PreTest®
Self-Assessment and Review

Pharmacology

Third Edition

Priscilla S. Dannies
John W. Kozarich
John Stephen Lazo

- 500 board-type multiple-choice questions
- Comprehensive explanations
- Thorough, up-to-date references and bibliography

Pharmacology:
PreTest® Self-Assessment and Review

Third Edition

Edited by

Priscilla S. Dannies, Ph.D.
Associate Professor of Pharmacology
Yale University School of Medicine
New Haven, Connecticut

John W. Kozarich, Ph.D.
Associate Professor of Pharmacology
Yale University School of Medicine
New Haven, Connecticut

John Stephen Lazo, Ph.D.
Assistant Professor of Pharmacology
Yale University School of Medicine
New Haven, Connecticut

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Pharmacology

NOTICE

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required. The editors and the publisher of this work have made every effort to ensure that the drug dosage schedules herein are accurate and in accord with the standards accepted at the time of publication. Readers are advised, however, to check the product information sheet included in the package of each drug they plan to administer to be certain that changes have not been made in the recommended dose or in the contraindications for administration. This recommendation is of particular importance in regard to new or infrequently used drugs.

List of Contributors

Kristin R. Carlson, Ph.D.
Associate Professor of Pharmacology
University of Massachusetts Medical School
Worcester, Massachusetts

Priscilla S. Dannies, Ph.D.
Associate Professor of Pharmacology
Yale University School of Medicine
New Haven, Connecticut

Robert E. Humphreys, M.D., Ph.D.
Associate Professor of Pharmacology and Medicine
University of Massachusetts Medical School
Worcester, Massachusetts

John W. Kozarich, Ph.D.
Associate Professor of Pharmacology
Yale University School of Medicine
New Haven, Connecticut

John Stephen Lazo, Ph.D.
Assistant Professor of Pharmacology
Yale University School of Medicine
New Haven, Connecticut

M. G. Marinus, Ph.D.
Associate Professor of Pharmacology
University of Massachusetts Medical School
Worcester, Massachusetts

Emil R. Smith, Ph.D.
Associate Professor of Pharmacology
University of Massachusetts Medical School
Worcester, Massachusetts

Introduction

Pharmacology: PreTest® Self-Assessment and Review has been designed to provide medical students, as well as physicians, with a comprehensive and convenient instrument for self-assessment and review. The 500 questions provided have been designed to parallel the format and degree of difficulty of the questions contained in Part I of the National Board of Medical Examiners examinations, the Federation Licensing Examination (FLEX), the Visa Qualifying Examination, and the ECFMG examination.

Each question in the book is accompanied by an answer, a paragraph explanation, and a specific page reference to either a current journal article, a textbook, or both. A bibliography, listing all the sources used in the book, follows the last chapter.

Perhaps the most effective way to use this book is to allow yourself one minute to answer each question in a given chapter; as you proceed, indicate your answer beside each question. By following this suggestion, you will be approximating the time limits imposed by the board examinations previously mentioned.

When you finish answering the questions in a chapter, you should then spend as much time as you need verifying your answers and carefully reading the explanations. Although you should pay special attention to the explanations for the questions you answered incorrectly, you should read **every** explanation. The contributors to this book have designed the explanations to reinforce and supplement the information tested by the questions. If, after reading the explanations for a given chapter, you feel you need still more information about the material covered, you should consult and study the references indicated.

This book meets the criteria established by the AMA's Department of Continuing Medical Education for up to 22 hours of credit in category 5D for the Physician's Recognition Award. It should provide an experience that is instructive as well as evaluative; we also hope that you enjoy it. We would be very happy to receive your comments.

Contents

General Principles

DIRECTIONS: Each question below contains five suggested answers. Choose the **one best** response to each question.

1. On the assumption that passive transport of the nonionized forms of the following drugs determines the rate of their absorption, which of the following drugs will be best absorbed in the small intestine?

(A) Acetylsalicylic acid, pK_a 3.0
(B) Boric acid, pK_a 9.2
(C) Phenobarbituric acid, pK_a 7.9
(D) Salicylic acid, pK_a 3.0
(E) Sulfadiazine, pK_a 6.5

2. If 90.9 percent of a drug is in the nonionized form at pH 5, the pK_a of the drug is approximately

(A) 3
(B) 4
(C) 5
(D) 6
(E) 10

3. Drugs may be released slowly from various drug reservoirs over long periods of time. The body reservoir that holds the largest amount of the barbiturate thiopental is

(A) fat
(B) lung
(C) liver
(D) muscle
(E) serum albumin

4. Drug accumulation will occur after repeated injections if a drug is

(A) not metabolized by the liver
(B) administered intravenously
(C) administered at the $t_{1/2}$ of the drug
(D) distributed quickly into the extracellular space
(E) significantly protein-bound in the plasma

5. The route of excretion for drugs or their metabolic derivatives that is quantitatively the LEAST significant is which of the following?

