tablets
3. 3/17	Tums Chewable 500 mg

DIRECTIONS (Questions 27a through 27l): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

27a. In dispensing the prescription for oxaprozin, the pharmacist should have dispensed

(A) Daypro
(B) Orudis
(C) Ansaid
(D) Toradol
(E) Lodine

27b. Oxaprozin is believed to act by

(A) antagonizing dopamine receptors
(B) stimulating dopamine receptors
(C) inhibiting xanthine oxidase
(D) increasing the production of prostaglandins
(E) decreasing the production of prostaglandins

27c. Which of the following statements are true?

I. The active ingredient of Advil is ibuprofen.
II. Advil should be administered three to four times daily.
III. Antacids should not be used within 2 hours of taking Advil.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

27d. Tums Chewable contains

(A) calcium carbonate
(B) propylene glycol
(C) polyethylene glycol
(D) simethicone
(E) cation exchange resin

27e. When dispensing piroxicam, the pharmacist could dispense

(A) Nalfon
(B) Orudis
(C) Feldene
(D) Torodol
(E) Anaprox

27f. When the piroxicam prescription was filled the pharmacist should have advised the physician that

(A) it is not available in a 20-mg strength
(B) it is only used on a prn basis for acute pain
(C) it should not be used for more than 10 days
(D) it is not to be used in patients with rheumatoid arthritis
(E) it should not be administered four times daily

27g. Vioxx (rofecoxib) can best be classified as a (an)

(A) cytoprotectant
(B) anticholinergic
(C) antimicrobial effective against *H. pylori*
(D) COX-2 inhibitor
(E) narcotic agonist–antagonist

27h. The product most similar in action to Vioxx is

(A) Enbrel
(B) Lodine
(C) Celebrex
(D) Auranofin
(E) Toradol

27i. Misoprostol (Cytotec) can best be described as a (an)

I. synthetic prostaglandin analog
II. inhibitor of gastric acid secretion
III. H_2-receptor antagonist

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

27j. Misoprostol (Cytotec) is contraindicated for use in

(A) pregnant women
(B) patients using aspirin
(C) patients with osteoarthritis
(D) the elderly
(E) patients with hypertension

27k. Which of the following is an ingredient in Anacin?

I. acetaminophen
II. aspirin
III. caffeine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

27l. Which of the following would be inappropriate to use in treating this patient's osteoarthritis?

I. Enbrel
II. Relafen
III. Clinoril

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 28

Community Pharmacy Medication Record

Patient Name: Irving Teller
Address: 902 West 1st St.
Age: 81 Height: 5′7″
Sex: M Weight: 182 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. hypertension	1.
2. CHF	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 6/23	90988	Wilson	Digoxin 0.25	#30	1 daily	3
2. 6/23	90989	Wilson	Lasix 40 mg	#60	1 b.i.d.	3
3. 6/23	90990	Wilson	Klorvess 20 mEq	#60	1 daily	3
4. 8/10	90988	Wilson	Refill			
5. 8/10	90989	Wilson	Refill			
6. 8/10	93889	Thomas	Amiloride 5 mg tab	#30	1 daily in AM	3

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 7/15	Baking soda to settle stomach

DIRECTIONS (Questions 28a through 28j): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

28a. Digoxin can be described as an agent that produces a

I. vagomimetic effect
II. positive inotropic effect
III. positive chronotropic effect

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

28b. Patients with congestive heart disease who begin using digoxin are likely to experience

(A) tardive dyskinesia
(B) edema
(C) decreased force of cardiac contraction
(D) slowed heart rate
(E) orthostatic hypotension

28c. Which of the following drugs is most closely related to digoxin?

(A) amrinone
(B) mexiletine
(C) flecainide
(D) cyclandelate
(E) hydralazine

28d. Which of the following would be suitable to use in a patient who needs a cardiac glycoside but has severe renal impairment?

(A) amiodarone
(B) disopyramide
(C) digoxin
(D) digitoxin
(E) isradipine

28e. If this patient's medication were changed from digoxin tablets to Lanoxicaps, what would be an appropriate equivalent dose?

(A) 2.5 mg
(B) 25 µg
(C) 200 µg
(D) 0.25 mg
(E) 0.125 mg

28f. Which of the following are effects associated with digoxin toxicity?

I. diarrhea
II. ventricular tachycardia
III. agranulocytosis

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

28g. In dispensing Midamor (amiloride), the pharmacist should recommend to the prescriber that the

(A) dose of digoxin be increased by 50%
(B) Klorvess be discontinued
(C) dose of Klorvess be raised by 50%
(D) dose of digoxin be decreased by 50%
(E) dose of Klorvess be reduced by 50%

28h. A normal serum potassium concentration would be

(A) 4.4 mg/dL
(B) 9.4 mEq/L
(C) 7.2 mg/dL
(D) 3.9 mEq/L
(E) 120 mEq/L

28i. Bumex (bumetanide) is most similar to

(A) Demadex
(B) HydroDIURIL
(C) Buprenex
(D) Dyrenium
(E) Diamox

28j. The profile for Mr. Teller reveals the possibility of

I. substance abuse
II. potential complexation
III. noncompliance

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

PROFILE NO. 29

Community Pharmacy Medication Record

Patient Name: Henry Marchese
Address: 1904 Murray St.
Age: 10 Height: 4′4″
Sex: M Weight: 78 lb
Allergies: ragweed pollen

DIAGNOSIS

Primary	Secondary
1. bronchial asthma	1.
2. head lice	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 7/9	38383	Charmin	Benadryl 25 mg	#30	b.i.d.	1
2. 7/9	38384	Charmin	RID Shampoo	2 oz	Apply ut dict	1
3. 7/15	39439	Charmin	Diprosone Cream 0.05%	15 g	Apply as needed	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 7/9	Hydrocortisone cream 0.5% (OTC)

DIRECTIONS (Questions 29a through 29j): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

29a. Benadryl may have been prescribed for this patient as a (an)

I. antipruritic
II. sedative
III. antihistamine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

29b. An active ingredient of RID Shampoo is

(A) lindane
(B) pyrethrins
(C) piperonyl butoxide
(D) undecylenic acid
(E) crotamiton

29c. In counseling the parent of the patient receiving RID Shampoo, the pharmacist should stress the importance of avoiding

I. the use of vitamin A–containing foods
II. the use of metallic combs
III. contact with the eyes

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

29d. Another name for head lice is

(A) *Sarcoptes scabiei*
(B) *Pediculus pubis*
(C) tinea capitis
(D) *Pediculus capitis*
(E) tinea versicolor

29e. RID Shampoo is usually administered

(A) once daily for 3 days
(B) once daily for 5 days
(C) once in 7 days
(D) twice daily for 2 days
(E) twice daily for 3 days

29f. Diprosone Cream contains

(A) hydrocortisone
(B) betamethasone dipropionate
(C) dexamethasone
(D) triamcinolone acetonide
(E) fluocinonide

29g. Diprosone Cream should not be used in patients with

I. bacterial infection
II. herpes simplex infection
III. *Candida* infection

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

29h. Which of the following products for the treatment of head lice may be purchased over the counter (OTC)?

I. Eurax
II. Nix
III. A-200 Pyrinate

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

29i. Patients with ragweed allergy should avoid lice remedies that contain

(A) pyrethrins
(B) organic solvents
(C) lindane
(D) parabens
(E) pyrogens

29j. Scabies is a condition caused by a

(A) fungus
(B) virus
(C) flea
(D) protozoan
(E) mite

PROFILE NO. 30

Community Pharmacy Medication Record

Patient Name: Laura Machless
Address: 89 Noah Road
Age: 25 Height: 5′3″
Sex: F Weight: 105 lb
Allergies:

DIAGNOSIS

Primary	Secondary
1. heroin abuse	1. PCP
2. AIDS-HIV	2.
3.	3.

MEDICATION RECORD

Date	Rx No.	Physician	Drug & Strength	Quantity	Sig	Refills
1. 5/16	39998	Malhous	Retrovir Caps 100 mg	#100	2 q4h	2
2. 5/28	39999	Malhous	Pentam 300	10	Bring to office	

PHARMACIST'S NOTES AND OTHER PATIENT INFORMATION

Date	Comment
1. 6/1	Robitussin DM (OTC)

DIRECTIONS (Questions 30a through 30j): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

30a. Which of the following agents would be appropriate to use in treating a patient with acute heroin overdose?

(A) Naprosyn
(B) Tolazamide
(C) Naloxone
(D) Physostigmine
(E) Cuprimine

30b. Another name for heroin is

(A) diacetylmorphine
(B) oxycodone
(C) ethylmorphine
(D) oxymorphone
(E) methylmorphine

30c. "PCP" in the profile refers to

(A) phencyclidine
(B) pronounced cardiac pronation
(C) pneumocystis carinii pneumonia
(D) postcoronary patient
(E) precancerous psoriasis

30d. Another name for Retrovir is

I. ribavirin
II. zidovudine
III. AZT

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

30e. Patients receiving Retrovir must be monitored carefully for the development of

(A) pneumothorax
(B) malignant hypertension
(C) edema
(D) hematologic suppression
(E) pulmonary fibrosis

30f. Which of the following drugs used to treat HIV is a protease inhibitor?

I. Viramune
II. Sustiva
III. Viracept

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

30g. Patients on Retrovir should avoid the use of

(A) penicillins
(B) beta-adrenergic blockers
(C) acetaminophen
(D) iron products
(E) vitamin A

30h. Pentamidine (Pentam) is available in which of the following dosage forms?

I. capsules
II. aerosol
III. injection

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

30i. Patients using Pentam must be monitored for the development of

(A) GI ulceration
(B) *Pseudomonas* infection
(C) kidney failure
(D) liver failure
(E) severe hypotension

30j. Which of the following are active ingredients in Robitussin DM?

I. codeine
II. dextromethorphan HBr
III. guaifenesin

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

Answers and Explanations

PROFILE NO. 1

1a. **(A)** Indapamide (Lozol) is a thiazide-like drug that inhibits reabsorption of sodium and chloride in the ascending limb of the loop of Henle and the early distal tubules. Choices (B), (C), and (E) are loop diuretics and choice (D) is a calcium-channel-blocking agent. *(3)*

1b. **(C)** Benazepril (Lotensin) is an angiotensin-converting enzyme (ACE) inhibitor. *(3)*

1c. **(B)** Thiazide diuretics such as HydroDiuril are best taken in the morning to avoid being awakened during the night because of an urge to void. Patients should also be advised to maintain adequate hydration and to take the drug with food or milk. *(3)*

1d. **(E)** The use of thiazide diuretics such as hydrochlorothiazide (HydroDiuril) is associated with the potential for causing hypokalemia, hypomagnesemia, and hypercalcemia. *(3)*

1e. **(C)** Thiazide drugs such as hydrochlorothiazide (HydroDiuril) may exhibit a cross-sensitivity with sulfa drugs. *(3)*

1f. **(B)** Ms. Carlson should be advised to avoid the use of Dimetapp because this product contains phenylpropanolamine, which could cause her blood pressure to rise. *(3)*

1g. **(B)** Chronic cough is occasionally seen in patients using ACE inhibitors. *(3)*

1h. **(C)** Angioedema generally involves swelling of the facial area, usually the lips. In some cases, laryngeal edema may also occur and requires emergency medical care. *(5:142)*

1i. **(C)** One can conclude that the patient has not adequately responded to the use of HydroDiuril alone and the prescriber has chosen to add Lotensin to the patient's regimen to take advantage of the synergistic antihypertensive action of these drug products. *(5:142)*

1j. **(E)** Untreated chronic hypertension is a major cause of stroke, renal failure, retinopathy, coronary artery disease, and left ventricular hypertrophy. *(5:136)*

1k. **(A)** Methyldopa (Aldomet) is considered to be the safest antihypertensive agent of those listed for use in pregnancy. The others may have a higher likelihood of causing fetal damage. *(5:144)*

PROFILE NO. 2

2a. **(B)** Oretic is a brand of hydrochlorothiazide. Diuril is a brand of chlorothiazide. Zaroxolyn is metolazone, a thiazide-like diuretic. *(3)*

2b. **(A)** Micro-K is a formulation that contains microencapsulated potassium chloride crystals. The microencapsulated potassium chloride serves to provide a slow release for the potassium chloride and thereby reduces the irritant effect of the salt. *(3)*

2c. **(E)** The molecular weight of potassium chloride is 74. One milliequivalent of potassium chloride, therefore, contains 74 mg of potas-

sium chloride. Ten milliequivalents of potassium chloride will contain 10 mEq × 74 mg/mEq = 740 mg of potassium chloride. *(3)*

2d. **(A)** Amlodipine (Norvasc) is a calcium-channel-blocking agent that is indicated for the treatment of hypertension. *(3)*

2e. **(D)** Dexatrim is an OTC appetite suppressant containing phenylpropanolamine. Sibutramine (Meridia) is an appetite suppressant that acts by inhibiting the reuptake of norepinephrine, serotonin, and dopamine. *(3)*

2f. **(D)** Dexatrim is a product that contains phenylpropanolamine. Because phenylpropanolamine is a vasoconstrictor, its use in hypertensive patients is undesirable. *(3)*

2g. **(C)** Amlodipine (Norvasc) is a calcium-channel-blocking agent that may produce some peripheral edema, particularly in female patients. *(3)*

2h. **(C)** Nisoldipine (Sular), felodipine (Plendil), and amlodipine (Norvasc) are calcium-channel-blocking agents. Losartan potassium (Cozaar) is an angiotensin-II antagonist. *(3)*

2i. **(E)** Pruritis is itching. *(27)*

2j. **(B)** Each Tylenol/Codeine No. 3 tablet contains 30 mg of codeine and 300 mg of acetaminophen. *(3)*

2k. **(D)** Amlodipine (Norvasc) is a calcium-channel-blocking agent that is also indicated for the treatment of angina pectoris. *(3)*

2l. **(D)** Codeine produces an antiperistaltic action on the GI tract and commonly causes constipation. *(3)*

PROFILE NO. 3

3a. **(B)** Ovrette is a progestin-only oral contraceptive product. Such products are somewhat less effective than combination products that contain both an estrogen and progestin. Progestin-only products are taken daily rather than cyclically. *(3)*

3b. **(A)** Koromex Cream is a product usually used with a diaphragm. It contains the spermicidal agent nonoxynol-9. *(3)*

3c. **(E)** Generalized tonic–clonic seizures have also been referred to as grand mal seizures. Such seizures are characterized by alternating tonic muscle contractions and clonic contractions. *(3)*

3d. **(C)** Dilantin Kapseals contain phenytoin sodium extended. This product is suitable for single daily dosing or divided daily dosing. Products that contain phenytoin sodium, prompt, are suitable only for divided daily dosing. *(3)*

3e. **(C)** Nystagmus is a condition characterized by oscillation of the eyeball. It is occasionally seen when patients use phenytoin or phenobarbital. *(3)*

3f. **(A)** Dilantin Kapseals are manufactured by Parke–Davis and contain phenytoin sodium, extended, as their active ingredient. *(3)*

3g. **(E)** The therapeutic plasma concentration of phenytoin is 10 to 20 μg/mL. A phenytoin plasma concentration of 5 μg/mL several weeks after initiating therapy is indicative of inadequate dosing or noncompliance. *(3)*

3h. **(D)** Phenytoin use may decrease the pharmacologic effect of the Ovrette by increasing the hepatic metabolism of the progestin in Ovrette. Because progestin-only products, such as Ovrette, tend to be somewhat less effective in preventing pregnancy, this may result in an unwanted pregnancy. *(3)*

3i. **(D)** The IM route for phenytoin sodium is generally avoided because the precipitation of phenytoin at the injection site may be painful and result in erratic absorption. Phenytoin is easily precipitated in the presence of an acidic substance in the IV admix-

ture. The addition of phenytoin sodium to an IV infusion is therefore generally not recommended. *(3)*

3j. **(A)** A morbilliform rash is one that resembles that of measles. *(3)*

3k. **(B)** Nonoxynol-9 is a surfactant spermicide that is the active ingredient of Koromex Cream. *(3)*

3l. **(E)** Docusate sodium, the active ingredient of the stool softener Colace, is an anionic surfactant that promotes the penetration of water into the intestinal contents. This softens the contents and facilitates their evacuation. *(3)*

3m. **(E)** Theragran-M is a therapeutic multivitamin product that also contains minerals. *(3)*

PROFILE NO. 4

4a. **(D)** Carbidopa serves as a dopadecarboxylase inhibitor that prevents the peripheral decarboxylation of levodopa and permits a greater proportion of the levodopa dose to enter the brain in its intact form. The use of carbidopa in combination with levodopa permits the use of lower levodopa doses than would be used without carbidopa. *(3)*

4b. **(D)** Pyridoxine promotes the peripheral conversion of levodopa to dopamine, thereby decreasing the activity of the administered levodopa. *(3)*

4c. **(E)** Darkening of the urine with the use of levodopa or Sinemet is normal and is a product of levodopa metabolism. The patient may disregard it. *(3)*

4d. **(E)** Benztropine mesylate (Cogentin) is an anticholinergic agent used in the treatment of Parkinson's disease. Such agents reduce the incidence and severity of akinesia, rigidity, and tremor in patients with Parkinson's. Anticholinergic drugs are used as adjuncts to levodopa in the treatment of Parkinson's disease. *(3)*

4e. **(E)** Selegiline (Eldepryl), pergolide (Permax), and bromocriptine (Parlodel) are dopaminergic agents and tolcapone (Tasmar) is a COMT inhibitor used in treating Parkinson's disease. Venlafaxine (Effexor) is an antidepressant. *(3)*

4f. **(C)** Amantadine (Symmetrel), in addition to being employed in the treatment of Parkinson's disease, is also used in the prevention and treatment of respiratory tract infections caused by influenza A virus. *(3)*

4g. **(D)** Diplopia, or double vision, is sometimes experienced by patients receiving levodopa therapy. *(3)*

4h. **(C)** When a patient on levodopa is to be switched to Sinemet, at least 8 hours must be allowed to elapse from the last dose of levodopa to the first dose of Sinemet in order to decrease the likelihood of toxicity. Because the carbidopa in the Sinemet increases the proportion of intact levodopa that enters the brain, the dose of levodopa administered via Sinemet should be 75 to 80% less than that administered prior to the initiation of Sinemet therapy. *(3)*

4i. **(A)** Levodopa is a precursor of dopamine, an agent that seems to be deficient in the brain of patients with Parkinson's disease. *(3)*

4j. **(D)** Carbidopa is available by itself as Lodosyn. It should be employed in combination with levodopa to create a dosage combination for patients with Parkinson's disease. *(3)*

4k. **(C)** Chlorpromazine is a phenothiazine antipsychotic agent that acts as a dopamine antagonist. With prolonged use, it can cause a variety of Parkinson-like effects. *(3)*

4l. **(A)** Parkinson's disease generally causes muscle rigidity, tremor, and postural disturbances. *(A)*

PROFILE NO. 5

5a. **(B)** Levobunolol acts as a beta-adrenergic blocking agent that reduces the production of aqueous humor in the eye. *(3)*

5b. **(A)** Levobunolol and timolol are both beta-adrenergic blocking agents. *(3)*

5c. **(D)** Intraocular pressure may vary considerably in the same individual, depending on the time of day the measurement is taken as well as many other factors. A measurement of 14 mm Hg is well within the normal range of 10 to 20 mm Hg. *(3)*

5d. **(D)** Polyvinyl alcohol is a viscosity builder that increases the contact time of the ophthalmic solution with the surface of the eye. *(3)*

5e. **(B)** Urticaria is a name for hives. These are usually caused by a hypersensitivity reaction and can be manifested as discolored swollen areas of the body. *(27)*

5f. **(E)** Betaxolol (Betoptic), timolol (Timoptic), carteolol (Ocupress), and metapranolol (OptiPranolol) are beta-adrenergic blocking agents used ophthalmically in the treatment of glaucoma. They appear to act by decreasing the formation of aqueous humor within the eye. *(3)*

5g. **(E)** EDTA, or ethylenediaminetetraacetic acid, is a chelating agent that has the ability to remove trace quantities of metals that might promote the decomposition of the active drug. *(3)*

5h. **(D)** Visine Allergy Relief contains tetrahydrozoline as its active ingredient. This agent is an imidazoline decongestant that tends to exhibit alpha-adrenergic agonist activity. Its use in the eye causes vasoconstriction and relief of "red eyes" and ophthalmic congestion. *(3)*

5i. **(D)** The use of a beta-adrenergic blocking agent such as levobunolol or betaxolol (Betoptic) by a patient with a history of respiratory illness and breathing difficulty may be hazardous because beta-adrenergic blockers may cause bronchoconstriction. Even the relatively small amount of drug that enters the systemic circulation via an ophthalmic administration has been reported to cause breathing difficulty in susceptible patients. *(3)*

5j. **(A)** Both Ecotrin Maximum Strength and Easprin are enteric-coated aspirin formulations. They each have an enteric coat on the surface of the tablet that dissolves only when the tablet reaches the more neutral-to-alkaline region of the small intestine. *(3)*