(A) Biliary tract
(B) Kidneys
(C) Lungs
(D) Feces
(E) Milk

6. Oxidizable drugs form a complex with and are oxidized by which of the following iron-containing pigments in the microsomal fraction of liver?

(A) Cytochrome *a*
(B) Cytochrome *b*
(C) Cytochrome *c*
(D) Cytochrome c_1
(E) Cytochrome P-450

Questions 7-9

The following values were obtained for a patient:

24-hour urine volume	= 720 ml
concentration of creatinine in 24-hr urine specimen	= 0.6 mg/ml
concentration of creatinine in plasma	= 6.0 mg/100 ml

7. The patient's creatinine clearance (C_{Cr}) is

(A) 5 ml/min
(B) 10 ml/min
(C) 20 ml/min
(D) 60 ml/min
(E) 120 ml/min

8. A creatinine clearance value of 100 ml/min is a sign of which of the following conditions?

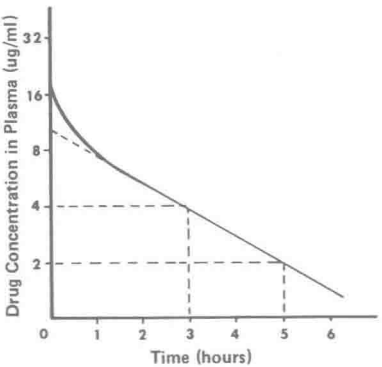
(A) Normal renal function
(B) Mild renal failure
(C) Severe renal failure
(D) Severe hepatic damage
(E) Mild cardiac toxicity

9. In the presence of impaired renal function, the time interval between maintenance doses needs to be lengthened for all the following antibiotics EXCEPT

(A) erythromycin
(B) streptomycin
(C) sulfisoxazole
(D) chlortetracycline
(E) ethambutol

Questions 10-13

Three hundred mg of a drug were administered intravenously to a 50-kg woman. The plasma concentration was then determined at intervals of time, as shown in the graph below.



10. The apparent volume of distribution of the drug administered is

(A) 3 liters
(B) 10 liters
(C) 30 liters
(D) 50 liters
(E) 300 liters

11. The half-time ($t_{1/2}$) of clearance of the drug is

(A) 30 minutes
(B) 1 hour
(C) 2 hours
(D) 3 hours
(E) 4 hours

12. The elimination rate constant (k_e) of the drug is

(A) 0.1 hr^{-1}
(B) 0.2 hr^{-1}
(C) 0.35 hr^{-1}
(D) 0.69 hr^{-1}
(E) 1.38 hr^{-1}

13. The total body clearance of the drug is

(A) 0.2 liter/hr
(B) 0.5 liter/hr
(C) 1.0 liter/hr
(D) 3.0 liters/hr
(E) 10.5 liters/hr

14. If a drug has an elimination half-time ($t_{1/2}$) of 25 hr and 10 mg is administered intravenously every 12 hr, the expected average total body store of drug would be how many times greater than the 10 mg dose?

(A) 1.5
(B) 3.0
(C) 4.5
(D) 6.0
(E) 12.0

15. Assume that drug X is not significantly bound to plasma proteins and is excreted exclusively by the kidneys. If drug X is cleared from the body at a rate of 50 ml/min, which of the following conclusions is correct?

(A) Drug X is filtered by the glomeruli and reabsorbed in the tubules
(B) Drug X must be metabolized before excretion
(C) Renal blood flow should be increased
(D) The pH of urine must be alkaline
(E) None of the above

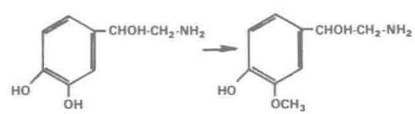
16. Phase 2 clinical studies of a drug are for the purpose of

(A) first administering it to humans
(B) establishing its efficacy and proper dosage schedules
(C) investigating its metabolic fate in humans
(D) conducting multi-institution trials with a large number of patients
(E) obtaining final FDA approval for marketing

17. Prescriptions for Schedule IV drugs, such as meprobamate (Miltown, Equanil), are subject to which of the following restrictions?

(A) They are not refillable
(B) They are refillable up to five times
(C) They are refillable without limit
(D) They can be dispensed only by hospital pharmacies
(E) They can be dispensed only by the Drug Enforcement Administration (DEA)

18. The transformation illustrated below is an example of which of the following detoxification mechanisms?



Norepinephrine Normetanephrine

(A) Acetylation
(B) Esterification
(C) Hydrolysis
(D) Hydroxylation
(E) Methylation

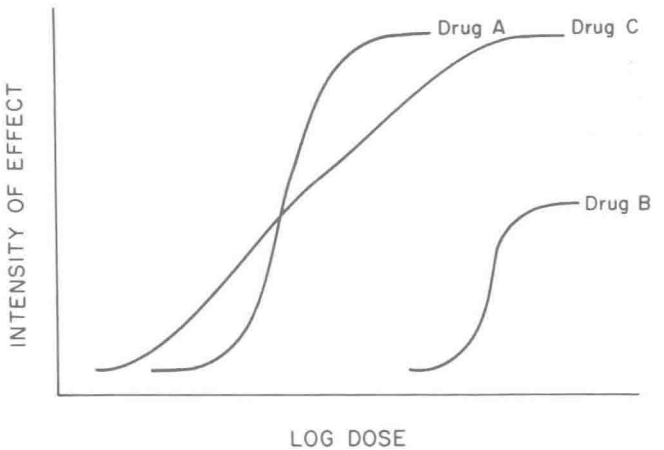
19. The pharmacokinetic value that most reliably reflects the amount of drug reaching the target tissue after oral administration is

(A) peak blood concentration
(B) time to peak blood concentration
(C) product of the volume of distribution and the first-order rate constant
(D) volume of distribution
(E) area under the blood concentration-time curve

DIRECTIONS: Each question below contains four suggested answers of which **one** or **more** is correct. Choose the answer:

A	if	**1, 2, and 3**	are correct
B	if	**1 and 3**	are correct
C	if	**2 and 4**	are correct
D	if	**4**	is correct
E	if	**1, 2, 3, and 4**	are correct

20. From the graph below, which of the following statements are correct?



(1) Drug A is more potent than Drug B
(2) Drug A is less effective than Drug C
(3) Drug B is less effective than Drug C
(4) Drug A is more selective than Drug B

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21. Agents that appear to act via cellular receptors include

(1) mannitol
(2) halothane (Fluothane)
(3) ethylenediaminetetraacetic acid (EDTA)
(4) cimetidine (Tagamet)

22. Monitoring the blood levels of a drug is particularly important if the

(1) interpatient variability is considerable
(2) therapeutic index of the drug is low
(3) biological effect is difficult to monitor
(4) drug has a short duration of action

SUMMARY OF DIRECTIONS				
A	**B**	**C**	**D**	**E**
1, 2, 3 only	**1, 3 only**	**2, 4 only**	**4 only**	**All are correct**

23. Biotransformation reactions classed as nonsynthetic include which of the following?

(1) Oxidation
(2) Reduction
(3) Hydrolysis
(4) Acetylation

DIRECTIONS: The groups of questions below consist of lettered choices followed by several numbered items. For each numbered item select the **one** lettered choice with which it is **most** closely associated. Each lettered choice may be used once, more than once, or not at all.

Questions 24-26

For each description of a drug response that follows, choose the term with which it is most likely to be associated.

(A) Supersensitivity
(B) Tachyphylaxis
(C) Tolerance
(D) Hyposensitivity
(E) Anaphylaxis

24. Immunologically mediated drug reaction observed soon after drug administration

25. A rapid reduction in the effect of a given dose of a drug after only one or two doses

26. Hyperreactivity to a drug seen as a result of denervation

Questions 27-31

For each description that follows, select the transmembranal transport mechanism it best defines.

(A) Filtration
(B) Passive diffusion
(C) Facilitated diffusion
(D) Active transport
(E) Endocytosis

27. Lipid-soluble drugs cross the membrane at a rate proportional to the concentration gradient across the membrane and the lipid:water partition coefficient of the drug

28. Bulk flow of water through membrane pores, resulting from osmotic differences across the membrane, transports drug molecules that fit through the membrane pores

29. Drugs are transported by a membrane carrier that exhibits selectivity, competition, saturability. The movement is with the concentration gradient, and no energy is required

30. Cell membranes engulf droplets of solutions that are released inside the cell

31. By a selective saturable process requiring energy, molecules are transported across an electrochemical gradient

Questions 32-34

For each type of incompatibility described below; select the pair of substances that illustrates it.