5k. **(A)** Anticholinergic drugs may cause mydriasis (pupillary dilation). This is likely to result in increased intraocular pressure. *(3)*

PROFILE NO. 6

6a. **(D)** The active ingredient in Benzac is benzoyl peroxide, an agent that appears to act by providing antibacterial activity, especially against *Propionibacterium acnes,* the predominant organism in acne lesions. *(3)*

6b. **(D)** Patients using tretinoin (Retin-A) products should be advised to avoid the use of the product near the eyes, mouth, angles of the nose, and mucous membranes because tretinoin may irritate these tissues. Patients using this product should also be advised to avoid excessive exposure to sunlight and sunlamps because the drug may increase the patient's susceptibility to burning. Although tretinoin is a vitamin A derivative, its topical use makes it unnecessary for patients to limit their intake of vitamin A-containing foods. *(3)*

6c. **(E)** Butylated hydroxytoluene, or BHT, is an antioxidant that is commonly employed in food and topical products in order to reduce the likelihood of spoilage. *(3)*

6d. **(C)** The use of clindamycin, the active ingredient of Cleocin, has been associated with the development of diarrhea in some patients. If the diarrhea is severe and/or persistent, the

patient's physician should be contacted because such a response may indicate the development of pseudomembranous enterocolitis, a serious and potentially life-threatening condition. *(3)*

6e. **(A)** A product that contains 10 mg of drug per milliliter will contain 1000 mg, or 1.0 g/100 mL. This is equivalent to a 1% (w/v) solution of the drug. *(3)*

6f. **(D)** Accutane contains isotretinoin as its active ingredient. This is an isomer of retinoic acid, a metabolite of retinol (vitamin A). *(3)*

6g. **(C)** Many adverse effects are associated with the use of Accutane. Cheilitis, an inflammation around the margins of the lips, is very common. Conjunctivitis (inflammation of the conjunctival lining of the eye) is also a common adverse effect associated with the use of this drug. *(3)*

6h. **(A)** Because of the many adverse effects associated with the use of Accutane, a patient package insert must be dispensed by the pharmacist to any patient receiving this drug. *(3)*

6i. **(E)** The use of Accutane in patients who are or may become pregnant is contraindicated because the use of this drug in pregnant patients has been shown to cause fetal abnormalities. Accutane has been given a pregnancy category X rating by the FDA because of this hazard. *(3)*

6j. **(D)** Aluminum oxide is a water-insoluble material that is employed in the Brasivol formulation as an abrasive. When rubbed onto the affected area, the abrasive property is meant to help remove the comedone plugs and allow better drainage of the comedone. *(3)*

6k. **(B)** Salicylic acid is a keratolytic agent; that is, it helps to remove keratin from the skin surface. This facilitates the opening of plugged comedones and decreases the likelihood of new comedone formation. *(3)*

6l. **(D)** Sebum is a lipid secretion of the sebaceous glands, which are associated with the hair follicle. Sebum acts as a protectant on the skin surface. When the esterified fatty acids of sebum are broken down to free fatty acids by microorganisms, the inflammatory lesion of acne may be formed. *(3)*

PROFILE NO. 7

7a. **(B)** Salmeterol is a selective $beta_2$-adrenergic agonist. It is capable of stimulating $beta_2$-receptors found in the respiratory tract to produce bronchodilation. *(3)*

7b. **(C)** Salmeterol (Serevent) is a long-acting bronchodilator. It is not intended for use in the treatment of acute asthma attacks. Proventil is a rapidly acting bronchodilator that will be more effective in treating an acute attack. *(3)*

7c. **(B)** The Serevent Diskus product contains a disposable inhalation device containing a drug powder for inhalation. *(3)*

7d. **(D)** The Proventil Aerosol product contains albuterol, a selective $beta_2$-agonist. *(3)*

7e. **(C)** Older and younger patients who have difficulty in coordinating their inhalation of an aerosol may benefit from the use of a spacer device. *(3)*

7f. **(E)** Proventil is available as an aerosol, powder for inhalation, solution for inhalation, tablet, extended-release tablet, and oral liquid dosage forms. *(3)*

7g. **(C)** Rotacaps are a dosage form marketed by GlaxoWellcome that contain a powder intended for inhalation. It is used with a device called a Rotahaler. *(3)*

7h. **(A)** The active ingredient in Vanceril is beclomethasone dipropionate, a corticosteroid. When administered by inhalation to asthmatic patients, Vanceril reduces the likelihood of future acute asthmatic attacks. Vanceril is not suitable for use during an acute attack. *(3)*

7i. **(C)** When a bronchodilator such as Proventil is to be used with a corticosteroid inhalation such as Vanceril, the patient should be advised to use the bronchodilator at least several minutes before the corticosteroid to promote better passage of the corticosteroid into the lower lung. *(5:456)*

7j. **(C)** Nicotine (Nicoderm) patches are applied for a 24-hour period. A new site should be used for each application. *(3)*

7k. **(C)** Albuterol is a beta-adrenergic agonist, which is more specific in its action for $beta_2$-receptors in the respiratory tract than for $beta_1$-adrenergic receptors in the heart. Isoproterenol is relatively nonspecific in its effect. Albuterol is therefore less likely to cause unwanted cardiac stimulation than is isoproterenol. *(3)*

7l. **(E)** Both Beclovent and Vanceril are inhalation products containing beclomethasone dipropionate. *(3)*

PROFILE NO. 8

8a. **(E)** Nitrostat is a nitroglycerin sublingual tablet that has been stabilized with polyethylene glycol in order to decrease the likelihood that volatilization of the nitroglycerin will take place. As a result, Nitrostat has a considerably longer shelf-life than do nonstabilized nitroglycerin tablets. *(3)*

8b. **(B)** Nitrostat, as well as other oral nitroglycerin products, should be dispensed by the pharmacist in its original container because such containers are designed to minimize the loss of nitroglycerin during storage. *(3)*

8c. **(B)** Transdermal nitroglycerin patches should be applied onto a hairless site. Site rotation is important with each administration in order to decrease the likelihood of skin irritation. Transdermal patches should not be applied to distal portions of the extremities because these areas do not permit as reliable absorption of the nitroglycerin as do other areas of the body. *(3)*

8d. **(A)** When discontinuing therapy with nitroglycerin transdermal systems, gradual reduction of both the dosage and frequency of application over a 4- to 6-week period is advisable in order to minimize the likelihood of sudden withdrawal reactions. *(3)*

8e. **(E)** Amyl nitrite is the only antianginal product administered by inhalation. It is available as a liquid packaged in small glass capsules covered by protective cotton or gauze material. When required, the capsule is crushed and the patient inhales the vapors released. A rapid response is generally evident. Dosage control is, however, a major drawback in the use of this drug. *(3)*

8f. **(C)** Dipyridamole (Persantine), in addition to being used in the treatment of angina, is also employed as an antiplatelet agent. It appears to act in this regard by inhibiting cyclic nucleotide phosphodiesterase activity. *(3)*

8g. **(D)** Nitroglycerin administered orally undergoes extensive first-pass hepatic deactivation, thereby limiting the usefulness of this route of administration. *(3)*

8h. **(C)** The use of alcohol or sildenafil (Viagra) in combination with nitroglycerin may produce a hypotensive response because of the vasodilating action of all of these drugs. The hypotensive response may be manifested as dizziness, fainting, and/or weakness. *(3)*

8i. **(B)** Nitroglycerin may be adsorbed onto the polyvinyl chloride (PVC) tubing used in most IV administration sets. This may result in loss of drug and inadequate dosing. Manufacturers of nitroglycerin for IV use supply non-PVC infusion tubing, which minimizes the adsorption of nitroglycerin. Such special tubing is generally recommended for use with nitroglycerin products. *(3)*

8j. **(B)** The dose of nitroglycerin topical ointment is measured in inches. It is applied to the skin with minimal rubbing, and the area

to which it has been applied is covered with plastic wrap to facilitate drug absorption and to prevent staining of clothing. *(3)*

8k. **(B)** Nitrolingual Spray and sublingual forms of nitroglycerin provide the most rapid onset of action, ranging from 1 to 3 minutes. Transdermal patches have a 30- to 60-min onset time. *(3)*

PROFILE NO. 9

9a. **(E)** Patients with type 1 diabetes mellitus are generally insulin-dependent. Their disease generally begins early in life and is characterized by little or no insulin production by the pancreas. *(5)*

9b. **(C)** Humulin R insulin is human regular insulin that is prepared by recombinant DNA technology. As is the case with all regular insulin products, Humulin is short-acting and is a clear solution. *(3)*

9c. **(D)** The Humulin R insulin contains 100 units of activity per milliliter. Twenty-four units of insulin activity will therefore be contained in 0.24 mL of the product. *(3)*

9d. **(A)** Polydipsia refers to excessive thirst. This is frequently seen in type 1 diabetics because of the excessive urination (polyuria) that is associated with the body's attempt to eliminate excessive glucose in the blood. *(3)*

9e. **(E)** A fasting blood sugar of 100 mg/dL is well within the normal range of 70 to 110 mg/dL. *(3)*

9f. **(C)** Regular Insulin is the only form of insulin available as a clear solution. The other forms are suspensions, which would be unsuitable for IV administration. *(3)*

9g. **(D)** When mixing two types of insulin, the clear Regular Insulin is always drawn into the syringe first in order to reduce the likelihood of contamination of the Regular Insulin with suspended particles of the second insulin. Insulin mixtures may be stored in a prefilled syringe for up to 1 week with refrigeration. *(3)*

9h. **(C)** Lispro Insulin has the most rapid onset of action. Its onset is about 0.25 hour as opposed to 0.5 to 1.0 hour for the next most rapid onset insulin, Regular. *(3)*

9i. **(A)** The Glucometer Elite device requires that a small amount of blood be used to measure the blood glucose level. To obtain this blood, the patient or caregiver must use a lancet device to puncture the skin. *(3)*

9j. **(E)** Contac 12-Hour Caplets contain phenylpropanolamine, a sympathomimetic decongestant that is capable of inducing the conversion of glycogen to glucose in the body. This may increase glucose levels in the blood and increase the patient's insulin requirement. *(3)*

9k. **(B)** Lo-Dose syringes have a capacity of 0.5 mL. They are useful in situations where a low dose (< 50 units) of insulin must be administered. *(3)*

9l. **(C)** Glimepiride (Amaryl) and glipizide (Glucotrol) are second-generation sulfonylureas. Such agents are administered in lower doses than are first-generation agents and tend to produce somewhat fewer adverse effects than do first-generation agents. *(3)*

9m. **(C)** Lactic acidosis is a rare but serious complication in the use of metformin HCl (Glucophage). It may be fatal in 50% of patients who develop it. *(3)*

PROFILE NO. 10

10a. **(D)** Both warfarin and dicumarol are oral anticoagulants that interfere with vitamin K–dependent clotting factors. They are both derivatives of 4-hydroxycoumarin. *(3)*

10b. **(B)** The administration of cimetidine to a patient stabilized on warfarin is likely to result

in increased warfarin activity because of the ability of cimetidine to inhibit the metabolism of warfarin. The other choices listed are agents that promote the hepatic metabolism of warfarin and would therefore decrease warfarin activity. *(3)*

10c. **(A)** Phytonadione (vitamin K_1) is a specific antidote for warfarin toxicity. Treatment of hemorrhage caused by oral anticoagulant therapy generally consists of the administration of 10 to 20 mg of phytonadione. *(3)*

10d. **(A)** Datril contains acetaminophen, an analgesic/antipyretic that does not appear to displace warfarin from plasma protein–binding sites. Ecotrin contains aspirin and Advil contains ibuprofen. Both of these agents are capable of displacing warfarin from protein-binding sites and increasing warfarin activity. *(3)*

10e. **(A)** Synthroid contains levothyroxine, or T_4, as its active ingredient. *(3)*

10f. **(E)** 100 µg of Synthroid is approximately equivalent to 60 mg of Thyroid USP, 25 µg of Cytomel, and 0.1 mg of Levothroid (also a levothyroxine product). *(3)*

10g. **(E)** Propylthiouracil and methimazole each inhibit the synthesis of thyroid hormones. Sodium iodide ^{131}I is a radioactive isotope that is concentrated in thyroid tissue and emits radiation that destroys thyroid tissue. Any of these agents may be used to treat hyperthyroidism. *(3)*

10h. **(D)** Synthroid and other thyroid hormone products appear to increase the catabolism of vitamin K–dependent clotting factors. This potentiates the action of warfarin and decreases the warfarin dosage requirement. *(3)*

10i. **(E)** In a radiation emergency, the administration of potassium iodide would saturate the thyroid with nonradioactive iodide, thereby making it less likely that radioactive iodides created in the emergency would accumulate in thyroid tissue. *(3)*

10j. **(D)** Thyroid hormone production in the body is controlled by the level of thyroid-stimulating hormone (TSH) produced by the anterior pituitary. *(3)*

10k. **(D)** Empirin/Codeine No. 3 contains aspirin. The aspirin may displace warfarin from protein-binding sites and may increase warfarin activity in the body. *(3)*

10l. **(D)** The international normalized ratio (INR) is a measure that takes into consideration the prothrombin time (PT) and the International Sensitivity Index (ISI), which is a measure of the sensitivity of the thromboplastin reagent used to determine the PT. *(3)*

PROFILE NO. 11

11a. **(C)** The term "pyuria" refers to pus in the urine. Such a condition is often associated with a urinary tract infection (UTI). *(27)*

11b. **(D)** *E. coli* organisms are gram-negative bacilli generally associated with the GI tract. They are commonly a causative organism in urinary tract infections as well as institutionally borne infections. *(5:1793)*

11c. **(C)** Trimethoprim–sulfamethoxazole and ofloxacin products are popular drugs for the treatment of urinary tract infections. Drug-resistant strains may necessitate switching to another antimicrobial agent. *(5:1793)*

11d. **(D)** Both Septra and Bactrim are combination products of trimethoprim–sulfamethoxazole that have synergistic action against many microorganisms. The advantage of using such a combination as opposed to single-drug therapy is the ability of this combination to block two consecutive steps used by bacteria to produce tetrahydrofolic acid. Blocking two steps greatly diminishes the likelihood that bacterial resistance will develop. Trimox is one of the brand names for amoxicillin. *(3)*

11e. **(C)** Enoxacin (Penetrex) and ofloxacin (Floxin) are fluoroquinolone drugs. Kanamycin (Kantrex) is an aminoglycoside. *(3)*

11f. **(A)** Patients using either Septra or other sulfa drugs should be advised to maintain adequate fluid intake in order to facilitate the urinary antimicrobial action of the product as well as to prevent precipitation of poorly soluble drugs in the urinary tract. Urinary acidification may accelerate the precipitation of sulfa drugs. There is no need for patients to avoid the use of folic acid–containing foods. *(3)*

11g. **(C)** Microstix-3 is designed to test for nitrite in the urine. Elevated nitrite levels are indicative of the presence of bacteria in the urine (ie, bacteriuria). *(3)*

11h. **(E)** Phenazopyridine (Pyridium) is an azo dye employed as a urinary analgesic. It has no antiseptic activity. Phenazopyridine is often used to reduce pain in patients with urinary tract infections prior to the successful control of bacteria by antimicrobial agents. *(3)*

11i. **(A)** Phenazopyridine (Pyridium) is excreted unchanged into the urine. In doing so, it may cause a red–orange discoloration of the urine. *(3)*

11j. **(A)** When used with antimicrobial agents for the treatment of urinary tract infections, Pyridium should not be used for more than 2 days. This permits Pyridium's analgesic action to be employed during the early period of therapy when the infection is not yet under control. After 2 days, the infection should be under control and the continued use of Pyridium should not be required. In addition, the use of Pyridium beyond 2 days would mask pain that might be an indication of the failure of the antimicrobial therapy. *(3)*

11k. **(E)** Probably the most common psychological symptom of premenstrual syndrome is tension characterized by irritability and depression, which occur in 70 to 90% of all women. Weight gain of several pounds may be observed due to water retention. Several OTC products contain mild diuretics to combat this "bloating." *(3)*

11l. **(C)** Caffeine in doses of 100 to 200 mg every 3 to 4 h is a safe and effective diuretic but may cause sleeplessness. Pamabrom, a derivative of theophylline, is also effective in doses of 50 mg up to four times a day. Pamabrom is the active ingredient in Midol PMS and Pamprin. *(3)*

11m. **(D)** When methenamine mandelate (Mandelamine) is administered, the methenamine is converted to formaldehyde in acid (ie, < 5.5) urine. If the urine is not sufficiently acidic, the formaldehyde will not form. *(3)*

11n. **(A)** The Foley or balloon catheter is an indwelling urinary catheter. After insertion, it is inflated to prevent slippage out of the urinary tract. The other choices, the Broviac and the Hickman, are venous catheters intended for nutritional intravenous therapy. *(3)*

PROFILE NO. 12

12a. **(D)** A nomogram is a chart that permits the determination of a patient's body surface area (BSA) in square meters from the patient's known height and weight data. Nomograms are frequently employed in calculating doses for potent agents such as the antineoplastic drugs. *(3)*

12b. **(A)** The patient is to receive 45 mg of daunorubicin per square meter of body surface area per day. Because the patient's BSA has been found to be 1.85 m^2, then 1.85 m^2 × 45 mg/m^2 = 83.25 mg of drug per administration. Because each vial contains 20 mg of drug, five vials will be required to supply the amount of drug needed. *(3)*

12c. **(C)** Cytarabine (Ara-C) is a pyrimidine analog that is employed as an antimetabolite either alone or in combination with other antineoplastic drugs. Other pyrimidine antagonists include fluorouracil (5-FU) (Adrucil) and floxuridine (FUDR). *(3)*

12d. **(D)** Myelosuppression, or suppression of the bone marrow, usually results in a sharp decrease in white blood cells as is seen on the patient's profile. This may be life-threatening because of the patient's increased susceptibility to infection. *(5:2002)*

12e. **(A)** Acute lymphocytic leukemia is a common malignancy in children and is rarely observed in persons older than age 15. Long-term survival rates of greater than 70% are now obtained with chemotherapy. *(5:2149)*

12f. **(B)** One of methotrexate's main uses is in psoriasis therapy. It is available in both oral and parenteral dosage forms. Carmustine (BCNN) inhibits synthesis of DNA and RNA and is classified as an alkylating agent, as is cyclophosphamide. *(3)*

12g. **(C)** Allopurinol is a xanthine oxidase inhibitor. Inhibition of xanthine oxidase enzyme results in a reduction in the formation of uric acid, a common metabolite formed in patients being treated with antineoplastic drugs. Allopurinol is, therefore, commonly employed in the prevention or management of hyperuricemia. *(3)*

12h. **(A)** When allopurinol therapy is initiated, large quantities of uric acid are mobilized in the body and enter the urinary tract. Without adequate hydration, urates are likely to precipitate in the tract, causing pain and inflammation. *(3)*

12i. **(D)** Because allopurinol is employed in managing uric acid levels in the body, the monitoring of serum urate levels will provide a means of determining the success of therapy. *(3)*

12j. **(B)** When nystatin (Mycostatin) oral suspension is employed in the treatment of oral candidiasis infection, it is important that sufficient contact time be allowed between the drug and the mucosal surface of the oral cavity. This can be accomplished by having the patient swish the suspension in the mouth for several minutes prior to swallowing it. *(3)*

12k. **(E)** Extravasation is the leakage of injection fluid into tissue surrounding the injection site. When this occurs with the use of potent drugs such as daunorubicin, irritation and inflammation commonly occur. Once extravasation has occurred, the application of cold compresses to the injection site will relieve pain and minimize further dissemination of the drug into neighboring tissue. *(3)*

12l. **(B)** A serious adverse effect associated with the use of daunorubicin is cardiotoxicity. This is commonly manifested as congestive heart failure (CHF) and requires early diagnosis and aggressive treatment with sodium restriction, diuretics, and digoxin. *(3)*

12m. **(E)** The active metabolite of Dalmane has a long half-life, and thereby accumulates over time. It also suppresses REM sleep even at low doses. The net result is impaired daytime functioning, especially in the elderly. Temazepam (Restoril) and triazolam (Halcion) are benzodiazepines that have shorter half-lives and are less likely to cause side effects mentioned in the question. Zaleplon (Sonata) is a short-acting nonbenzodiazepine. *(3)*

12n. **(C)** Melatonin is an endogenous hormone that may affect human sleep patterns. Tryptophan has been advocated as a sleep aid, but its effectiveness has not been clearly established. *(3)*

PROFILE NO. 13

13a. **(D)** A normal hemoglobin level is considered to be approximately 12.3 to 15.3 g/dL for females and 14 to 17.5 g/dL for males. When values drop below 10 g/dL, symptoms of iron-deficiency anemia become evident. Six months of iron therapy is generally sufficient to raise hemoglobin levels to within a normal range. A better estimate of iron therapy effectiveness would be an increase in hemoglobin of 2 g/dL in the first 3- to 4-week period. *(5:1520)*

13b. **(A)** Epogen is Amgen's brand of erythropoietin, which is effective for the prevention of anemia and in reducing the need for blood transfusions. It is administered either intravenously or subcutaneously in doses of 50 to 150 units/kg to normalize body hematocrit counts. Folex is methotrexate, the drug of

choice for several types of tumors. Intron-A (interferon alfa-2a is a biotech drug used in the therapy of hairy cell leukemia and AIDS-related Kaposi's sarcoma. Neupogen or filgrastim is a granulocyte colony-stimulating factor and Neumega or oprelvekin is a substance that enhances the production of platelets. *(3)*

13c. **(A)** Maalox Suspension contains magnesium hydroxide and aluminum hydroxide. The use of magnesium hydroxide–containing products is commonly associated with the development of diarrhea because the magnesium ion creates an osmotic effect in the GI tract. While the aluminum hydroxide will often reduce the diarrheal effect, some patients still experience discomfort. *(3)*

13d. **(D)** Omeprazole (Prilosec) is a proton pump inhibitor that is used for the short-term treatment of duodenal and gastric ulcers as well as GERD and hypersecretory conditions of the stomach. *(3)*

13e. **(A)** The use of antacids such as Maalox with iron products is likely to result in a decrease in absorption of the iron because iron tends to precipitate in an alkaline medium. *(3)*

13f. **(B)** Iron absorption may be somewhat increased by the co-administration of at least 200 mg of ascorbic acid per 30 mg of elemental iron administered. This appears to be the result of ascorbic acid's ability to maintain iron in the ferrous state, a form that is more absorbable than the ferric state. *(3)*

13g. **(D)** Feosol tablets contain exsiccated (dried) ferrous sulfate. The exsiccated form of ferrous sulfate contains approximately 30% elemental iron, considerably higher than that contained in hydrous ferrous sulfate or ferrous gluconate. *(3)*

13h. **(D)** Because of potential local irritation, the only form of injectable iron is iron dextran injection available as InFeD and Dexferrum. Dosage forms of ferrous sulfate include tablets (Feosol), oral drops (Mol-Iron and Fer-In-Sol), oral liquid (Mol-Iron), and an elixir (Feosol). *(3)*

13i. **(A)** Patients who have iron-deficiency anemia tend to have red blood cells that are microcytic, smaller than normal—and hypochromic, lacking in normal color. Megaloblastic cells are larger than normal cells. These are frequently seen in patients who have pernicious anemia. *(3)*

13j. **(B)** Omeprazole (Prilosec) and lansoprazole (Prevacid) are both proton pump inhibitors. *(3)*

13k. **(D)** A deficiency or impaired utilization of vitamin B_{12} and especially of folic acid may result in megaloblastic anemia. Other causes of the anemia include use of cytotoxins, such as the antineoplastics, or the immunosuppressive agents. *(3)*

13l. **(B)** Foods from animal sources such as eggs, dairy products, and especially liver contain vitamin B_{12}. Another source is shellfish. Vegetables and fruit do not contain the vitamin. Strict vegetarians may eventually experience vitamin B_{12} deficiency. *(3)*

13m. **(D)** Pernicious anemia is a progressive disease caused by a lack of the intrinsic factor resulting in malabsorption of vitamin B_{12}. The condition affects more adult women, especially African-American women, than men. Individuals living in temperate regions (North America or northern Europe) are more susceptible than are people living in the tropics. There also appears to be an increased rate in certain families, suggesting a genetic factor. *(5:1541)*

13n. **(B)** Nicotrol is available as a transdermal system, a spray pump, and as an inhaler. Nicorette is available only as a chewing gum dosage form, whereas Habitrol is available only as a transdermal system. *(3)*

PROFILE NO. 14

14a. **(D)** Most *Streptococcus* infections are sensitive to cephalosporins. Cefaclor is a second-generation cephalosporin that is unlikely to

be effective against *Chlamydia, Proteus, Pseudomonas*, or fungal infections. *(3)*

14b. **(D)** Epsom Salt contains magnesium sulfate. It can be used orally as a saline laxative or topically as an astringent. *(3)*

14c. **(B)** Routine use of pHisoHex has reduced the incidence and severity of pyogenic skin infections, especially those caused by gram-positive microorganisms, such as staphylococci. However, there is the possibility of superinfection of gram-negative microorganisms and *Candida.* (3)

14d. **(B)** Chlorhexidine gluconate is the active ingredient in Hibiclens and Hibistat. It possesses bacteriocidal activity against both gram-positive and gram-negative bacteria and the 4% solution is popular as a surgical scrub. It is a faster-acting agent than is hexachlorophene. *(3)*

14e. **(D)** The active ingredient in Cidex is glutaraldehyde, used mainly as a disinfectant. Chlorhexidine is present in Hibistat, which is used as a skin cleanser. Peridex also contains chlorhexidine. It is an oral rinse for the prevention of oral infections in immunocompromised patients. *(3)*

14f. **(E)** If 0.8 mL of water will dissolve 1 g of magnesium sulfate, one must simply determine how many grams 120 mL of water will dissolve.

$$\frac{1\text{ g}}{0.8\text{ mL}} = \frac{X\text{ g}}{120\text{ mL}}$$

$$x = 150\text{ g}$$

14g. **(C)** Percogesic contains 325 mg acetaminophen and 30 mg phenyltoloxamine citrate per tablet. Phenyltoloxamine is classified as an antihistamine. *(3)*

14h. **(E)** Pepto-Bismol contains bismuth subsalicylate, which appears to exert an antisecretory effect on intestinal mucosa and also binds both cytotoxins and enterotoxins. Doses of 60 mL or 2 tablets four times a day have been used prophylactically. If diarrhea occurs, doses of 30 mL every one-half hour for eight doses is used. *(3)*

14i. **(C)** The fluoroquinolones are very effective agents and are used when the causative microorganism has not been identified. TMP–SMZ and doxycycline are still used, although microbial resistance is increasingly encountered. *(3)*

14j. **(D)** Giardiasis is a protozoal infection caused by *Giardia lamblia.* It mainly affects the intestinal tract, causing diarrhea, other GI disorders, and profound malaise. The drug of choice is metronidazole, which is better tolerated than the alternative quinacrine. *(3)*

14k. **(C)** The disease is caused by the spirochete *Borrelia burgdorferi,* carried by a tick. Serious cases can result in crippling arthritis. *(3)*

14l. **(C)** Doxycycline or tetracycline are first-line antibiotics in the treatment of Lyme disease. However, more serious cases are treated with intravenous ceftriaxone. *(3)*

14m. **(A)** Doses ranging from 80 mg daily to 325 mg every other day have been shown to reduce the incidence of myocardial infarction, especially in men over 50. Doses above 325 mg are not advocated because side effects such as bleeding may occur. *(3)*

14n. **(A)** Many products have converted from kaolin to attapulgite because of its greater absorbent properties. *(3)*

PROFILE NO. 15

15a. **(B)** Ranitidine bismuth citrate is available as Tritec. *(3)*

15b. **(A)** Ataxia is the inability to coordinate muscles controlling voluntary movement. Atresia is the absence of a hole; aphasia indicates an impaired ability to communicate; dysarthria is a difficulty of speech; and dementia indicates mental deterioration. *(27)*

15c. **(B)** Clarithromycin (Biaxin) and azithromycin (Zithromax) are both macrolide antimicrobial agents. *(3)*

15d. **(D)** Zollinger–Ellison syndrome is a pathologic hypersecretory condition caused by adenomas of the gastrin-producing islet cells of the pancreas. Patients with this condition experience persistent ulcer pain and diarrhea. The drug of choice for this is considered to be omeprazole. *(5:566)*

15e. **(A)** When two doses of Brethaire are to be administered they should be separated by one minute. *(3)*

15f. **(A)** Individual patients may have to be titrated to alleviate symptoms. Daily doses of 900 to 1200 mg will maintain plasma lithium levels of 0.6 to 0.8 mEq/L. To obtain plasma levels of 1 mEq/L, daily doses of 1500 to 2400 mg may be necessary. Toxic symptoms usually manifest themselves when plasma levels are greater than 1.5 mEq/L. Blood sampling is performed 10 to 12 h after the last dose. Usually, it is convenient to draw the blood just before the morning dose. *(3)*

15g. **(A)** The reported symptoms are mild effects that probably relate to peaks in lithium levels. The first approach in correcting the problem is to spread the doses further apart. *(3)*

15h. **(A)** Lithium is usually considered to be the drug of choice in the treatment of acute manic episodes. Symptoms of this condition include delusions, irritability, hallucinations, polyuria, and polydipsia. Some of the first signs that signal manic episodes are euphoric moods with hyperactivity, excessive energy, and perceived need for little sleep. Lithium has been used in treating schizophrenia, but it is not the drug of choice. *(3)*

15i. **(B)** Nosocomial infections are those that have been acquired during hospital stays. *(27)*

15j. **(D)** Paroxetine (Paxil) is used in the treatment of depression. *(3)*

15k. **(B)** Paxil is a selective serotonin reuptake inhibitor. Its antidepressant effects are believed to be due to the drug's ability to prevent the reuptake of serotonin. It appears to be more selective in its serotonin to norepinephrine reuptake inhibition than are the tricyclic antidepressants. *(3)*

15l. **(C)** Fluvoxamine (Luvox) and citalopram (Celexa) are also selective serotonin reuptake inhibitors (SSRIs). Zyprexa is an antipsychotic agent. *(3)*

15m. **(D)** Gingival hyperplasia is a condition of the gums that is characterized by the overgrowth of gum tissue. This may result in oral infections and tooth decay if not corrected. *(3)*

15n. **(C)** The SSRIs offer many advantages over other classes of antidepressants including the first two listed answers. However, many patients require 6 to 12 months of therapy to treat a depressive episode. Stopping the drug too soon may cause a relapse. *(3)*

PROFILE NO. 16

16a. **(D)** Conventional therapy of urinary tract infections with Amoxil requires treatment for 7 to 14 days. Apparently, Ms. Johnson discontinued therapy after a few days, probably because the symptoms subsided. She should be encouraged to take a full dosage regimen to clear the infection. *(3)*

16b. **(D)** When bacterial counts reach greater than 1×10^5, the condition is considered to be bacteriuria even if it is asymptomatic. *(5:1779)*

16c. **(C)** Large single doses of drugs have been employed successfully in treatment of UTIs in nonpregnant patients. Three grams of amoxicillin (Amoxil) or fosfomycin (Monurol) has been recommended. *(3)*

16d. **(C)** Both ascorbic acid and ammonium chloride have been used to acidify the urine with varying degrees of success. The pharmacist

must be aware of other drugs being consumed because the acidic urine may affect their renal clearance. *(3)*

16e. **(D)** The sympathomimetic agent phenylpropanolamine has been found to be safe and effective for short-term weight control. The stimulant caffeine, acting as a thermogenic agent, may be effective in increasing physical activity with a corresponding expenditure of energy. *(3)*

16f. **(D)** There is evidence that the hypothalamus contains a "satiety" center. Normal-weight individuals appear to have internal cues such as hunger sensation and response to caloric density of foods that reduce the overeating habit. The genetic factor is also important. Statistically, the incidence of obesity is greater in children when either or both of the parents were obese. Because obesity is often associated with neurotic traits, overeating is commonly considered to be a behavioral defect. Either anxiety or depression may cause a tendency for some individuals to overindulge in eating. *(5:2336)*

16g. **(A)** Bulimia is characterized by uncontrolled rapid ingestion of large amounts of food followed by self-induced vomiting. The individual often has bouts of self-loathing and depression. Fluoxetine is indicated for the treatment of bulimia. *(3)*

16h. **(D)** Several oral OTC products such as Pediacon DX, Triaminicin, and Robitussin CF contain phenylpropanolamine (PPA) as the nasal decongestant. However, most OTC oral decongestant products contain pseudoephedrine, rather than PPA, as the decongestant. *(3)*

16i. **(E)** Insomnia and restlessness are more likely to be experienced by patients consuming phenylpropanolamine. *(3)*

16j. **(B)** Lubriderm is an O/W emulsion that may be poured from a bottle. The added ingredients would not increase its viscosity significantly. Thus, the final product is most likely to be classified as a lotion. Obviously both "shake well" and "external use only" labels must be attached to the container. *(3)*

16k. **(C)** The designation "aa qs 1%" translates as "of each a sufficient quantity to make 1%." Therefore, 0.5% each of menthol and camphor is needed. (120 mL × 0.5% = 0.6 g)

16l. **(A)** Incorporating the two solids, menthol and camphor, into a lotion is best accomplished if a liquid is first formed. Simple mixing of the two chemicals will result in a eutectic liquid, which would mix readily with the alcoholic coal tar solution (LCD). Additional alcohol is not needed. It is not advisable to use alcohol as a solvent in ointment formulas because the alcohol may slowly migrate to the ointment surface, carrying dissolved drugs with it. There is no need to add polysorbate 80 to the product because it is already present in the LCD as a dispersing agent.

16m. **(E)** Coal tar solution contains 20% coal tar in an alcoholic solvent. Coal tar, especially in combination with UV radiation, has been successful in the treatment of psoriasis. The combination is known as the Goeckerman regimen. *(3)*

16n. **(C)** Coal tar is a photosensitizer and a potential carcinogen. It increases a patient's tendency to sunburn for up to 24 h after application. The patient's medication record should also be reviewed for other photosensitizers such as the phenothiazines and tetracyclines. Coal tar is relatively safe when included in shampooing products, partially because of the short contact period. There are several shampoos on the market, including Ionil T, Polytar, and Zetar. *(3)*

PROFILE NO. 17

17a. **(E)** On reviewing the lab reports, the pharmacist concludes that none of the other conditions are present. The white blood count is within normal values (5000 to 10,000 cells/mm^3). The normal hemoglobin for

males is 14 to 18 g/dL, and the hematocrit only slightly low (range of 40 to 54%). Diabetes is suspected when serum glucose levels are above 120 mg/dL. Both the BUN and serum creatinine values are normal. *(3)*

17b. **(B)** Clinical data suggest that administration of an antibiotic 1 to 2 h before surgery will reduce the incidence of post-surgical infections significantly. Usually one of the cephalosporins on formulary is prescribed. *(3)*

17c. **(E)** Docusate sodium (Colace) is an anionic surfactant used as a fecal softener. Its surfactant properties enable better penetration of water into the intestinal contents. *(3)*

17d. **(C)** PEG/Electrolyte Lavage Solutions such as GoLYTELY are intended as a bowel evacuation and completely flush out the GI tract prior to surgery. The product is provided as a powder concentrate and reconstituted usually to a 4-L volume. The entire amount is to be consumed by the patient over a relatively short period of time—240 mL every 10 min. *(3)*

17e. **(C)** Both Aminosyn and FreAmine are standard formulas containing essential and nonessential amino acids. NephrAmine is a specially designed formula intended for use in renally impaired patients. It contains a mixture of the essential amino acids, but none of the nonessential amino acids except histidine. NephrAmine is significantly more expensive than are the other two products. *(3)*

17f. **(B)** TPN solutions are intended for slow parenteral infusion by either central administration through the subclavian vein or by peripheral administration through smaller veins. However, the TPN formula listed for this patient is very hypertonic, which precludes peripheral routes because the small veins may be damaged. Glucose concentrations of 10% or more should not be infused peripherally. *(3)*

17g. **(A)** The patient's chloride levels were 120 mEq/L, which is above the normal range of 98 to 109 mEq/L. Although it is possible to monitor blood pH, the pharmacist should suggest that potassium and sodium acetates be used in place of the respective chlorides. The "1 vial" designation for MVI refers to the standard 10 mL product. *(3)*

17h. **(A)** 500 mL amino acid solution × 8.5% = 42.5 g of amino acids. Because the average amount of nitrogen in amino acids is 16%, 42.5 g × 16% = 6.8 g of nitrogen. *(3)*

17i. **(A)** 500 mL dextrose × 40% = 200 g of dextrose. 200 g dextrose × 3.4 cal/g = 680 kcal. *(3)*

17j. **(C)** TPN formulas should provide sufficient nonprotein calories to convert the amino acids present to lean body mass. A ratio of nonprotein calories to each gram of nitrogen (NPC:N) has been established. For most patients, a value of 150:1 is ideal, with a range of 125 to 175:1 acceptable. In stressed patients, such as burn victims, a 100 to 1 ratio may be used. When lower ratios are used, either other sources of calories must be employed (ie, body fats) or some of the amino acids will be used as calories. *(3)*

17k. **(C)** EFAD is essential fatty acid deficiency. Liposyn III is a parenteral fatty oil emulsion that will provide the linoleic acid needed in humans for cell membrane synthesis and stabilization. EFAD is characterized by scaly skin, alopecia, poor wound healing, and thrombocytopenia. *(5:2229)*

17l. **(C)** Parenteral fatty oil emulsions are available in both 10 and 20% mixtures. Each milliliter of 10% emulsions provides 1.1 kcal, whereas each milliliter of 20% emulsions contributes 2 kcal. Therefore, 500 mL of 20% emulsion × 2 kcal/mL = 1000 kcal. If one did not know the exact calories present, the value could be estimated knowing that every gram of oil has approximately 9 kcal. Thus: 500 mL × 20% = 100 g oil; 100 g oil × 9 kcal = 900 kcal. *(3)*

17m. **(E)** Patients experiencing delayed healing of wounds or burns have responded to therapeutic doses of zinc. *(3)*

17n. **(D)** Legionnaires' disease occurs mainly in the summer when the airborne gram-positive *Legionella pneumophilia* is present. Many victims are older males, especially smokers with chronic lung disease. *(5:1661)*

17o. **(B)** Aggressive treatment with erythromycin is usually necessary. Oral rifampin may also be added to this therapy. *(5:1632)*

PROFILE NO. 18

18a. **(D)** Propylthiouracil is an anti-thyroid drug used in treating Graves' disease since this disease is characterized by hyperthyroidism. *(3)*

18b. **(D)** A regimen of chemotherapy known as MOPP is used in the treatment of Hodgkin's disease. Procarbazine (Matulane) and prednisone are given by the oral route on each day of the 14-day schedule. Mechlorethamine (Mustargen) and vincristine (Oncovin) are given intravenously on the first and eighth days of therapy. Experience has shown that combining drugs that have different mechanisms of action increases remission rates and lowers the incidence and severity of side effects. *(3)*

18c. **(A)** Hepatocellular, renal cell, and thyroid carcinomas have shown poor responses to presently used chemotherapeutic drugs. Ovarian and prostatic carcinomas are moderately responsive, with palliation and probable prolongation of life. Prolonged survival and probably some cures are expected in patients with testicular cancer and Hodgkin's disease. *(5:1967)*

18d. **(B)** Vincristine is available as a ready-to-use solution (1 mg/mL) in 1-, 2-, and 5-mL vials and 1- and 2-mL disposable syringes. It is intended for intravenous administration. It is never administered by the intramuscular, subcutaneous, or intrathecal routes. *(3)*

18e. **(B)** Mechlorethamine is a potent vesicant. Serious localized damage may occur if the drug solution seeps into the area surrounding the infusion site. The thiosulfate ion will react with the nitrogen mustard. Ice compresses will relieve the burning sensation and slow the spread of mechlorethamine. Other solutions that have been infused are normal saline and sodium bicarbonate. *(3)*

18f. **(B)** A 1-molar solution of sodium thiosulfate will contain 248 g of chemical in 1 L of solution. A one-sixth molar solution will contain 248/6 = 41 g/L or 4.1g/100 ml. *(3)*

18g. **(B)** Although the official form of sodium thiosulfate contains five waters of hydration, the correct amount of active ingredient can be obtained by using the anhydrous form. Simply subtract 90 (weight of water in the molecule) from 248 to obtain 158 (the weight of anhydrous sodium thiosulfate), then follow the procedure outlined in Answer 18f. *(3)*

18h. **(D)** The dictionary defines nadir as the place or time of deepest depression. When discussing drug chemotherapy, the term usually refers to the length of time before maximum bone marrow depression occurs. Many chemotherapeutic drugs, especially the alkylating agents, cause a depression characterized by low leukocyte counts with increased susceptibility to infections. For example, the nadir for a given drug may be 7 to 10 days after the start of therapy, with bone marrow recovery in 14 to 18 days. *(3)*

18i. **(E)** Bone marrow suppression is often the dose-limiting factor for toxicity during chemotherapy. Vincristine appears to have little effect on bone marrow. *(3)*

18j. **(C)** Epoetin alfa (Epogen) is a stimulant of red blood cell production. Filgrastim (Neupogen) is a stimulant of granulocyte (leukocyte) production. These are used in patients receiving myelosuppressive drugs such as mechlorethamine. Clopidogrel (Plavix) is an inhibitor of platelet aggregation. *(3)*

18k. **(C)** Cyanocobalamin injection is a pink-colored solution available in strengths of 100 and 1000 mcg/mL. It is administered by either IM or subcutaneous injection, but not IV.