(A) Tetracycline and milk
(B) Phenobarbital (Luminal) and secobarbital (Seconal)
(C) Isoproterenol (Isuprel) and propranolol (Inderal)
(D) Soap and benzalkonium chloride (Ionil)
(E) Doxycycline (Vibramycin) and chlortetracycline (Aureomycin)

32. Therapeutic incompatibility

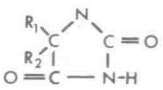
33. Physical incompatibility

34. Chemical incompatibility

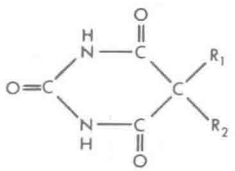
Questions 35-39

Many families of drugs consist of members that vary only with respect to substituents on a common ring structure. For each type of pharmacologic effect that follows, select the ring structure with which it is most likely to be associated.

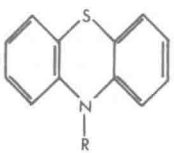
A



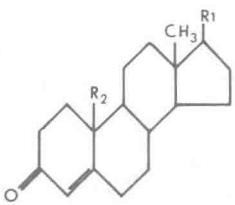
B



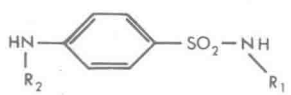
C



D



E



35. Antibiotic
36. Antipsychotic
37. Hypnotic
38. Oral contraceptive
39. Antiepileptic (petit mal)

Questions 40-44

For each description that follows, choose the drug with which it is most likely to be associated.

(A) Chloramphenicol
(B) Doxycycline
(C) Erythromycin
(D) Methenamine mandelate
(E) Penicillin G

40. This drug, which normally is excreted as glucuronide by the kidneys, reaches toxic levels in newborn infants deficient in glucuronyl transferase

41. This drug becomes concentrated in the liver and is excreted in an active form in the bile

42. Can inhibit hepatic microsomal enzymes and increase the half-times and toxicity of other drugs metabolized by this system

43. Usually prepared as a potassium salt, it may contribute to a potassium imbalance in the presence of renal failure

44. Although systemically nontoxic, this drug is contraindicated in the presence of moderate to severe renal failure because it potentiates uremic acidosis

General Principles

Answers

1. **The answer is B.** *(Gilman, ed 6. p 4.)* The neutral nonionized form of a drug passes through a cellular membrane more easily than the ionized form because it is more lipid soluble. Thus, the rate of passive transport varies with the proportion of the drug that is nonionized. When the pH of a drug's environment is equal to its pK_a, the drug is half-dissociated. At an alkaline intestinal pH of about 8, of the drugs listed in the question, boric acid has the greatest percentage of its molecules in the nonionized form. The pH in the gastrointestinal tract is the major factor in absorption of many drugs. Weak acids (e.g., salicylates, barbiturates) are more readily absorbed from the stomach than from the other intestinal regions because these weak acids are mostly nonionized in the acidic environment of the stomach. The higher the value of the pK_a, the less ionized these acidic substances are in the stomach.

2. **The answer is D.** *(Goth, ed 10. pp 16-17.)* The Henderson-Hasselbalch equation defines the pK_a and can be expressed as

$$pK_a = pH + \log \frac{\text{(percent of drug not ionized)}}{\text{(percent of drug ionized)}}$$

$$pK_a = 5 + \log \frac{(90.9)}{(9.1)}$$

$$pK_a = 5 + 0.99952$$

$$pK_a = 5.99952$$

The transfer of drugs across membranes is dependent upon the pH of the internal environment and upon the pK_a of the drug. As the degree of ionization increases for an acidic drug, the smaller the value of the pK_a and the less the drug is permeable in membranes.

3. **The answer is A.** *(Gilman, ed 6. pp 9-10.)* Body fat may contain up to 70 percent of an administered dose of lipid-soluble thiopental three hours after injection. Other drugs may tend to accumulate in muscle or liver. For example, the concentration of the antimalarial drug quinacrine can be one thousand times greater in liver than in plasma. Serum albumin binds many drugs, some to ap-