The parenteral route offers better bioavailability than oral administration. *(3)*

18l. **(E)** Cetirizine (Zyrtec), loratidine (Claritin) and fexofenadine (Allegra) are peripherally selective antihistamines. They cause less drowsiness than non-selective agents. *(3)*

PROFILE NO. 19

19a. **(A)** Adriamycin is marketed in vials containing either 10 or 50 mg of powder for reconstitution. The drug is also available under the tradename of Rubex (Bristol). *(3)*

19b. **(D)** Both doxorubicin and cyclophosphamide cause alopecia in a significant number of patients. *(3)*

19c. **(E)** The nadir for the drug is approximately 10 to 15 days after administration. Recovery from the leukopenia occurs in about 20 days. Cardiomyopathy is a delayed, cumulative, dose-related adverse effect. *(3)*

19d. **(B)** The patient weight is 140 lb. (1 kg = 2.2 lb)

$$140 \text{ lb} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} = 64 \text{ kg}$$

Because 700 mg of cyclophosphamide is being given, $\frac{700 \text{ mg}}{64 \text{ kg}} = 11 \text{ mg/kg}$.

(23:67)

19e. **(A)** Almost all patients receiving cisplatin experience nausea and vomiting. Granisetron (Kytril) is a 5-HT_3 receptor antagonist that prevents nausea and vomiting associated with high-dose emetogenic cancer therapy. *(3)*

19f. **(B)** The elevated creatinine value (normal = 1 mg/dL) indicates renal damage. Cisplatin can cause proximal renal tubular damage that is not completely reversible. It is advisable to either discontinue the cisplatin or reduce the dosage while carefully monitoring the patient for acute renal failure. *(3)*

19g. **(B)** Hemorrhagic cystitis or bladder inflammation occurs in 7 to 12% of patients using this drug. It can best be avoided by advising the patient to drink lots of fluids. *(3)*

19h. **(D)** High serum levels of methotrexate will result in passive diffusion of the drug into normal cells. To avoid the resulting cytotoxic effects on normal cells, an injection of leucovorin (folinic acid) is administered approximately 24 hours after the methotrexate injection. Leucovorin is also used in treating megaloblastic anemia. It is administered by intramuscular injection. *(3)*

19i. **(C)** Methotrexate is sometimes given intrathecally because the drug does not normally enter the cerebrospinal fluid except if given at high levels (> 1 g/m^2). Thiotepa is poorly absorbed from the GI tract. Because it is not a vesicant, it can be administered intravenously, by bladder irrigation, and intrathecal injection. *(3)*

19j. **(A)** Progressive dose-related hepatotoxicity may occur in patients on long-term therapy with methotrexate. Oral weekly doses of methotrexate (7.5 mg) have been successful in reducing the symptoms of rheumatoid arthritis. The potential for toxicity has been reduced by giving leucovorin 1 day after the methotrexate dose. *(3)*

19k. **(D)** Both 2.5-mg tablets and a Solution for Injection are available. *(3)*

19l. **(D)** Kytril (granisetron) as 1-mg tablet and injection (1 mg/mL) is administered at doses of 10 μg/kg prior to chemotherapy. Zofran (ondansetron) as 4- and 8-mg tablet, oral solution, or injection is dosed at 8 mg prior to surgery or chemo, then repeated 4 and 8 h after surgery, then every 8 h for 1 or 2 days. Marinol (dronabinol), the active ingredient in marijuana, is only available in gelatin capsules (2.5, 5, and 10 mg). It is administered 1 to 3 h before chemotherapy, then every 2 to 4 h for a total of 4 to 6 doses per day. It has also been found effective as an appetite stimulant. *(3)*

19m. **(E)** All the listed drugs are appropriate. Another drug used for breast cancer is the anti-

estrogen Tamoxifen. It is important to reduce doses of mercaptopurine to 25% of normal when allopurinol is being used. *(3)*

19n. **(E)** The antihypertensive enalapril maleate (Merck's Vasotec) is available as 5-, 10-, and 20-mg tablets, with usual maintenance dosing of 10 to 40 mg daily. *(3)*

19o. **(E)** Vasotec is an angiotensin-converting enzyme (ACE) inhibitor. *(3)*

19p. **(C)** Several of the ACE inhibitors cause the unusual side effect of an occasional dry and nonproductive cough. Patients should also be warned of incidences of hypotension, especially during the first few days of therapy. The drugs also appear to increase alertness and produce mood elevation. Vasotec does not cause reflex tachycardia. *(3)*

PROFILE NO. 20

20a. **(E)** The 30-day supply of HCTZ appears to have been dispensed only once with tablets depleted by April 1. Either Mr. Tralor has had the prescription filled elsewhere or is not complying with the once daily dosing. This may explain why Dr. Lange has issued a new prescription for the more potent verapamil. Mevacor is available in several strengths (10-, 20-, and 40-mg tablets). Verapamil may increase digoxin levels by 50 to 70% during the first week of therapy. Monitoring of the patient may be necessary. *(3)*

20b. **(B)** Verapamil is a calcium-channel blocker used as an antihypertensive agent, antianginal, and antiarrhythmic. It is available as both regular tablets and controlled release dosage forms. The products may be given with food. *(3)*

20c. **(E)** Verapamil is indicated for the treatment of angina, atrial flutter or fibrillation, and essential hypertension. *(3)*

20d. **(A)** When drugs such as verapamil have significant differences between the oral and parenteral doses administered, there are several explanations. One is poor absorption from the GI tract. Another is that the drug undergoes significant first-pass effect, usually due to rapid metabolism by the liver. Because this occurs before the drug reaches sites of activity, the oral dose must be relatively high as compared to the intravenous dose, which avoids the first-pass effect. Another drug example is propranolol, which has an IV dose of 4 mg compared to the oral dose of 40 to 80 mg. *(3)*

20e. **(E)** Taking Mevacor with the evening meal appears to maximize the GI absorption of the drug. *(3)*

20f. **(C)** A fast disintegration time for tablets indicates that the tablet has broken into smaller pieces, which allows the dissolution process to occur. The fastest disintegration occurred with brand D (the shortest time), followed by brand C. However, brand C dissolved faster than brand D. Because dissolution is critical for drug absorption and is usually the rate-limiting step, brand C probably has the greatest bioavailability. *(3)*

20g. **(E)** Niacin is one of the most economical drugs in attempting to reduce blood triglycerides and cholesterol. It causes the catabolism of low-density lipoproteins (LDL). *(3)*

20h. **(D)** The vasodilation effect of niacin causes peripheral flushing that may last up to 1 hour after administration. The drug may also irritate the stomach, causing abdominal discomfort. The flushing and pruritus can be prevented by administration of 325 mg of aspirin 30 minutes before the niacin. *(3)*

20i. **(B)** Screening is usually based on total cholesterol, with a targeted goal of less than 200 mg/dL (5.17 mM/L in the non-fasting adult). People with higher cholesterol levels should have their LDL value calculated by determining their triglyceride and high-density lipoprotein (HDL) while in the fasting state. Hyperlipidemia is closely associated with increased incidences of CHD (coronary heart disease). *(5:359)*

20j. **(D)** High levels of LDL and VLDL (very low-density lipoproteins) indicate a high atherosclerotic risk. Patients with LDL values greater than 130 mg/dL should consider both dietary changes and possible drug therapy. For example, patients should limit their intake of meats (up to 6 oz per day of lean red meat or chicken with the skin removed is permissible). HDL appears to be a scavenger of cholesterol and protects arteries from deposition of cholesterol. Generally, an LDL/HDL ratio of less than 3.0 is ideal. *(5:359)*

20k. **(E)** When comparing the dosing regimen of the listed drugs, simvastatin (Zocor) has the lowest dosing regimen—5 to 40 mg daily—which is reflected in the tablet strengths available (5-, 10-, 20-, and 40-mg). Lovastatin (Mevacor) has the next lowest dose—20 mg daily—with 10-, 20-, and 40-mg tablets marketed. The remaining drugs were cholestyramine (Questran)—4 g t.i.d.; colestipol (Colestid)—15 g daily; and gemfibrozil (Lopid)—300 mg b.i.d. *(3)*

20l. **(C)** Weak acidic compounds such as warfarin, digoxin, and penicillin will bind to cholestyramine and colestipol. Bile acids also bind with these agents. This is the mechanism by which the resins exert their activity. *(3)*

20m. **(C)** Although the depressant effects of alcohol may occur at lower blood levels, mental impairment and loss of motor coordination is obvious in most individuals once blood alcohol levels exceed 0.1%. The major problem with alcohol metabolism is the limited supply of enzymes for the oxidation procedure. Therefore, alcohol may be described as mainly following zero-order kinetics with limited amounts metabolized each hour. *(3)*

20n. **(C)** Deficiencies in thiamine (vitamin B_1) may result in Wernicke's syndrome or Korsakoff's syndrome characterized by peripheral neuropathy and confusion. Depletion of folic acid leads to moderate or severe anemia. Folic acid has been a valuable supplement for pregnant women in the prevention of fetal spina bifida. *(3)*

PROFILE NO. 21

21a. **(A)** Hypothyroidism (myxedema) is characterized by the slowing of body processes because of a deficiency of thyroid hormone. The classic treatment was thyroid tablets. Today, this drug has been replaced with L-thyroxine (T_4), L-thyronine (T_3), and liotrix (a mixture of T_4 and T_3). Synthroid is levothyroxine sodium (L-thyroxine). Graves' disease is a form of hyperthyroidism (thyrotoxicosis). *(5:1247)*

21b. **(E)** Omission of a single dose of Synthroid will not have significant effects on the disease state. *(3)*

21c. **(B)** Aspartame and saccharin are artificial sweeteners that are 200 and 400 times sweeter, respectively, than sucrose. These agents are used in many dietary foods and in some pharmaceuticals. The use of saccharin in place of 1 teaspoonful of sugar saves the consumer 33 calories. Aspartame should be avoided in patients with phenylketonuria. *(3)*

21d. **(C)** The tannins in teas may react with iron to form insoluble iron tannates. It is well established that many antacids combine with iron, thereby reducing the absorption of iron. *(3)*

21e. **(D)** Amantadine is a selective antiviral agent for prophylactic action (200 mg daily) against influenza A, but not B. It is also useful in reducing the signs and symptoms of Parkinson's disease, in which it augments dopamine release. Amantadine can be used as the sole agent or with levodopa. Amantadine is available in both 100-mg capsules and syrup (50 mg/5 mL) under the tradename of Symmetrel. *(3)*

21f. **(C)** Although there is some patient-to-patient variation, one of the earliest signs of Alzhei-mer's disease is the forgetfulness of current events; for example, what one has eaten for lunch. Although gradual, this memory loss becomes progressively worse. *(5:1065)*

21g. **(D)** Tacrine (Cognex) and donepezil (Aricept) are cholinesterase inhibitors that have reduced the clinical symptoms of Alzheimer's. Selegiline is available as Eldepryl and is used in the treatment of parkinsonism. *(3)*

21h. **(A)** Most of the drugs currently used to treat Alzheimer's disease are cholinesterase inhibitors. They are used orally and are palliative, not curative. *(3)*

21i. **(C)** Digoxin immune FAB (Digibind) binds free digoxin in the blood and is a specific antidote for digoxin poisoning. Potassium chloride administration may be useful if the patient is hypokalemic. *(3)*

21j. **(C)** Women, especially postmenopausal women, should increase their intake of calcium to avoid osteoporosis. Tums is available as 500-mg of calcium carbonate per chewable tablet, 750-mg chewable tablets (Tums E-X) and 1000-mg chewable tablets (Tums Ultra). Although calcium carbonate can be used in the prevention of gastroesophageal reflux (GERD), there are better products on the market and the dosing regimen for GERD would be a dose after each meal as well as at bedtime. *(3)*

21k. **(A)** Many of the elderly have an increase in the relative amount of fat in their bodies, partially because of dehydration and less activity. The corresponding volume of distribution for lipophilic drugs may increase. Renal clearance rates are often lower in the elderly because of impaired kidney function. The plasma albumin levels are sometimes lower than normal, thereby affecting the amount of protein binding. *(3)*

21l. **(C)** If both dosage forms had 100% bioavailability (F value of 1.0), the answer would be 5 mL.

$$\frac{0.05\text{ mg}}{1\text{ mL}} = \frac{0.25\text{ mg}}{x\text{ mL}}$$

$$x = 5\text{ mL of elixir}$$

However, all of the drug is not available as reflected in the "F" values of 0.6 for the tablet and 0.75 for the elixir. Therefore,

$$[Q_1]\,[C_1] = [Q_2]\,[C_2]$$

$$[0.25\text{ mg}]\,[0.6] = [x\text{ mg}]\,[.75]$$

$$x = 0.2\text{ mg of digoxin needed}$$

Since the elixir contains 0.05 mg per mL

$$\frac{0.05\text{ mg}}{1\text{ mL}} = \frac{0.2\text{ mg}}{x\text{ mL}}$$

$$x = 4\text{ mL of elixir}$$

21m. **(A)** Many elderly persons who exhibit digoxin toxicity experience hazy vision rather than the more classic halo and color vision changes that occur in the younger population. Rather than having an increase in appetite, anorexia often occurs. *(3)*

21n. **(E)** All of the choices decrease digoxin's volume of distribution and renal clearance rate. It is usually necessary to reduce the digoxin by 50%. *(3)*

PROFILE NO. 22

22a. **(C)** The term tocolytic refers to a drug that will reduce uterine contractility, thereby preventing premature delivery. *(5:480)*

22b. **(B)** Terbutaline is available under the trade names of Brethine (Geigy) and Bricanyl. To inhibit preterm labor, it is administered orally, SC, or IV. However, its greatest market is as a bronchodilator. A second agent that has been very successful for tocolytic therapy is ritodrine (Yutopar) which can be given either orally or IV. *(3)*

22c. **(D)** The medication order calls for 25 μg of drug per minute. The pharmacist added 2 mL (2 mg or 2000 μg) to 250 mL of diluent.

$$\frac{2000\ \mu\text{g}}{250\text{ mL}} = \frac{25\ \mu\text{g}}{x\text{ mL}}$$

$$x = 3.125\text{ mL}$$

$$\frac{15\text{ gtt}}{1\text{ mL}} = \frac{x\text{ gtt}}{3.125\text{ mL}}$$

$$x = 46.8\text{ drops per minute}$$

22d. **(B)** The total amount of drug present is 2000 μg Ng in 250 mL. It is being administered at a rate of 25 μg/min or 3.125 mL/min.

$$\frac{250\ \text{mL}}{x\ \text{min}} = \frac{3.125\ \text{mL}}{1\ \text{min}}$$
$$x = 80\ \text{min}$$

22e. **(E)** Elastomeric containers contain an elastic balloon that is filled with sterile solution. They slowly but constantly collapse, thus providing a steady volume of drug solution at zero-order kinetics through a small diameter infusion line. Syringe pumps are used in many institutions in place of standard infusion pumps. The pharmacist simply fills syringes instead of infusion bags. PCA stands for "patient-controlled analgesia." Although originally designed for slow infusion of analgesic solutions, it is currently used for many other infusion solutions. *(3)*

22f. **(C)** Barium sulfate is used to render the intestinal tract opaque for x-rays. A dose of 60 to 250 g is administered as a suspension. *(3)*

22g. **(E)** Barium sulfate is practically insoluble in water; thus, there is little danger of toxicity from systemic absorption of the chemical. It is administered either orally or rectally, depending on the portion of the GI tract to be x-rayed. *(3)*

22h. **(B)** Atropine is classified as an antimuscarinic/antispasmodic agent used to inhibit salivation and other excessive secretions during surgery. It may also prevent cholinergic effects such as cardiac arrhythmias, hypotension, and bradycardia during surgery. An alternative drug is glycopyrrolate (Robinul), which may be administered 30 minutes prior to surgery for action similar to that of atropine. It is also available as oral tablets (1 and 2 mg) to suppress gastric secretions for the treatment of peptic ulcers. *(3)*

22i. **(B)** The usual adult dose of atropine is 0.4 mg SC, IM, or even IV. Atropine sulfate and chlorpromazine HCl (Thorazine) will be compatible in a syringe. The purpose of chlorpromazine is to relieve pre-surgical apprehension and control nausea and vomiting during surgery. *(3)*

22j. **(A)** Because of their sizing and use, urinary catheters bear a federal warning concerning dispensing without a prescription. Ostomy pouches are available in several sizes and designs, but the consumer may purchase them, as well as bandages and dressings, without a prescription. *(3)*

22k. **(B)** The active ingredient in Metamucil is the bulk former psyllium. Some psyllium-containing products contain sucrose for sweetening. A pharmacist may wish to counsel diabetics away from this type of product to one that contains an artificial sweetener such as aspartame; for example, Orange Flavor Metamucil Instant Mix. *(3)*

22l. **(A)** Bulk-forming agents such as Metamucil should be dispersed in water or a flavored vehicle such as orange juice, stirred quickly, then swallowed immediately. Otherwise the powder will swell, forming a gel that would be difficult to swallow. *(3)*

22m. **(B)** Theo-Dur contains anhydrous theophylline for the prevention of asthma. Theo-Dur is available as sustained-action tablets and sustained-action capsules. *(3)*

22n. **(D)** The centrally acting beta-2 agonist methyldopa (Aldomet) is a commonly used antihypertensive during pregnancy. Other alternatives include labetalol (Normodyne or Trandate) or hydralazine (Apresoline). *(3)*

PROFILE NO. 23

23a. **(B)** The active ingredient in Monistat-7 is miconazole, an antifungal agent effective against numerous species, including *Candida albicans* and *Trichophyton mentagrophytes,* which infect the vagina and the foot, respectively. Monistat-7 consists of suppositories for vaginal insertion. Many products containing miconazole are now OTC as 2% creams, powders, and sprays. *(3)*

23b. **(B)** With the successful treatment of gonorrhea with either fluoroquinolones or cephalosporins, other causes of sexually transmitted urethritis have emerged. More than 50% of cases of non-gonorrheal urethritis are caused by the obligate intracellular parasite *Chlamydia.* *(5:1798)*

23c. **(D)** Syphilis is usually transmitted by direct contact with an active lesion containing spirochetes. Although there are several stages and types of syphilis, the drug of choice is still parenteral penicillin G, such as 2.4 million units of benzathine penicillin G. For patients allergic to penicillin, doxycycline or tetracycline is generally used. *(5:1803)*

23d. **(C)** Infections caused by *Chlamydia* are usually asymptomatic in females, whereas males experience dysuria. Primary treatment will be either doxycycline 100 mg twice a day for 7 days or azithromycin as a single 1000-mg dose. Alternatives include erythromycin 500 mg qid or ofloxacin 300 mg bid for 7 days. Ciprofloxacin has been used but is not as successful as doxycycline. *(5:1806)*

23e. **(C)** Oral contraceptives appear to be the best method to avoid conception, followed by intrauterine devices (IUDs). *(5:1339)*

23f. **(C)** White Vaseline or any other petrolatum product is not acceptable as a lubricant for either condoms or diaphragms, because small openings will develop due to the solvent characteristics of petrolatum toward rubber. *(5:1338)*

23g. **(C)** Skin implants such as Norplant offer long-term contraceptive protection. Six capsules are implanted subcutaneously into the upper arm. A constant rate release of 20 to 30 μg of levonorgestrel occurs daily. The implants appear to be even more effective than the oral contraceptives. *(24:242–43)*

23h. **(A)** The testicular hormone danazol (Danocrine) is given orally in 100- to 200-mg doses to treat endometriosis, a condition characterized by menstrual-like bleeding and localized inflammation and pain, usually within the pelvis. A second drug successful in the treatment of endometriosis is nafarelin acetate (Synarel), which is available as an intranasal spray. *(3)*

23i. **(B)** Obsessive–compulsive disorder (OCD) is an anxiety disorder characterized by compulsions such as a fear of dirt or microorganisms, recurrent fear that a stove has not been shut off, constant checking to see if lights have been turned off, or having persistent thoughts that one might injure a loved one. *(4:1197)*

23j. **(A)** Fluvoxamine (Luvox) and other SSRIs are commonly employed in the treatment of OCD. They appear to act by inhibiting reuptake of serotonin. *(5:1201)*

23k. **(C)** Zaleplon (Sonata) is a non-benzodiazepine hypnotic drug. *(3)*

23l. **(E)** The benzodiazepines exert their antianxiety effects by potentiation of the inhibitory neurotransmitter GABA. *(3)*

23m. **(E)** Therapy with clozapine (Clozaril) should be reserved for severely ill schizophrenic patients. Although the drug has many valuable attributes, blood monitoring is necessary. One serious adverse effect is the development of agranulocytosis. *(3)*

23n. **(D)** The incidence of extrapyramidal effects (EPS), including tardive dyskinesia, is minimal with clozapine (Clozaril), especially when compared with other psychiatric drugs. *(3)*

23o. **(D)** Risperidone (Risperdal) is an antipsychotic drug used for many of the same conditions as clozapine. Although there is a lower incidence of agranulocytosis, there is an increase in EPS. Clonazepam is used to treat absence seizures, and the other choices are antidepressants. *(3)*

PROFILE NO. 24

24a. **(D)** These two microorganisms are major causes of both ear infections and sinusitis. A third microorganism often implicated is *Moraxella catarrhalis.* *(5:1672)*

24b. **(C)** Other appropriate agents are cefixime, cefaclor, azithromycin, etc. *(5:1673)*

24c. **(B)** All three drugs possess antipyretic activity. However, Jason is sensitive to salicylates and neither aspirin nor ibuprofen (to which he may also be sensitive) should be dispensed. The newer OTC agents such as naproxen and ketoprofen carry a label warning that they should not be used in young children unless under a physician's supervision. *(3)*

24d. **(C)** Ibuprofen is 2 (p-isobutylphenyl) propionic acid. *(3)*

24e. **(A)** Fever may be the sign of a serious systemic infection. If the fever is masked by the use of an antipyretic, prompt treatment may be delayed. *(3)*

24f. **(A)** Amount of cromolyn needed for Rx is 30 mL × 2.5% = 0.75 g. The amount of the available 4% solution to use:

$$\frac{4\text{ g}}{100\text{ mL}} = \frac{0.75\text{ g}}{x\text{ mL}}$$

x = 19 mL (which is already isotonic)

Therefore, the pharmacist must make only the remaining 11 mL isotonic.

11 mL × 0.9% NaCl = 0.099 g, or 99 mg

(24:472–74)

24g. **(A)** Removal of bacteria and fungi from extemporaneously prepared solutions may be accomplished by passage through a .20- or .22-micron filter into a sterile container. *(24:408)*

24h. **(C)** "OS" or "sinister eye" translates as left eye.

24i. **(B)** Ophthalmic solutions containing cromolyn sodium have been effective in the treatment of allergic conjunctivitis. Chronic allergic conjunctivitis patients should also avoid using OTC sympathomimetic decongestants, which may cause rebound vasodilation. *(3)*

24j. **(C)** Tofranil (imipramine) in doses of 25 mg 1 hour before bedtime reduces the incidence of childhood enuresis. If unsuccessful, the dose may be increased up to 75 mg. *(3)*

24k. **(C)** Diphenhydramine (Benadryl) is a well-known antihistamine exhibiting drowsiness as a major side effect. It is sometimes prescribed as a sleep aid and is available in several commercial OTC sleep aid products including Compoz, Sominex, and Nytol. *(3)*

24l. **(D)** Because of the limited capacity of the eye surface, separating the 2 drops by a few minutes will increase the amount of solution that actually enters and remains in the eye. Blocking the passageway between the eye and nose will reduce the amount of drug lost through the tear duct. *(24:469)*

24m. **(A)** The tympanic thermometer is a device, the tip of which is placed gently in the ear and a sensor receives infrared emission from the tympanic membrane. A digital readout of temperature occurs in approximately 3 seconds. TENS refers to transcutaneous electrical nerve stimulation. TENS devices are worn on the body, usually to relieve pain. *(3)*

24n. **(A)** Debrox drops contain carbamide peroxide, which will soften earwax, easing its removal. S.T. 37 is a mouthwash and topical anti-infectant with hexylresorcinol as the active ingredient. Anbesol is used in the treatment of cold sores and contains both benzocaine and phenol. *(3)*

24o. **(E)** Tartrazine (F.D. & C. Yellow #5) is included in both solid and liquid products. A percentage of the general population is sensitive to the dye and may respond with typical allergic responses. There appears to be a high incidence of cross allergies in individuals sensitive to aspirin and to tartrazine. *(24:97)*

PROFILE NO. 25

25a. **(A)** Gout is a chronic metabolic disease characterized by hyperuricemia. The uric acid is an end product of protein catabolism. Either uric acid production has increased or impaired renal clearance is slowing the removal. The immediate concern during an acute attack is to relieve pain. Only after this

relief should longer-term therapy be initiated. *(5:1460)*

25b. **(D)** To relieve an acute attack, an anti-inflammatory drug (NSAID) or colchicine is administered. Colchicine is most effective if given within the first 12 to 36 hours of the acute attack. *(5:1462)*

25c. **(A)** Allopurinol (Zyloprim) is the most commonly used agent for long-term control of chronic gout and is the drug of choice for patients that are overproducers of uric acid. Not only does allopurinol inhibit xanthine oxidase, which converts xanthine to uric acid, but allopurinol's metabolite, oxypurinol, also inhibits xanthine oxidase. *(5:1464)*

25d. **(C)** Sufficient liquid intake of at least 2 L daily is necessary to prevent formation of urate calculi. Acute attacks of gout may occur on initial therapy; therefore, colchicine therapy should be continued for a few days. Because of possible stomach irritation, it is best to take allopurinol with food. *(3)*

25e. **(A)** Antacids appear to increase the absorption of levodopa. Because levodopa dosing for Parkinson's disease is usually established by titration, either the addition or discontinuation of concurrent antacids may change plasma levels of levodopa significantly. Many drugs decrease the effectiveness of levodopa, the classic being pyridoxine (B_6), which speeds the transformation of levodopa to dopamine before it can cross the blood–brain barrier. There is evidence that combination products such as Sinemet are less affected by pyridoxine than is pure levodopa. *(3)*

25f. **(E)** In addition to aluminum hydroxide and magnesium hydroxide, Mylanta also contains simethicone, a defrothicant. *(3)*

25g. **(E)** *Facts and Comparisons* and all three volumes of the *USP DI* have color charts. *(3)*

25h. **(C)** Minoxidil (Loniten) is available as 2.5- and 10-mg tablets for the treatment of hypertension. A topical 2% solution is marketed as Rogaine and is indicated for the treatment of alopecia. *(3)*

25i. **(D)** The prescribed dose was 0.6 mg/kg/h. Because the patient weighs 160 lb:

Step 1. $160\ \text{lb} \times 1\ \text{kg}/2.2\ \text{lb} = 77\ \text{kg}$

Step 2. $77\ \text{kg} \times 0.6\ \text{mg/kg} = 46.2\ \text{mg/h}$

Step 3. $$\frac{500\ \text{mg}}{1000\ \text{mL}} = \frac{46.2\ \text{mg}}{x\ \text{mL}}$$

$$x = 92.4\ \text{mL/h or } 1.5\ \text{mL/ min}$$

Step 4. $$\frac{15\ \text{gtt}}{1\ \text{mL}} = \frac{x\ \text{gtt}}{1.5\ \text{mL}}$$

$$x = 22.5\ \text{gtt}$$

25j. **(A)** The half-life of theophylline in smokers is 4 to 5 hours, as compared to 7 to 9 hours in nonsmokers. Infusion rates of 0.7 mg/kg/h are needed, as compared to 0.4 mg/kg/h in nonsmokers. Aminophylline is the ethylenediamine salt of theophylline, and therefore has only 85% of the potency. The desired serum levels of theophylline are between 10 and 20 μg/mL. *(3)*

25k. **(E)** Because ranitidine does not interact with hepatic cytochrome P-450 mixed function oxidases, it has minimal effect on the pharmacokinetics of theophylline. All of the other choices inhibit the metabolism of theophylline, thereby increasing its half-life. *(3)*

25l. **(C)** If the rate of initial distribution is not greater than the rate of elimination, two slopes will not be evident when the plasma drug levels are plotted on graph paper. Half-lives of drugs are not directly related to whether a one- or two-compartment model is present. The half-life relates to the clearance of the drug. *(17:69, 592)*

25m. **(D)** A faster heartbeat is a fairly early sign of theophylline overdosing. It is actually more reliable than are nausea and anorexia, which do not occur in all patients. *(3)*

25n. **(C)** Phenytoin will increase the clearance of theophylline resulting in an approximate 40% drop in expected serum levels. Interferon decreases theophylline clearance significantly, resulting in a 100% increase in activity. Allopurinol and alcohol decrease clearance by approximately 25%. Propranolol and cimetidine inhibit cytochrome P-450 enzymes, requiring that theophylline dosing be reduced. *(3)*

25o. **(E)** Rifampin (Rifadin or Rimactane) discolors urine, sweat, and tears. The drug's major use is in the treatment of tuberculosis, usually in combination with isoniazid or pyrazinamide. *(3)*

PROFILE NO. 26

26a. **(D)** Both citalopram (Celexa) and sertraline (Zoloft) are selective serotonin reuptake inhibitors indicated for the treatment of depression. Pamelor is a tricyclic antidepressant, Nardil is a monoamine oxidase inhibitor, and Clozaril and Loxitane are antipsychotic agents. *(3)*

26b. **(C)** Bupropion HCl (Wellbutrin) is an aminoketone antidepressant agent and is chemically unrelated to other currently available antidepressant drugs. *(3)*

26c. **(A)** Wellbutrin and Zyban contain the active ingredient bupropion HCl. Wellbutrin is indicated for the treatment of depression and Zyban is classified as a smoking cessation aid. *(3)*

26d. **(C)** Patients using Lithobid should be advised to consume 8 to 12 glasses of water daily. This will stabilize lithium levels in the blood and prevent lithium toxicity. *(3)*

26e. **(A)** Adverse reactions to lithium rarely occur when serum lithium levels are below 1.5 mEq/L. Mild to moderate toxic reactions may occur at a level of 1.5 to 2.5 mEq/L, and severe toxicity is seen above these levels. *(3)*

26f. **(A)** The addition of hydrochlorothiazide to this patient's regimen is likely to increase serum lithium levels because when sodium is depleted from the body, the body will conserve lithium, thereby resulting in lithium accumulation. *(3)*

26g. **(C)** Blood samples are drawn just prior to taking a dose, because lithium levels will be steady at that time and will represent the trough value for lithium. *(3)*

26h. **(B)**

$$300 \text{ mg} = \frac{(x \text{ mEq})(74)}{2}$$

$$x = 8 \text{ mEq}$$

26i. **(E)** Hydrochlorothiazide (HydroDIURIL) is an example of a thiazide diuretic. *(3)*

26j. **(E)** Triazolam (Halcion) is an ultrashort hypnotic with a half-life of 2 to 3 hours. It is the least likely of any of the benzodiazepines to produce a morning hangover; however, it does produce short-term amnesia in some patients. *(3)*

26k. **(E)** Ambien has an onset of action of less than 30 minutes and a half-life of 2 to 5 hours. Thus, a patient will fall asleep quickly, and the drug wears off before waking. Prosom and Restoril have an onset of 1 to 2 hours with half-lives of 10 to 20 hours. *(3)*

26l. **(D)** Azulfidine (sulfasalazine) is used in the treatment of ulcerative colitis. Usually 1 to 2 g of drug is needed daily. *(3)*

26m. **(C)** Sulfasalazine (Azulfidine) is usually administered for ulcerative colitis in doses of 500 mg q.i.d. A second drug, olsalazine (Dipentum), may also be used. It is a nonsulfonamide topical anti-inflammatory agent that forms 5 amino-salicylic acid in the colon. *(3)*

26n. **(A)** Amiloride blocks reuptake of lithium into cells of the distal tubules and collection ducts. Other drug classes such as the ACE inhibitors significantly increase lithium levels by 100 to 200%. *(3)*

26o. **(B)** Anticholinergic action such as that caused by diphenhydramine or doxylamine

include constipation. A major symptom of prostatitis is restricted urinary flow. *(3)*

26p. **(E)** PSA refers to the prostate-specific antigen, which as a glycoprotein product is almost exclusively produced by prostate epithelial cells. Routine determination of PSA allows comparison of newer values to the individual's baseline value. Increases indicate the possibility of prostate cancer. *(3)*

26q. **(D)** Mitrolan tablets contain calcium polycarbophil, which possesses both laxative and antidiarrheal properties. It quickly binds water in the GI tract, thus reducing fluidity by forming a bulk. *(3)*

26r. **(D)** For many years Ex-Lax contained phenolphthalein as its active ingredient. Because phenolphthalein has been suspected of being a carcinogen, Ex-Lax and many other products containing phenolphthalein were reformulated. Ex-Lax now contains 15 mg of sennosides, also a stimulant laxative. *(3)*

PROFILE NO. 27

27a. **(A)** Daypro is the brand name of oxaprozin. All of the choices are nonsteroidal anti-inflammatory drugs (NSAIDs). *(3)*

27b. **(E)** NSAID have analgesic and antipyretic action, which appears to be related to their ability to inhibit cyclooxygenase activity and prostaglandin synthesis. *(3)*

27c. **(C)** Advil is a nonprescription brand of ibuprofen. Ibuprofen is usually administered three to four times daily, although more frequent administration may be required in some cases. Antacids may be taken with ibuprofen to increase its GI tolerance. *(3)*

27d. **(A)** Tums Chewable contains calcium carbonate. The product has become popular not only as an antacid but as a source of calcium for individuals who are attempting to reduce their chance of developing osteoporosis. *(3)*

27e. **(C)** Piroxicam is available as the brand Feldene. *(3)*

27f. **(E)** Piroxicam (Feldene) is a relatively long-acting NSAID that requires only a single daily 20-mg dose for most patients. *(3)*

27g. **(D)** Rofecoxib (Vioxx) is an NSAID that is an inhibitor of cyclooxygenase-2 (COX-2). Most other NSAIDs are COX-1 inhibitors and are, therefore, more likely to cause GI upset and bleeding. *(3)*

27h. **(C)** Celecoxib (Celebrex) and rofecoxib (Vioxx) are both COX-2 inhibitors. *(3)*

27i. **(C)** Misoprostol (Cytotec) is a synthetic prostaglandin analog that has both antisecretory activity and mucosal protective properties. It is employed primarily in preventing NSAID-induced gastric ulcers. *(3)*

27j. **(A)** Misoprostol is contraindicated for use during pregnancy and is classified as a pregnancy category X drug by the US Food and Drug Administration. *(3)*

27k. **(D)** Anacin is an OTC analgesic product containing 400 mg of aspirin and 32 mg of caffeine in each tablet. *(3)*

27l. **(A)** Etanercept (Enbrel) is a drug product that is used parenterally in the treatment of rheumatoid arthritis. It is not indicated for the treatment of osteoarthritis. *(3)*

PROFILE NO. 28

28a. **(C)** Digoxin is a cardiac glycoside that produces a negative chronotropic effect (slowed heart rate), a positive inotropic effect (greater force of contraction), and a vagomimetic effect on the heart. *(3)*

28b. **(D)** Most patients using digoxin will experience a slowed heart rate (negative chronotropic effect). *(3)*

28c. **(A)** Amrinone (Inocor), although not a digitalis glycoside, is a positive inotropic agent. *(3)*

28d. **(D)** Digitoxin is a cardiac glycoside suitable for use in patients with renal impairment because it is primarily cleared by the liver. Digoxin is cleared primarily by the kidneys. *(3)*

28e. **(C)** Lanoxicaps are liquid-filled capsules that contain a solution of digoxin in polyethylene glycol. Because the digoxin is already in solution, the Lanoxicap dosage form provides greater bioavailability of digoxin than is achieved from digoxin tablets. A dose of 0.25 mg (250 μg) of digoxin from a tablet dosage form is equivalent to 0.2 mg (200 μg) from the Lanoxicap dosage form. *(3)*

28f. **(C)** Digoxin toxicity is characterized by nausea and vomiting, diarrhea, blurred vision, disorientation, and ventricular tachycardia. *(3)*

28g. **(B)** If amiloride (Midamor) is substituted for Lasix in this patient's regimen, the patient should no longer receive the potassium supplement Klorvess because amiloride is a potassium-sparing diuretic and the administration of the combined agents would likely result in hyperkalemia. *(3)*

28h. **(D)** Normal serum potassium concentration is 3.5–5.0 mEq/L. When the serum level of potassium is below this range the patient is said to be hypokalemic. If above this range, the patient is said to be hyperkalemic. *(5:896)*

28i. **(A)** Torsemide (Demadex) and bumetanide (Bumex) are both loop diuretics. Dyrenium is a potassium-sparing diuretic, and Diamox is a carbonic anhydrase inhibitor. *(3)*

28j. **(B)** The patient appears to be noncompliant because he received a month's supply of digoxin but did not get a refill until about 1½ months later. *(3)*

PROFILE NO. 29

29a. **(E)** Diphenhydramine (Benadryl) is an ethanolamine antihistamine with both sedative and antipruritic properties. *(3)*

29b. **(B)** Pyrethrins, one of the active ingredients in RID, is a parasite neurotoxin that is used for the treatment of human lice and scabies. *(3)*

29c. **(B)** When RID Shampoo is used, it is essential that the product not come in contact with the eyes because it can cause significant irritation. RID should not be used on the face or on open cuts or excoriated areas of the body. *(3)*

29d. **(D)** The term "pediculus" refers to lice. *Pediculus capitis* refers to head lice, whereas *Pediculus pubis* refers to pubic lice. *Sarcoptes scabiei* is the organism that causes scabies. The term "tinea" refers to a type of fungal organism. *(3)*

29e. **(C)** RID Shampoo is generally administered once. After working it thoroughly into the shampood and dried hair, it remains in place for 10 minutes and is then worked into a lather with water. It is then rinsed well from the hair, and the hair is towel-dried and combed to ensure the removal of any remaining nit shells. Retreatment may occur after 7 days if there is still evidence of living lice at that time. *(3)*

29f. **(B)** Diprosone Cream contains 0.05% betamethasone dipropionate in a hydrophilic emollient base. *(3)*

29g. **(E)** Diprosone Cream or any other potent corticosteroid topical product should not be used on areas of the skin that are infected by bacteria, fungi, or a virus because the corticosteroid will inhibit the body's defense mechanisms and potentially cause spreading of the infection. *(3)*

29h. **(D)** Both Nix (permethrin) and A-200 Pyrinate (pyrethrins, piperonyl butoxide, and petroleum distillate) are available for OTC use. Eurax (crotamiton) is available only by prescription. *(3)*

29i. **(A)** Pyrethrin-containing products should be avoided by people with ragweed allergy because pyrethrins are plant derivatives that

may precipitate a hypersensitivity reaction in such patients. *(3)*

29j. **(E)** Scabies is a skin condition caused by the mite *Sarcoptes scabiei.* The mite burrows into the skin and causes severe itching and excoriation of the affected area. Lindane and crotamiton are effective drugs for the treatment of scabies. *(3)*

PROFILE NO. 30

30a. **(C)** Naloxone is a pure narcotic antagonist that, when administered parenterally, rapidly reverses the effects of opioid narcotic agents such as heroin. Because it has no agonist action of its own, there is no danger in administering this agent to an unconscious patient even if the source of drug toxicity is unknown. *(3)*

30b. **(A)** Heroin is diacetylmorphine. Codeine is methylmorphine, whereas dionin is ethylmorphine. *(3)*

30c. **(C)** *Pneumocystis carinii* pneumonia (PCP) is a condition seen commonly in AIDS patients. It is an opportunistic infection that emerges when the immune system of a patient is suppressed by disease or drugs. *(3)*

30d. **(D)** Zidovudine or azidothymidine (AZT) is an antiviral agent commonly used in the management of patients with HIV infection who have evidence of impaired immunity. The drug is available by the brand name Retrovir. *(3)*

30e. **(D)** Patients on Retrovir are at risk of developing granulocytopenia or anemia that may require discontinuation of the medication or blood transfusions. It is therefore important to monitor the patient's hematologic status closely while on Retrovir therapy. *(3)*

30f. **(B)** Nelfinavir (Viracept) is the only choice that is a protease inhibitor. Efavirenz (Sustiva) and nevirapine (Viramune) are reverse transcriptase inhibitors. *(3)*

30g. **(C)** Acetaminophen use may competitively inhibit the glucuronidation of zidovudine (Retrovir). This may increase the likelihood of granulocytopenia developing with the use of Retrovir. *(3)*

30h. **(D)** Pentamidine isethionate (Pentam 300, NebuPent) is an agent that is useful in the treatment of pneumocystis carinii pneumonia. It is available as an injectable product that may be administered intravenously or intramuscularly and as an aerosol solution administered by inhalation using a nebulizer. *(3)*

30i. **(E)** Patients receiving pentamidine must be monitored for a variety of serious adverse effects, including sudden, severe hypotension that may occur after a single parenteral dose. Other adverse effects include hypoglycemia, bronchospasm, and cough. *(3)*

30j. **(D)** Robitussin DM is an OTC product used for the treatment of cough. It contains guaifenesin, an expectorant, and dextromethorphan HBr, a cough suppressant. *(3)*

CHAPTER 8

Practice Test

You have come a long way to get here. You have completed hundreds of test items and have studied 30 medication profiles and records. This practice test should confirm what you may already feel—that is, confidence that your time and effort have been well spent. You should set aside about 2 hours of uninterrupted time to take this test. You should be able to answer 80 or more Practice Test questions without guessing, because most test the same competencies that you mastered in previous chapters.

Of course, the Practice Test is also a learning and self-assessment experience. Correct answers will build your confidence in the knowledge base that you have developed. Incorrect answers will enable you to focus on specific areas that may require more time for you to master. Good luck!

Questions

DIRECTIONS (Questions 1 through 100): Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

1. One course of fluorouracil therapy is 6 mg/kg twice a day for 4 days. How many mg will be given daily to a 140-lb patient?

(A) 380 mg
(B) 48 mg
(C) 3040 mg
(D) 1500 mg
(E) 760 mg

2. According to the National Bureau of Standards (NBS), the initial calibration mark on a 250-mL graduate should be

(A) 10 mL
(B) 25 mL
(C) 50 mL
(D) 75 mL
(E) 100 mL

3. The most common type of drug transport in humans is

(A) active transport
(B) passive transport
(C) facilitated transport
(D) Newtonian transport
(E) pinocytosis

4. Which of the following vitamins is not added to TPN solutions?

(A) thiamine
(B) pyridoxine
(C) phytonadione
(D) tocopherol
(E) ascorbic acid

5. Which of the following cautions must be considered when dispensing most parenteral liposomal products?

I. Do not reconstitute with sodium chloride injection.
II. Dosing is less than that of the conventional drug solutions.
III. Infuse only through administration sets that have an in-line filter.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

6. An elixir contains 100 μg of drug per teaspoon dose. How many mg are present in each mL?

(A) 0.02 mg
(B) 0.025 mg
(C) 0.1 mg
(D) 2.0 mg
(E) 20 mg

7. Patients with phenylketonuria (PKU) should avoid food products containing

(A) unsaturated fats
(B) medium-chain triglycerides

(C) soy protein
(D) sodium chloride
(E) aspartame

8. Generic product A has a greater AUC than generic product B, containing the same quantity of drug per dose. One can conclude that

(A) product B is more bioavailable than is product A
(B) product A is more bioavailable than is product B
(C) product A has a shorter half-life than product B
(D) product B has a shorter half-life than product A
(E) product A is more readily excreted in the urine than is product B

9. Infusion of morphine sulfate solution to an ambulatory patient in a home setting is best accomplished by the use of a device known as a (an)

(A) PCA
(B) PVP
(C) Viadex
(D) Implant
(E) Rotocap

10. Misoprostol (Cytotec) can best be described as a (an)

(A) ulcer-adherent complex
(B) anticholinergic
(C) H_2-receptor antagonist
(D) synthetic prostaglandin analog
(E) abortifacient

11. A hospital pharmacist adds 100 mL of alcohol USP (95% V/V ethanol) to 1 L of cough syrup that contains 8% V/V ethanol. What is the new percentage of ethanol present in the mixture?

(A) 10%
(B) 12%
(C) 14%
(D) 16%
(E) 18%

12. Which of the following needles is most suitable for the administration of insulin products?

(A) 16G ⅝″
(B) 21G ½″
(C) 21G ⅝″
(D) 25G 1″
(E) 25G ⅝″

13. Assuming first-order kinetics, the characteristic that readily allows the calculation of time to reach plasma steady-state is the drug's

(A) AUC
(B) half-life
(C) absorption constant
(D) elimination constant
(E) F value

14. Which of the following is true of fentanyl transdermal systems?

I. The brand name is Duragesic.
II. It may be applied for up to a 24-hour period.
III. The system may be cut to obtain a lower dose.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

15. A patient with an abnormally elevated number of erythrocytes is said to have

(A) macrocytic anemia
(B) polycythemia
(C) sickle cell anemia
(D) aplastic anemia
(E) microcytic anemia

16. A dietician adds 5 g of potassium chloride to 500 mL of an enteral formula. How many milliequivalents of potassium are present? (K = 39; Cl = 35.5; KCl = 74.5)

(A) 25 mEq
(B) 45 mEq
(C) 67 mEq
(D) 128 mEq
(E) 134 mEq

17. The agent most likely to precipitate when added to D_5W or NS is

(A) tetracycline HCl (Achromycin V)
(B) ethacrynic acid (Edecrin)
(C) tobramycin sulfate (Nebcin)
(D) phenytoin sodium (Dilantin)
(E) ascorbic acid

18. Sodium bicarbonate is likely to increase the rate of urinary elimination of

I. phenobarbital sodium
II. penicillin G potassium
III. cocaine HCl

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

19. Which one of the following cephalosporins has the greatest activity against gram-negative microorganisms?

(A) cefaclor (Ceclor)
(B) cefepime (Maxipime)
(C) cefonicid (Monocid)
(D) cefazolin (Ancef, Kefzol)
(E) cephalexin (Keflex)

20. Peripheral veins are SELDOM used for the administration of

(A) electrolyte infusions
(B) cephalosporins
(C) vitamin infusions
(D) heparin
(E) TPN solutions

21. How many mL of glycerin would be needed to prepare 1 lb of an ointment containing 8.5% (W/W) glycerin? (The density of glycerin is 1.25 g/mL.)

(A) 10.6
(B) 18.5
(C) 30.9
(D) 32.6
(E) 48.2

Questions 22 through 25 are based on the following order received from a hospital outpatient clinic:

For: Happy Hospital Ophthalmology Clinic

Rx

Atropine sulfate	0.25%
Boric acid	1.0%
Pur. Water qs	60 mL

Please make isotonic and sterilize. Label as "Atropine sulfate 0.25% ophthalmic solution."

22. Boric acid is present in the formula as a (an)

I. chelating agent
II. viscosity builder
III. antimicrobial preservative

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

23. How many milligrams of sodium chloride are required to adjust the tonicity of the formula? (The following "E" values are available: atropine sulfate = 0.20; boric acid = 0.50.)

(A) 210 mg
(B) 330 mg

(C) 425 mg
(D) 540 mg
(E) 900 mg

24. The most practical method for sterilizing this ophthalmic solution is

(A) autoclaving for 15 min
(B) autoclaving for 30 min
(C) membrane filtration through a 5-μ filter
(D) membrane filtration through a 0.2-μ filter
(E) the use of ethylene oxide gas

25. Kwell Lotion is indicated for the treatment of conditions caused by

I. tinea versicolor
II. *Pediculus capitis*
III. *Sarcoptes scabiei*

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

26. An administration set delivers 50 drops to the mL. How many drops per minute are needed to obtain 12 units of heparin per minute if the IV admixture contains 10,000 units of heparin per 500 mL of normal saline?

(A) 40
(B) 60
(C) 20
(D) 600
(E) 30

27. Which one of the following would be likely to render benzalkonium chloride solution inactive?

(A) acetic acid
(B) *Pseudomonas aeruginosa*
(C) sodium stearate
(D) sodium chloride
(E) ethanol

28. Fick's law is related to

(A) diffusion
(B) viscosity
(C) pediatric dosage
(D) adsorption
(E) buffers

29. The naturally occurring enkephalins, endorphins, and dynorphins are chemically classified as

(A) alkaloids
(B) peptides
(C) phospholipids
(D) polysaccharides
(E) prostaglandins

30. Ideal properties of drugs to be formulated into transdermal delivery systems include

I. high potency with a daily dose of 10 mg or less
II. lipophilicity
III. molecular weight of at least 2500

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

31. How many milliliters of a 1:150 stock solution of atropine sulfate would be needed to prepare the following prescription?

Rx	
Atropine sulfate	0.5%
Normal saline	qs. 30.0 mL

(A) 45.0 mL
(B) 15.0 mL
(C) 22.5 mL
(D) 66.7 mL
(E) 17.8 mL

32. The Henderson–Hasselbalch equation can be used to determine the pH of a

I. mixture of lactic acid and sodium lactate
II. 0.15 mole/L hydrochloric acid
III. 2% morphine sulfate solution

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

33. A high F value for a drug indicates that the drug is

(A) chemically unstable
(B) very soluble in water
(C) very bioavailable
(D) susceptible to hepatic first-pass metabolism
(E) renally eliminated

34. Which of the following injectable solutions may result in a precipitate when added to D_5W or NS?

(A) diazepam (Valium)
(B) folic acid (Folvite)
(C) furosemide (Lasix)
(D) gentamicin sulfate (Garamycin)
(E) succinylcholine chloride (Anectine)

35. A drug commonly employed in the treatment of acute morphine overdose is

(A) naloxone
(B) EDTA
(C) methadone
(D) physostigmine
(E) disulfiram

36. How many grams of hydrocortisone powder must be added to 2 lb of 1% W/W hydrocortisone cream to obtain a 4% W/W cream?

(A) 20 g
(B) 23 g
(C) 27 g
(D) 28 g
(E) 38 g

Answer questions 37 through 39 based on the following prescription:

Rx

Phenylephrine HCl		0.5%
Menthol		
Thymol	aa	2.0%
Methyl salicylate		0.5%
Mineral oil		qs 30 mL

Sig: gtt ii both sides t.i.d.

37. Which of the following ingredients will NOT dissolve in the prescribed solvent?

I. phenylephrine HCl
II. methyl salicylate
III. menthol

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

38. This prescription is intended for use in the

(A) eyes
(B) vagina
(C) ears
(D) nose
(E) buccal cavity

39. In compounding this prescription, which of the following would be useful to employ?

(A) fusion
(B) levigation
(C) eutexia
(D) trituration by intervention
(E) emulsification

40. An order for a TPN formula requests 500 mL of $D_{30}W$. How many milliliters of $D_{50}W$ may be used if $D_{30}W$ is not available?

(A) 200 mL
(B) 300 mL
(C) 400 mL
(D) 500 mL
(E) 600 mL

41. The decay constant of a radioisotope is 0.069/h. The half-life of the radioisotope is

(A) 100 h
(B) 14 h
(C) 10 h
(D) 1 h
(E) 69 h

42. Which of the following is true of active transport systems?

I. They do not consume energy.
II. They never become saturated.
III. They do not reach equilibrium.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

43. Which of the following agents are useful in the treatment of patients who are HIV positive and show signs of immunological deficiency?

I. acyclovir
II. zalcitabine
III. Crixivan

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

44. Patients with gluten intolerance should avoid foods containing

(A) eggs
(B) wheat
(C) tyramine
(D) milk
(E) fats

45. A pharmacist has 80 mL of a 1.5% benzalkonium chloride solution. What will be the final ratio strength if this solution is diluted to 1500 mL with purified water?

(A) 1:125
(B) 1:1250
(C) 1:100
(D) 1:1875
(E) 1:2250

46. Which of the following statements concerning epoetin alpha injection is (are) correct?

I. Human albumin is present to prevent adsorption of the epoetin in the vial.
II. The injection is refrigerated until time of use.
III. The drug solution is administered by IM injection only.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

47. The peak of the serum concentration versus time curve approximates the time when

(A) the maximum pharmacological effect occurs
(B) all of the drug has been absorbed from the GI tract
(C) absorption and elimination of the drug has equalized
(D) saturation of metabolizing enzymes has occurred
(E) renal elimination of the drug begins

48. The pharmacist should advise a patient who has just received a prescription for prazosin 2 mg t.i.d. to take the initial dose

(A) at noon
(B) at bedtime
(C) in the morning before breakfast
(D) in the morning after breakfast
(E) 1 hour before the evening meal

49. A disease characterized by inflammation of layers of the intestinal tract is

(A) Bright's disease
(B) Goeckerman's disease
(C) Graves' disease
(D) Cushing's disease
(E) Crohn's disease

50. Which one of the following pharmaceutical adjuvants is most likely to cause asthma-like reactions?

(A) sodium bisulfite
(B) benzyl alcohol
(C) edetate
(D) benzalkonium chloride
(E) methylparaben

51. A drug is said to have a biologic half-life of 2 hours. At the end of 8 hours, what percentage of the drug's original activity will remain?

(A) 2.5%
(B) 12.5%
(C) 25%
(D) 50%
(E) 6.25%

52. Bupropion is used as an

(A) anticonvulsant
(B) immunosuppressant
(C) antidepressant
(D) antipsychotic
(E) anti-inflammatory agent

Questions 53 through 56 refer to the following prescription:

For: David Harris	Age: 14
Rx	
Codeine phosphate	90 mg
Diphenhydramine	900 mg
NAPAP	2500 mg
Ft. Cap. #12	
Sig: 1 q.i.d. p.r.n. pain	

NOTE: The pharmacist has 50-mg diphenhydramine capsules, each containing 130 mg of powdered contents, as well as 1/4-grain codeine phosphate tablets, each weighing 90 mg. The NAPAP is available as a pure powder.

53. Which of the following statements concerning this prescription is (are) true?

I. The amount of codeine being consumed per dose is an overdose.
II. There is a chemical incompatibility between diphenhydramine and codeine phosphate.
III. The patient should be cautioned about the possibility of drowsiness from the capsules.

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

54. The final weight of each capsule will be approximately

(A) 270 mg
(B) 410 mg
(C) 340 mg
(D) 180 mg
(E) 450 mg

55. Aminophylline injection is likely to be compatible with which of the following parenteral solutions?

I. heparin
II. verapamil
III. dopamine

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

56. Which of the following stimulates red blood cell production?

I. Neupogen
II. Leukine
III. Procrit

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

57. A tine test is employed in identifying patients who have been exposed to

(A) acquired immunodeficiency syndrome (AIDS)
(B) influenza
(C) herpes simplex
(D) hepatitis virus
(E) tuberculosis

58. Candesartan is classified as a (an)

(A) antifungal
(B) angiotensin II antagonist
(C) ACE inhibitor
(D) beta-adrenergic receptor blocker
(E) calcium-channel blocker

59. A patient is using benazepril (Lotensin) for the treatment of hypertension. This patient should not receive

(A) potassium supplementation
(B) antihistamines
(C) aluminum-containing antacids
(D) folic acid supplementation
(E) tricyclic antidepressants

60. Which one of the following is an example of an absorption base?

(A) polyethylene glycol ointment
(B) cold cream
(C) Jelene
(D) Eucerin
(E) White petrolatum

Answer questions 61 through 66 based on the following prescription:

Rx

Burow's solution	10 mL
Salicylic acid	4%
Phenol	1%
White petrolatum	qs 60 g

Sig: apply to affected area tid.

61. The active ingredient in Burow's solution is

(A) aluminum hydroxide
(B) acetic acid
(C) aluminum chloride
(D) calcium hydroxide
(E) none of the above

62. When preparing this prescription the pharmacist may wish to include

I. alcohol
II. polysorbate 80
III. Aquaphor

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

63. The most appropriate way to incorporate salicylic acid into this product is by

(A) levigation
(B) fusion
(C) dissolution in alcohol
(D) trituration
(E) attrition

64. The concentration (% W/W) of Burow's solution in the final preparation will be

(A) 10
(B) 16.7
(C) 22.5
(D) 20.0
(E) 13.4

65. Which of the following may be employed as one of the ingredients of this prescription?

(A) carbolic acid
(B) aspirin
(C) thymol
(D) salicylamide
(E) lactic acid

66. The function of salicylic acid in this product is as a (an)

(A) preservative
(B) local anesthetic
(C) analgesic
(D) keratolytic
(E) abrasive

67. Which one of the following may be considered a viral disease?

(A) pertussis
(B) tuberculosis
(C) hepatitis
(D) cholera
(E) typhoid fever

68. Retinoic acid is used therapeutically

(A) by the oral route only
(B) to accelerate the production of epithelial cells in the skin
(C) to reverse the symptoms of psoriasis
(D) to promote healing of actinic keratoses
(E) to treat malignant melanoma

69. Which of the following systems is used in formulating Retin-A Micro?

(A) liposomes
(B) lyophilized powder
(C) microspheres
(D) micronized powder
(E) transdermal system

70. Oxidation will cause solutions of which of the following to turn pink?

I. epinephrine
II. milrinone acetate
III. streptokinase

(A) I only
(B) III only
(C) I and II only
(D) I and III only
(E) I, II, and III

71. Which one of the following is true of cholestyramine resin?

I. cationic exchange resin
II. solubilizes gallstones
III. not absorbed by the GI tract

(A) I only
(B) III only
(C) I and II only
(D) I and III only
(E) I, II, and III

72. In addition to being used as an anticonvulsant, phenytoin (Dilantin) is also used in treating

(A) tuberculosis
(B) cardiac arrhythmias
(C) systemic lupus erythematosus (SLE)
(D) Parkinson's disease
(E) cataracts

73. The HLB system is used to classify

(A) the danger of drugs in pregnant patients
(B) droplet size of aerosols
(C) pharmaceutical dyes
(D) drug solubility
(E) surfactants

74. Sunscreen products are usually rated by their

(A) MSG
(B) SLA
(C) LRI
(D) SPF
(E) PSA

75. A nurse informs you that a patient has polydipsia. This refers to

(A) excessive urination
(B) excessive craving for food
(C) excessive thirst
(D) diarrhea
(E) double vision

76. Which one of the following body areas usually has the lowest (most acidic) pH?

(A) blood
(B) lacrimal fluid
(C) oral cavity
(D) intestinal fluid
(E) vagina

77. Lotensin is most similar in action to

(A) Dobutrex
(B) Baycol
(C) Minipress
(D) Lotrisone
(E) Mavik

78. A drug interaction is likely to occur when 6-mercaptopurine (Purinethol) is used with

(A) aspirin
(B) pyridoxine
(C) allopurinol (Zyloprim)
(D) streptokinase (Streptase)
(E) iron products

79. Which of the following is (are) true of the use of nitroprusside sodium?

I. must be protected from light
II. administered by IV infusion
III. may cause cyanide poisoning

(A) I only
(B) III only
(C) I and II only
(D) I and III only
(E) I, II, and III

80. Acetylcysteine (Mucomyst) exerts its mucolytic effect by

(A) complexing with mucus protein
(B) altering the normal synthesis order of DNA
(C) altering the cellular synthesis of mucoproteins
(D) breaking chemical bonds of mucoproteins
(E) increasing the secretion of low viscosity mucus from the walls of the respiratory tract

81. A patient's chart reveals a hypersensitivity to penicillin. The patient should be suspected of exhibiting a similar reaction to

(A) nystatin (Mycostatin)
(B) erythromycin
(C) vancomycin (Vancocin)
(D) cefixime (Suprax)
(E) phenazopyridine (Pyridium)

82. An antacid that is most likely to induce gastric hypersecretion is

(A) calcium carbonate
(B) magaldrate
(C) aluminum hydroxide
(D) magnesium hydroxide
(E) glycine

83. Which of the following is utilized in the treatment of intermittent claudication?

(A) pentoxifylline
(B) ergonovine
(C) misoprostol
(D) amantadine
(E) moricizine

84. A patient's blood test reveals an excessively high level of amylase. This may indicate a disease of the

(A) liver
(B) heart
(C) kidney
(D) lung
(E) pancreas

85. Monitoring of INR is essential in monitoring patients using

(A) heparin
(B) lamotrigine
(C) warfarin
(D) glimepiride
(E) acarbose

86. Patients with estrogen-dependent neoplasms may benefit from the use of

(A) oral contraceptives
(B) methotrexate
(C) cyanocobalamin
(D) tamoxifen
(E) cisplatin

87. Which of the following is indicated for the prevention of osteoporosis in postmenopausal women?

I. raloxifene
II. tiludronate
III. calcitonin

(A) I only
(B) III only
(C) I and II only
(D) I and III only
(E) I, II, and III

88. A patient receiving selegiline (Eldepryl) should be advised to

(A) avoid foods high in potassium
(B) avoid foods high in tyramine
(C) avoid foods high in sodium
(D) avoid foods high in vitamin K
(E) consume a low-fat diet

89. Dextranomer (Debrisan) is employed pharmaceutically as a (an)

(A) topical corticosteroid
(B) absorbant for secreting wounds
(C) antipsoriatic agent
(D) abrasive cleanser for the skin
(E) plasma expander

90. Imitrex is most similar in action to

(A) Lozol
(B) Buprenex
(C) Pentasa
(D) Maxalt
(E) Cogentin

91. Sibutramine is used in the treatment of

(A) partial seizures
(B) alcoholism
(C) endogenous depression
(D) attention deficit hyperactivity disorder (ADHD)
(E) obesity

92. Polyvinyl alcohol is commonly employed in pharmaceutical systems as a

(A) solvent
(B) preservative
(C) buffer
(D) lubricant
(E) viscosity builder

93. Bupropion is employed clinically as a (an)

I. antianxiety agent
II. analgesic
III. smoking deterrent

(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

94. The hub of a needle is the

(A) portion that fits onto the syringe
(B) needle shaft
(C) portion of the needle that is ground for sharpness
(D) needle hole
(E) needle bevel

95. The use of which of the following drugs is associated with the development of an SLE-like syndrome?

(A) probenecid (Benemid)
(B) hydralazine (Apresoline)
(C) cyclosporine (Neoral)
(D) gabapentin (Neurontin)
(E) phenytoin (Dilantin)

96. Miraplex is most similar in action to

(A) Tasmar
(B) Requip
(C) Eldepryl
(D) Permax
(E) Sinemet

97. The most rapid insulin action can be obtained by the use of

(A) Humulin-R
(B) Humulin-N
(C) Humalog
(D) Humulin-L
(E) Humulin-U

98. Vasopressin is a hormone secreted by the

(A) anterior pituitary gland
(B) posterior pituitary gland
(C) adrenal gland
(D) pancreas
(E) kidney

99. An inverse relationship exists between the concentration of calcium in the blood and the blood concentration of

(A) magnesium
(B) thyroid hormone
(C) estrogen
(D) sodium
(E) phosphorus

100. Patients using sildenafil should be advised to avoid the use of

(A) Mevacor
(B) Isordil
(C) Singulair
(D) Orudis
(E) Lamictal

Answers

1. (E)	21. (C)	41. (C)	61. (E)	81. (D)
2. (C)	22. (B)	42. (B)	62. (B)	82. (A)
3. (B)	23. (A)	43. (D)	63. (A)	83. (A)
4. (C)	24. (D)	44. (B)	64. (B)	84. (E)
5. (C)	25. (D)	45. (B)	65. (A)	85. (C)
6. (A)	26. (E)	46. (C)	66. (D)	86. (D)
7. (E)	27. (C)	47. (C)	67. (C)	87. (E)
8. (B)	28. (A)	48. (B)	68. (B)	88. (B)
9. (A)	29. (B)	49. (E)	69. (C)	89. (B)
10. (D)	30. (C)	50. (A)	70. (A)	90. (D)
11. (D)	31. (C)	51. (E)	71. (B)	91. (E)
12. (E)	32. (A)	52. (C)	72. (B)	92. (E)
13. (B)	33. (C)	53. (B)	73. (E)	93. (B)
14. (A)	34. (A)	54. (E)	74. (D)	94. (A)
15. (B)	35. (A)	55. (A)	75. (C)	95. (B)
16. (C)	36. (D)	56. (B)	76. (E)	96. (B)
17. (D)	37. (A)	57. (E)	77. (E)	97. (C)
18. (C)	38. (D)	58. (B)	78. (C)	98. (B)
19. (B)	39. (C)	59. (A)	79. (E)	99. (E)
20. (E)	40. (B)	60. (D)	80. (D)	100. (B)

APPENDIX A

Frequently Dispensed Drugs

The practicing pharmacist should be familiar with commonly prescribed pharmaceutical products. If given the generic name, he or she should be able to match the following information with the drug:

1. brand or trade name
2. general pharmacologic category or use
3. commonly available dosage forms
4. available strengths
5. names of other products with identical or similar ingredients

The table contains the following abbreviations:

COMPANIES

A & H	Allen & Hanbury's
BMS	Bristol-Myers Squibb
B-W	Burroughs Wellcome
ESI	Elkins-Sinn Inc
G-W	Glaxo-Wellcome
M-J	Mead Johnson
MSD	Merck Sharp & Dohme
P-D	Parke-Davis
R-PR	Rhone-Poulenc Rorer
SK-B	SmithKline-Beecham
W-A	Wyeth-Ayerst
W-C	Warner Chilcott

DRUGS

ASA	aspirin
APAP	acetaminophen
HC	hydrocortisone
HCTZ	hydrochlorthiazide
NSAID	nonsteroidal anti-inflammatory drug
PE	phenylephrine
PPA	phenylpropanolamine

TABLE OF FREQUENTLY DISPENSED DRUGS

Generic Name	Trade Name & Company	Category or Use	Dosage Forms and Strength
Acetaminophen + Codeine	Tylenol with Codeine (McNeil) Empracet with Cod. (G-W) generic	analgesic	APAP 300 mg with 7.5, 15, 30, or 60 mg Cod.
Acyclovir Sodium	Zovirax (B-W)	treatment of herpes	injection vial (600 mg), cap. 200 mg; oint 5%; tab (800 mg); suspension
Albuterol	Proventil (Schering) Ventolin (Glaxo) + generic Volmax (Muro)	bronchodilator	tab (2 & 4 mg); repetabs inhalation aerosol; syrup; nebulizer solution = extended-release tabs (4 and 8 mg)
Alendronate Sodium	Fosamax (Merck)	treat & prevent osteoporosis & Paget's disease	tab (10 & 40 mg)
Allopurinol	Zyloprim (B-W)	treatment of gout (hyperuricemia)	tab (100 & 300 mg)
Alprazolam	Xanax (Upjohn) + generic	treat anxiety	tab (.25; .5; & 1 mg)
Amitriptyline HCl	Elavil (Merck) + generic	antidepressant	tab (10; 25; 50; 75; 100; 150 mg); injection
Amlodipine	Norvasc (Pfizer)	antihypertensive	tab (2.5; 5; & 10 mg)
Amlodipine + Benazepril	Lotrel (Novartis)	same	cap (2.5 + 10 mg; 5 + 20 mg)
Amoxicillin	Amoxil (Beecham) Trimox (Apothecon) Larotid (Beecham) Polymox (Apothecon) Wymox (Wyeth)	broad spectrum antibiotic	cap (250; 500 mg); suspensions
Amoxicillin + Clavulanate K	Augmentin (Beecham)	broad spectrum antibiotic	tab (250 & 500 mg + 125-mg Clavulanate); 875-mg tab; suspensions; Augmentin BID 875 mg
Ampicillin	Omnipen (Wyeth) Principen (Squibb) Polycillin (Bristol) Totacillin (Beecham)	broad spectrum antibiotic	cap (250 & 500 mg); and suspensions
Atorvastatin Calcium	Lipitor (P-D)	antihyperlipidemic	tab (10, 20, & 40 mg)
Atenolol	Tenormin (ICI) + generic	antihypertensive (beta adrenergic blocking agent)	tab (50 & 100 mg)
Azithromycin	Zithromax (Pfizer)	antibiotic (macrolide)	tab (250 mg); can be taken with food; available in a Z-pak
Beclomethasone dipropionate	Vanceril Vancenase AQ DS (Schering) Beconase AQ (A & H)	corticosteroid for treatment of rhinitis	inhalation aerosol, aerosol nasal inhaler
Benazepril HCl	Lotensin (Novartis)	antihypertensive (ACE inhibitor)	tab (5, 10, 20, & 40 mg)
Bisoprolol Fumarate + HCTZ	Ziac (Lederle)	antihypertensive combination	tab (2.5, 5, or 10 mg + 6.25 mg HCTZ)
Budesonide	Rhinocort (Astra) Pulmicort	intranasal steroid (anti-inflammatory)	aerosol for nasal use
Bupropion HCl	Wellbutrin SR (B-W)	antidepressant	tab (100 & 150 mg) sustained-release
Bupropion HCl	Zyban	aid in smoke cessation	SR (100 & 150 mg)
Buspirone HCl	BuSpar (BMS)	antianxiety	tab (5 & 10 mg); 15 mg as a Dividose
Calcitonin Salmon	Miacalcin (Norvartis)	postmenopausal osteoporosis	nasal spray
Carbamazepine	Tegretol (Ciba-Geneva)	anticonvulsant	tab (200 mg); chewable tab (100 mg); approved for children > 6 yr
Carisoprodol	Soma (Wallace) + generic	skeletal muscle relaxant	tab (350 mg)
Cefprozil	Cefzil (Bristol)	antibiotic	tab 250 & 500 mg); Susp
Cephalexin	Keflex (Dista) + generic	antibiotic	tab 250 & 500 mg); Susp
Cetirizine	Zyrtec (Pfizer)	antihistamine	tab (5 & 10 mg); oral sol.

(continued)

TABLE OF FREQUENTLY DISPENSED DRUGS (cont.)

Generic Name	Trade Name & Company	Category or Use	Dosage Forms and Strength
Chlorhexidine Gluconate	Peridex (Proctor-G)	microbicide	0.12% oral rinse
Cholestyramine	Questran (Bristol)	antihyperlipidemic	powder
Cimetidine	Tagamet (SKB) + generic	prevent and treat peptic ulcers	tab (200, 400, 800 mg)
Ciprofloxacin	Cipro (Bayer)	broad spectrum antibiotic (a fluoroquinolone)	tab (250, 500, 750 mg); injection solution
Clarithromycin	Biaxin (Abbott)	macrolide antibiotic	Filmtab (250 & 500 mg) suspension
Clonidine HCl	Catapres (Boehringer)	antihypertensive transdermal patches	tab (0.1; 0.2; & 0.3 mg)
Clonazepam	Klonopin (Roche)	treat absence seizures	tab (0.5, 1 & 2 mg)
Clotrimazole + betamethasone	Lotrisone (Schering)	antifungal & anti-inflammatory	cream
Cyclobenzaprine	Flexeril (Merck) + generic	skeletal muscle relaxant	tab (10 mg)
Dexamethasone + Tobramycin	TobraDex (Alcon)	ophthalmic steroid and antibiotic	suspension (0.1 + .3%); ointment
Dextroamphetamine salts	Adderall (Shire)	attention deficit disorder; obesity	tab (5 mg)
Diazepam	Valium (Roche)	antianxiety	tab (2, 5, 10 mg)
Diclofenac Sod. + Misoprostol	Arthrotec (Searle)	analgesic	50 mg or 75 mg diclofenac + 200 mcg misoprostol
Digoxin	Lanoxin (B-W) Lanoxicaps	cardiovascular agent	tab (.125, .25, & .5 mg) pediatric elixir; injection
Diltiazem	Cardizem (Marion) Dilacor XR Tiazac (Forest)	antianginal agent	tab (30, 60, 90, 120 mg) SR cap 60, 90 & 120 mg sustained release (180 mg)
Diphenoxylate HCl + Atropine	Lomotil (Searle)	antidiarrheal	tab 2.5 mg & liquid
Dorzolamide	TruSopt (Merck)	antiglaucoma	solution 2%
Doxazosin	Cardura (Roerig)	antihypertensive	tab (1, 2, 4, & 8 mg)
Enalapril	Vasotec Vaseretic (Merck)	antihypertensive	tab 2.5, 5, 10, 20 mg tab 5 or 10 mg + HCTZ 12.5 A or 25 mg
Erythromycin	E-Mycin (Boots)	broad spectrum antibiotic	tab (250 & 500 mg) suspensions
	Erythrocin (Abbott)		delayed-release tab (250 & 500 mg)
	ERY-TAB (Abbott) ERYC (P-D)		enteric-coated pellets (delayed-release caps (250 mg)
	PCE (Abbott)		500-mg tab with polymer-coated particles
Estradiol	Estraderm Transdermal (Ciba) Climara (Berlex) Vivelle	moderate symptoms of menopause	transdermal patches (4 and 8 mg)
Estradiol	Estrace + generic	same and to treat atrophic vaginitis	tablet (1 and 2 mg); vaginal cream
Estrogens combinations (Conjugated)	Demulen Triphasil Tri-Levlen Ovral & Ovral 28 Nordette	oral contraception	tablets
Estrogens + Medroxyprogesterone	Prempro (W-A) (1 card) Premphase (W-A) (2 blister cards)	prevent and manage osteoporosis and menopausal symptoms	tab (625 mg + 2.5 mg)
Estrogens Mixed	Premarin (W-A)	replacement therapy during menopause and post-menopause	tab (.3, .625, 1.25, & 2.5)
Ethinyl Estradiol + Desogestrel	Ortho-Cept	oral contraceptives	tab (30 mcg + .15 mg)
	Desogen (Organon)		
	Ortho Tri-Cyclen		
Ethinyl Estradiol + Norethindrone	Loestrin 21 (P-D)	monophasic oral contraceptives	tab + 75 mg Ferrous fumarate
	Loestrin Fe1/20		
	Ovcon 35; 50 (M-J)		

(continued)

TABLE OF FREQUENTLY DISPENSED DRUGS (cont.)

Generic Name	Trade Name & Company	Category or Use	Dosage Forms and Strength
Ethinyl Estradiol + Norgestrel	LoOvral 28	oral contraceptive	
Famotidine	Pepcid (Merck)	treatment of peptic ulcers	tab (20 & 40 mg); Pwd for susp; inject.
Felodipine	Plendil (Astra-Merck)	antihypertensive (calcium-channel blocker)	extended-release tab (2.5., 5, & 10)
Fentanyl	Duragesic	narcotic analgesic	transdermal patch (25, 50, 75, 100 mcg/hr) injection
	Sublimaze (Janssen)		transmucosal (Abbott)
Fluoxetine	Prozac	antidepressant	pulvules (10 & 20 mg) scored tab (10 mg)
Fluticasone	Flonase (G-W) Flovent (Glaxo)	seasonal & perennial allergic rhinitis	nasal spray aerosol & Rotadish Powder
Fluvastatin	Lescol (P-D)	antihyperlipidemic	cap (20 & 40 mg)
Fosfomycin	Monurol (Forest)	single dose treatment for UTIs	granules (packet of 3 g)
Fosinopril	Monopril (M-J)	antihypertensive [ACE inhibitor]	tab (10, 20, & 40 mg)
Furosemide	Lasix (Hoechst) + generic	diuretic	tab (20, 40, & 80 mg) oral sol.; injection
Gabapentin	Neurontin (P-D)	anticonvulsant	cap (100, 300, 400 mg)
Gentamicin HCl	Garamycin (Schering) + generic	broad spectrum antibiotic	oint, cream, ophthalmic sol. & oint.; injection
Glimepiride	Amaryl (Hoechst-Roussel)	antidiabetic	tab (1, 2, & 4 mg)
Glipizide	Glucotrol (Roerig)	antidiabetic	tab (5 & 10 mg); XL
Glyburide	Micronase (Upjohn) DiaBeta (Hoechst) Glynase (Upjohn) + generic	antidiabetic	tab (1.25; 2.5; & 5 mg) Prestab (3 & 6 mg)
Granisetron	Kytril (SKB)	prevent nausea & vomiting	tab (1 mg)
Haloperidol	Haldol (McNeil)	antipsychotic	tab (1, 2, 5, & 10 mg) oral liquid; injection
Hydrochlorothiazide (HCTZ)	Esidrex (Ciba) HydroDiuril (Merck) + generic	antihypertensive diuretic	tab (25 & 50 mg)
HCTZ + Bisoprolol	Ziac (Lederle)	antihypertensive	tab with 6.25 mg HCTZ; + 2.5, 5, or 10 mg Bisoprolol
Hydrocodone bitartrate + APAP	Vicodin (Knoll) Lortab (Russ) Lorcet Plus + generic Zydone (Endo)	narcotic, analgesic antitussive	tab of 5 mg + 500 mg ES = 7.5 mg + 750 tab of 2.5 mg + 750 5, 7,5, & 10 mg +
Hydrocortisone + Polymyxin & Neomycin	Cortisporin (B-W)	antibacterial/anti-inflammatory	topical ointment, otic solution
Insulin (all are OTC except U-500)	Humulin (Lilly) Novolin (Novo Nordisk)	control of diabetes	N; 50/50; R, 70/30
Ipratropium Br	Atrovent (Boehringer)	bronchodilator	inhalation aerosol
Irbesartan	Avapro (Bristol Myers) (also Sanofi)	antihypertensive	tab (75, 150 & 300 mg)
Isosorbide Dinitrate	Isordil (W-A)	treatment of angina pectoris	oral tab 5 & 10 mg; sublingual tab 2.5 & 5 mg; chewable tab
	Isordil Tembids Titradose		40 mg cap & tab; 5, 10, 20, 30, & 40 mg; chewable tab 10 mg
Isosorbide Mononitrate	Imdur (Key)	same	extended-release tab (30, 60, & 120 mg)
Itraconazole	Sporanox (Janssen)	antifungal oral & esophageal candidiasis	cap 100 mg; oral sol.
Lansoprazole	Prevacid (Tap Pharm)	proton pump inhibitor	delayed-release cap (15 & 30 mg)
Levonorgestrel + ethinyl estradiol	Alesse-21 (W-A)	oral contraceptive	0.1 mg + .02 mg
Latanoprost	Xalatan (Pharmacia)	Prostaglandin agonist for glaucoma	sol. .005%
Levofloxacin	Levaquin (McNeil)	fluoroquinolone antibiotic	tab (250 & 500 mg); injection

(continued)

TABLE OF FREQUENTLY DISPENSED DRUGS (cont.)

Generic Name	Tradename & Company	Category or Use	Dosage Forms and Strength
Levothyroxine	Synthroid (Boots) Levoxyl Eltroxin (Glaxo)	management of hypothyroidism	tablets various strengths (.025 to .3 mg)
Lisinopril	Prinivil (Merck) Zestril (Zeneca)	antihypertensive	tab (2.5, 5, 10, 20, & 40 mg)
Lisinopril + HCTZ	Zestoretic (Zeneca)		10 + 12.5; 20 + 12.5; 20 + 25
Lithium Carbonate	Eskalith (SKB)	treatment for manic depression	300-mg capsule; controlled-release 450 mg
Loracarbef	Lorabid (Lilly)	cephalosporin	200 & 500-mg cap; susp.
Loratadine	Claritin Claritin-D12 hr	long-acting antihistamine	tab (10 mg) 5 mg + 120 mg pseudoephedrine
Lorazepam	Ativan (Wyeth) generic (C IV)	antianxiety agent	tab (1, 2, & 5 mg); injection
Losartan Potassium	Cozaar (Merck)	antihypertensive [angiotensin II antagonist]	tab (25 and 50) mg
Losartan Pot. + HCTZ	Hyzaar (Merck)	antihypertensive	50 mg + 12.5 mg HCTZ
Lovastatin	Mevacor (Merck)	antihyperlipidemic	tab (20 & 40 mg)
Medroxyprogesterone	Provera (Upjohn) Cycrin (ESI) + generic	progestin	tab (2.5, 5, & 10 mg)
Metaproterenol	Alupent (Boehringer)	bronchodilator	tab (10 & 20 mg); syrup inhalation aerosol
Metaxalone	Skelaxin (Carnrick)	skeletal muscle relaxant	tab (400 mg)
Metformin HCl	Glucophage (B-M Squibb)	antidiabetic [a biguanide]	tab (500 & 850 mg)
Methylphenidate	Ritalin (Ciba) generic	cortical stimulant, ADHD treatment	tab (5, 10 & 20 mg); SR 20 mg
Methylprednisolone	Medrol (Upjohn)	anti-inflammatory	Tab (2, 4, 8, 16, 24, & 32 mg); topical; injection
Metoclopramide	Reglan (Robins)	antinauseant; stimulate GI tract motility	10-mg tab; syrup; inj. (10 mg/2 mL)
Metoprolol	Lopressor (Geigy) Toprol XL (Astra) generic	antihypertensive [adrenergic blocking agent]	tab (50 & 100 mg)
Metronidazole	Flagyl (Searle)	trichomonacide	oral tab (250 mg); vaginal tab (500 mg); injection
Miconazole	Monistat-7 Monistat-3 (ortho)	treatment of vulvovaginal candidiasis	2% cream; vaginal supp (100 & 200 mg)
Minoxidil	Rogaine (Upjohn)	stimulate hair growth	solution (20 mg/mL)
Misoprostol	Cytotec (Searle)	prevent gastric ulcers in NSAID users	tab (100 & 200 mg)
Mometasone Furoate	Elocon (Schering) Nasonex (Schering-Plough)	topical corticosteroid corticosteroid	oint, cream, lotion (all 0.1%) nasal spray 50 mcg
Mupirocin	Bactroban (SKB)	treatment of impetigo	2% ointment
Nabumetone	Relafen (SKB)	NSAID	tab (500 & 750 mg)
Naproxen	Naprosyn (Syntex) generic Naprelan (W-A)	antirheumatic	tab (250, 375, & 500 mg) suspension controlled-release (375 & 500 mg)—30 min. onset; full-day dosing
Nedocromil	Tilade (Fisions)	Prevention of mast cell degranulation	respiratory inhaler
Nefazodone HCl	Serzone (Bristol Myers)	antidepressant	tab (100, 150, 200, & 250 mg)
Neomycin, Polymyxin B, & Bacitracin	Neosporin (B-W) generic	antibiotic combination	oint.; ophthal. oint.
Nifedipine	Procardia Procardia XL (Pfizer) Adalat (Miles) Adalat CC	calcium-channel blocker	cap (10 mg) extended-release (30, (Pfizer) 60 & 90 mg) cap (10 & 20 mg) sustained-release (30, 60, & 90 mg)
Nitrofurantoin macrocrystals	Macrodantin (Norwich Eaton) Macrobid (Proctor & Gamble)	urinary tract anti-infective	cap (25, 50, & 100 mg) cap 100 mg

(continued)

TABLE OF FREQUENTLY DISPENSED DRUGS (cont.)

Generic Name	Trade Name & Company	Category or Use	Dosage Forms and Strength
Nitroglycerin	Nitroglycerin (Lilly)	treatment of angina	sublingual tab (.15, .3, .4 & .6 mg)
	NitroBid (Marion)		cap (2.5 mg); prolonged-release (6.5 mg); oint 2%
	Nitrostat (P-D)		regular and SR (2.5, 6.5, & 9 mg)
	NitroDur II (Key)		oint 2%; injection, & transdermal patches
Nizatidine	Axid (Lilly)	treatment of duodenal ulcers	cap (150 & 300 mg)
Nolvadex	Tamoxifen (Zeneca) + generic	treatment of breast cancer	tab (10 & 20 mg)
Norethindrone	Norlestrin (P-D)	oral contraceptive	tab (1, 2.5 mg)
same + Ethinyl Estradiol	Ortho-Novum (Ortho)	same	tab (0.5 mg + 35 mcg)
Norgestimate + ethinyl estradiol	Ortho-Cyclen Ortho-Tricyclen	same	tab (.25 mg + 35 mcg)
Ofloxacin	Floxin (Ortho)	fluoroquinolone antibiotic	tab (200, 300, & antibiotic 400 mg); injection
Olanzapine	Zyprexa (Lilly)	antipsychotic	tab (2.5, 5, 7.5, and 10 mg)
Omeprazole	Prilosec (Merck)	proton pump inhibitor	sustained-release cap (20 mg)
Ondansetron	Zofran (Glaxo)	antiemetic	tab (4 & 8 mg); (Glaxo) injection (2 mg/mL)
Oxaprozin	Daypro (Searle)	NSAID for osteoarthritis & rheumatoid arthritis	tab 600 mg
Oxazepam	Serax (Wyeth)	antianxiety	cap (10, 15, & 30 mg) tab (15 mg)
Oxycodone HCl + O. Terephthalate + ASA	Percodan (Dupont)	analgesic; antipyretic	tablets
Oxycodone HCl + Acetaminophen	Percocet-5 (Dupont) Tylox (McNeil) Roxicet (Roxane) Endocet (Endo)	same	tablets
Penicillin V Pot. (Potassium Phenoxymethyl Penicillin)	Beepen VK (SKB) Betapen VK (Apothecon) Ledercillin VK Pen-Vee K (Wyeth) Veetids (Apothecon)	antibiotic for gram-positive microbes	tablets & suspension of various strengths (usually 125, 250, & 500 mg), which are equivalent to V-Cillin K 400,000 & 800,000 units
Paroxetine	Paxil (SKB)	antidepressant	tab (10, 20, 30, & 40 mg)
Pentoxifylline	Trental (Hoechst)	treatment of intermittent claudication	400-mg tablet
Phenytoin	Dilantin (P-D)	anticonvulsant	cap (30 & 100 mg); susp infatab (50 mg)
Piroxicam	Feldene (Pfizer)	NSAID	cap 10 & 20 mg
Polymyxin B; Neomycin; Gramcidin; & Hydrocort.	Cortisporin (B-W)	broad spectrum antibiotic	cream
Potassium Bicarbonate & Citrate	K Lyte (Bristol)	potassium supplement	effervescent tab (25 mEq of potassium per tab)
Potassium Chloride	K-Tab (Abbott) Klotrix (M-J) + generic	potassium supplement	tabs (4 to 10m Eq of K)
	Slow-K (Summit) Micro-K (Robins)		wax matrix tab 8 mEq
	˙Klor-Con (Upsher-Smith)		pwd (20 & 25 mEq); tab 8 & 10 mEq
	˙K-Dur (Key)		controlled-release tab 10 & 20 mEq
Pravastatin Sodium	Pravachol (Squibb)	antihyperlipidemic	tablets (10 & 20 mg)
Prednisone	Deltasone (Ph & Upjohn) + generic	corticosteroid	tablets (2.5, 5, 10, 20, & 50 mg)
Procainamide HCl	Pronestyl (Squibb)	anti-arrhythmic	cap (250 & 500 mg); filmlok tab (250, 375, & 500 mg); sustained-release (250, 375, 500)

(continued)

TABLE OF FREQUENTLY DISPENSED DRUGS (cont.)

Generic Name	Trade Name & Company	Category or Use	Dosage Forms and Strength
Prochlorperazine	Compazine (SKB)	antianxiety; antiemetic	tab (5, 10, & 25 mg); (10, 15, 30, & 75 mg); suppositories (2.5, 5, & 25 mg)
Promethazine HCl	Phenergant generic	antihistamine; antiemetic	tab (12.5 & 25 mg) suppository (25 & 50 mg)
Propranolol HCl	Inderal (W-A)	treat angina, hypertension, arrhythmias, etc	tab (10, 20, 40, 60, & 80 mg); LA cap (80, 120, & 160 mg)
Propoxyphene Napsylate + APAP	Darvocet N (Lilly) Propacet (Lemon)	analgesic	tab (50 & 100 mg with acetaminophen 325 or
Quetiapine Fumarate	Seroquel (Zeneca)	antipsychotic	tab (25, 100, 200 mg)
Raloxifene HCl	Evista (Lilly)	prevent osteoporosis, SERM	tab (60 mg)
Ramipril	Altace (Hoechst)	antihypertensive (ACE inhibitor)	cap (1.25, 2.5, 5, & 10 mg)
Ranitidine HCl	Zantac (Glaxo)	histamine H_2 antagonist	tab 150 & 300 mg; syrup; injection (25 mg/mL); effervescent tab (150 mg) GELdose cap (150 mg)
Risperidone	Risperdal (Janssen)	antipsychotic	tab (1, 2, 3, & 4 mg) oral solution
Rofecoxib	Vioxx (Merck)	NSAID	tab (12.5 & 25 mg)
Salmeterol	Serevent (A & H)	Bronchodilator	aerosol; oral sol. (1 mg/mL)
Selegiline	Eldepryl (Somerset)	MAO-A inhibitor/antiparkinson	capsule (5 mg)
Sertraline	Zoloft (Roerig)	antidepressant	tab (50 & 100 mg)
Sildenafil	Viagra (Pfizer)	treat erectile dysfunction	tab (25, 50, & 100 mg)
Simvastatin	Zocor (Merck)	antihyperlipidemic	tab (5, 10, 20 & 40 mg)
Sumatriptan	Imitrex (Cerenex)	treatment of migraine	S.Q. injection (12 mg/mL) tab (25 & 50 mg)
Tamoxifen	Nolvadex (ICI)	antiestrogen reduce incidence of breast CA	tab (10 mg)
Temazepam	Restoril (Sandoz) + generic	sedative/hypnotic	capsule (15 & 30 mg)
Terbinafine HCl	Lamisil (Novartis)	antifungal	cream 1%; tab (250 mg); DermGel
Terconazole	Terazol-3 or -7 (Ortho)	vaginal antifungal	cream & suppository
Terazosin	Hytrin (Abbott)	antihypertensive	tablets (1, 2, 5, & 10 mg)
Tetracycline HCl	Achromycin V (Lederle) Robitet (Robins) + generic	broad spectrum antibiotic	cap (250 & 500 mg) suspension
Tetracycline Phosphate	Sumycin (Apothecon)	broad spectrum antibiotic	cap (250 & 500 mg) suspension
Theophylline	Elixophylline (Cooper)	treat bronchial asthma and reversible bronchospasm	elixir (80 mg/15 mL)
	Slo-Phyllin (R-P R)		cap (125 & 250 mg)
	Slo-BID (R-P R)		cap (50, 100, 200, & 300 mg)
	Theo-Dur (Key)		sustained-action tab (100, 200, 300, & 450) & sprinkle extended-release tab (400 & 600)
	Uni-Dur (Key)		
Timolol Maleate	Timoptic (MSD) Betimol (Ciba)	treat glaucoma	ophthalmic solution (0.25 & .5%)
	Blocadren (MSD)	antihypertensive	tab (5, 10, & 20 mg)
Tramadol	Ultram (Ortho-McNeil)	central analgesic	tab (50 mg)
Tretinoin	Retin-A (Ortho)	treat acne vulgaris	cream, gel, liquid
Triamcinolone Acetonide	Kenalog (Squibb)	anti-inflammatory	cream, ointment, & topical aerosol
	Azmacort (R-PR)	treatment of asthma	inhalation aerosol
	Nasacort (R-PR)	same	intranasal
Triamterene + HCTZ	Dyazide (SKF) + generic	antihypertensive; diuretic	cap (50 + 24 mg)
	Maxzide (Lederle)		tab (75 + 50 mg);
	Maxzide-25 (37.5 + 25)		
Trimethobenzamide	Tigan (Beecham)	antiemetic	cap (100 & 200 mg); supp. & injection
Trimethoprim + Sulfamethoxazole	Septra (B-W) Bactrim (Roche) + generic	antibacterial for urinary tract infections	tab (80 + 400 mg); DS = double-strength infusion solution

(continued)

TABLE OF FREQUENTLY DISPENSED DRUGS (cont.)

Generic Name	Trade Name & Company	Category or Use	Dosage Forms and Strength
Valacyclovir HCl	Valtrex (G-W)	antiherpes virus agent	caplet 500 mg
Valproic Acid	Depakote Depakene (Abbott)	anticonvulsant	tab (125, 250, & 500) liquid
Valsartan	Diovan (Novartis)	antihypertensive	cap (80 & 160 mg)
Venlafaxine	Effexor (W-A)	antidepressant	tab (25, 37.5, 50, 75, & 100 mg)
Verapamil	Calan (Searle) Isoptin (Knoll) Verelan (Lederle) + generic	treatment of angina, antiarrhythmic (calcium channel blocker)	tab (40, 80, & 120) SR = 240 mg; injection
Warfarin	Coumadin (DuPont) Panwarfin (Abbott) Sofarin (Lemmon) + generic	anticoagulant	tab (2, 2.5, 5, 7.5, & 10 mg)
Zafirlukast	Accolate (Zeneca)	treat asthma (leukotriene receptor antagonist)	tab (20 mg)
Zolpidem	Ambien (Searle)	non-benzodiazepine hypnotic, sedative, tranquilizer	tab (5 & 10 mg)

APPENDIX B

Brand Names (Trade Names) Versus Generic Names

Trade Name	Generic Name
Accolate	Zafirlukast
Accupril	Quinapril
Achromycin V	Tetracycline
Adalat CC	Nifedipine
Adapin	Doxepin
Adderall	Dextroamphetamine salts
Aldactone	Spironolactone
Aldomet	Methyldopa
Aldoril	Methyldopa + HCTZ
Alesse	Levonorgestrel
Allegra	Fexofenadine
Altace	Ramipril
Alupent	Metaproterenol
Amaryl	Glimepiride
Ambien	Zolpidem
Amcil	Ampicillin
Amitriptyline	Elavil
Amoxil	Naproxen
Ansaid	Flurbiprofen
Antivert	Meclizine
Anusol HC	Bismuth subgallate, resorcin & hydrocortisone
APC with Codeine	Empirin with codeine
Arthrotec	Diclofenac sodium + misoprostol
Atarax	Hydroxyzine
Ativan	Lorazepam
Atrovent	Ipratropium
Augmentin	Amoxicillin + clavulanate K
Avapro	Irbesartan
Axid	Nizatidine
Azmacort	Triamcinolone acetonide
Bactoban	Mupirocin
Bactrim	Trimethoprim + sulfamethoxazole
Beconase	Beclomethasone dipropionate
Beepen VK	Potassium phenoxymethyl penicillin
Biaxin	Clarithromycin
Blocadren	Timolol
Brethine	Terbutaline
Bricanyl	Terbutaline
Bumex	Bumetanide
BuSpar	Buspirone
Calan	Verapamil
Capoten	Captopril
Carafate	Sucralfate
Cardizem	Diltiazem
Cardura	Doxazosin
Catapres	Clonidine
Ceclor	Cefaclor
Ceftin	Cefuroxime
Cefzil	Cefprozil
Centrax	Prazepam
Cipro	Ciprofloxacin
Claritin	Loratadine
Cleocin	Clindamycin
Climara	Estradiol
Clinoril	Sulindac
Compazine	Prochlorperzine
Cogentin	Benztropine
Corgard	Nadolol

Trade Name	Generic Name
Cortisporin	Polymyxin B; neomycin; gramicidin; & hydrocortisone
Coumadin	Warfarin
Cozaar	Losartan
Cycrin	Medroxyprogesterone
Dalmane	Flurazepam
Darvocet N	Propoxyphene + acetaminophen
Daypro	Oxaprozin
Deltasone	Prednisone
Demulen	Estrogens
Depakene or Depakote	Valproic acid
Desogen	Ethinyl estradiol
Diabeta	Glyburide
Diabinese	Chlorpropamide
Diflucan	Fluconazole
Dilacor XR	Diltiazem
Dilantin	Phenytoin
Dimetapp	Brompheniramine maleate
Diovan	Valsartan
Dopastat	Dopamine
Duragesic	Fentanyl
Duricef	Cefadroxil
Dyazide	Triamterene + HCTZ
DynaCirc	Isradipine
Effexor	Venlafaxine
Elavil	Amitriptyline
Elixophyllin	Theophylline
Elocon	Mometasone
E-Mycin	Erythromycin
Endocet	Oxycodone + APAP
Entex	Phenylephrine; PPA; & guaifenesin
ERY-TAB, ERYC	Erythromycin
Erythrocin EES	Erythromycin ethyl succinate
Esidrix	Hydrochlorothiazide
Eskalith	Lithium carbonate
Estrace or Estraderm	Estradiol
Evista	Raloxifene
Feldene	Piroxicam
Fioracet	Butalbital, APAP, & caffeine
Fiorinal	Butalbital, ASA, & caffeine
Flagyl	Metronidazole
Flexeril	Cyclobenzaprine
Flonase	Fluticasone
Floxin	Ofloxacin
Flovent	Fluticasone
Fosamax	Alendronate
Garamycin	Gentamicin
Glucophage	Metformin
Glucotrol	Glipizide
Glynase	Glyburide
Gyne-Lotrimin	Clotrimazole
Halcion	Triazolam
Haldol	Haloperidol
Hismanal	Astemizole
Hydergine	Ergoloid mesylates
Hydrodiuril	Hydrochlorothiazide
Hygroton	Chlorthalidone
Hytrin	Terazosin
Hyzaar	Losartan
Ilosone	Erythromycin estolate
Imdur	Isosorbide mononitrate
Imitrex	Sumatriptan
Imodium	Loperamide
Inderal	Propranolol
Indocin	Indomethacin
Intal	Cromolyn
Intropin	Dopamine
Isoptin	Verapamil
Isordil	Isosorbide dinitrate
K-Dur	Potassium chloride
K Lyte	Potassium bicarbonate & citrate
K-Tab	Potassium chloride
Keflex	Cephalexin
Kenalog	Triamcinolone acetonide
Klonopin	Clonazepam
Klor-Con	Potassium chloride
Kwell	Gamma benzene hexachloride
Lamisil	Terbinafine
Lanoxin	Digoxin
Larotid	Amoxicillin

Trade Name	Generic Name
Lasix	Furosemide
Lescol	Fluvastatin
Levaquin	Levofloxacin
Levoxyl	Levothyroxine
Lidex	Fluocinonide
Lipitor	Atorvastatin
Lodine	Etodolac
Loestrin-Fe	Ethinyl estradiol
Lomotil	Diphenoxylate + atropine
Lo-Ovral 28	Ethinyl estradiol + norgestrel
Lopid	Gemfibrozil
Lopressor	Metoprolol
Lorabid	Lorcarbef
Lorcet Plus	Hydrocodone
Losartan	Cozaar
Losartan + HCTZ	Hyzaar
Lotensin	Benazepril
Lotrel	Amlodipine + benazepril
Lotrimin	Clotrimazole
Lotrisone	Clotrimazole + betamethasone
Lorelco	Probucol
Lozol	Indapamide
Lortab	Hydrocodone + APAP
Macrobid	Nitrofurantoin macrocrystals
Macrodantin	Nitrofurantoin
Medrol	Methylprednisolone
Mellaril	Thioridazine
Metrogel	Metronidazole
Mevacor	Lovastatin
Miacalcin	Calcitonin salmon
Micro-K	Potassium chloride
Micronase	Glyburide
Minipress	Prazosin
Monistat	Miconazole
Monopril	Fosinopril
Motrin	Ibuprofen
Mycelex G	Clotrimazole
Mycostatin	Nystatin
Nalfon	Fenoprofen
Naprosyn	Naproxen
Nasacort	Triamcinolone
Nasalcrom	Cromolyn
Nasonex	Mometasone
Neosporin	Neomycin, polymyxin B, & bacitracin
Neurontin	Gabapentin
Nicorette	Nicotine polacrilex
Nitrobid	Nitroglycerin
Nitrodur II	Nitroglycerin
Nitroquick	Nitroglycerin
Nitrostat	Nitroglycerin
Nizoral	Ketoconazole
Nolvadex	Tamoxifen
Normodyne	Labetalol
Norinyl	Norethindrone + mestranol
Norlestrin	Norethindrone acetate
Noroxin	Norfloxacin
Norvasc	Amlodipine
Novolin	Insulin
Ogen	Estropipate
Omnipen	Ampicillin
Ortho-Novum	Norethindrone + ethinyl estradiol
Ortho-Cept	Ethinyl estradiol
Ortho-Cyclen	Ethinyl estradiol
Ortho-Tri-Cyclen	Norgestimate + ethinyl estradiol
Orudis	Ketoprofen
Oruvail	Ketoprofen
Ovcon	Ethinyl estradiol + norethindrone
Ovral	Norgestrel + ethinyl estradiol
Pamelor	Nortriptyline
Paxil	Paroxetine
PCE	Erythromycin
Pediazole	Erythromycin ethyl succinate + acetylsulfisoxazole
Pepcid	Famotidine
Percocet-5	Oxycodone HCl + APAP
Percodan	Oxycodone + O. terephthalate + ASA
Peridex	Chlorhexidine gluconate
Persantine	Dipyridamole
Pen-Vee K	Pot. phenoxymethyl penicillin
Phenergan	Promethazine
Plendil	Felodipine

Trade Name	Generic Name
Polycillin	Ampicillin
Polymox	Amoxicillin
Poly Vi Flor	Fluoride + vitamins A, D, C, E, and B's
Pravachol	Pravastatin
Premarin	Conjugated estrogens
Prevacid	Lansoprazole
Prilosec	Omeprazole
Principen	Ampicillin
Prinivil	Lisinopril
Procan SR	Procainamide
Procardia	Nifedipine
Pronestyl	Procainamide
Propine	Dipivefrin
Proventil	Albuterol
Provera	Medroxyprogesterone
Prozac	Fluoxetine
Pulmicort	Budesonide
Questran	Cholestyramine
Reglan	Metoclopramide
Relafen	Nabumetone
Restoril	Temazepam
Retin-A	Tretinoin
Rhinocort	Flonase proprionate
Risperdal	Risperidone
Ritalin	Methylphenidate
Rogaine	Minoxidil
Robitet	Tetracycline
Roxicet	Oxycodone
Rufen	Ibuprofen
Septra	Trimethoprim + sulfamethoxazole
Serax	Oxazepam
Serevent	Salmeterol
Serzone	Nefazodone
Seroquel	Quetiapine
Sinemet	Carbidopa + levodopa
Sinequan	Doxepin
Skelaxin	Metaxalone
Slo-BID	Theophylline, anhydrous
Slow-K	Potassium chloride
Slo-Phyllin	Theophylline
Sorbitrate	Isosorbide dinitrate
Sulamyd	Sulfacetamide sodium
Sumycin	Tetracycline

Trade Name	Generic Name
Suprax	Cefixime
Synthroid	Levothyroxine
Tagamet	Cimetidine
Nolvadex	Tamoxifen
Tavist	Clemastine
Tegretrol	Carbamazepine
Tenormin	Atenolol
Terazol	Terconazole
Theo-Dur	Theophylline, anhydrous
Tigan	Trimethobenzamide
Timoptic	Timolol
TobraDex	Dexamethasone + tobramycin
Topex	Benzoyl peroxide
Toprol	Metoprolol
Toradol	Ketorolac
Totacillin	Ampicillin
Transderm Nitro	Nitroglycerin
Tranxene	Chlorazepate
Trental	Pentoxifylline
Triavil	Perphenazine + amitryptyline
Tri-Levlen	Estrogens
Trimox	Amoxicillin
Tri-Norinyl	Norethindrone + mestranol
Triphasil	Ethinyl estradiol + levonorgestrel
Tri-Vi-Flor	Fluoride + vitamins A, D, & C
Trusopt	Dorzolamide
Tussionex	Hydrocodone + phenyltoxamine
Tylenol	APAP
Tylox	Oxycodone HCL + APAP
Ultimox	Ampicillin
Ultram	Tramadol
Valium	Diazepam
Valrelease	Diazepam, sustained release
Valtrex	Valacyclovir
Vanceril	Beclomethasone dipropionate
Vancenase	Beclomethasone dipropionate
Vasotec	Enalapril

Trade Name	Generic Name
Vaseretic	Enalapril + HCTZ
V-Cillin	Pot. phenoxymethyl penicillin
Veetids	Pot. phenoxymethyl penicillin
Ventolin	Albuterol
Verelan	Verapamil
Viagra	Sildenafil
Vibramycin	Doxycycline
Vicodin	Hydrocodone + APAP
Vioxx	Rofecoxib
Vistaril	Hydroxyzine pamoate
Voltaren	Diclofenac
Wellbutrin	Bupropion
Wymox	Amoxicillin
Xalatan	Latanoprost
Xanax	Alprazolam
Zantac	Ranitidine
Zestoretic	Lisinopril + HCTZ
Zinacef	Cefuroxime
Zestril	Lisinopril
Ziac	Bisoprolol
Zithromax	Azithromycin
Zocor	Simvastatin
Zofran	Ondansetron
Zoloft	Sertraline
Zovirax	Acyclovir
Zyban	Bupropion
Zyloprim	Allopurinol
Zyprexa	Olanzapine
Zyrtec	Cetirizine