Chapter 1 Introduction to Pharmacology

1. A woman has been prescribed paroxetine hydrochloride, which is an antidepressant agent administered in pill form. The medication is administered for her obsessive-compulsive disorder. This medication will produce which of the following effects?

A) Curative  
B) Systemic  
C) Local  
D) Parenteral

Ans: B

Feedback:

Drugs that produce systemic effects are taken into the body, circulated through the bloodstream to their sites of action in various body tissues, and eventually eliminated from the body. Curative agents are given to cure a disease process. In
In this case, paroxetine hydrochloride will control the symptoms but not cure the disorder. Drugs with local effects, such as sunscreen and local anesthetics, act mainly at the site of application. Paroxetine hydrochloride is not administered parenterally. Parenteral agents are administered subcutaneously, intramuscularly, or intravenously.

A patient has been prescribed an antibiotic. This medication is a naturally occurring substance that has been chemically modified. What is another name for this type of medication?

A) Synthetic drug  
B) Semisynthetic drug  
C) Biotechnology drug  
D) Prototype drug

Ans:B

Feedback:

Semisynthetic drugs (e.g., many antibiotics) are naturally occurring substances that have been chemically modified. Synthetic drugs are more standardized in their chemical characteristics, more consistent in their effects, and less likely to produce allergic reactions. Biotechnology drugs involve manipulating DNA and RNA and recombining genes into hybrid molecules that can be inserted into living organisms. Prototype drugs are the first drug of a particular group to be developed.

A patient is administered morphine. Morphine is a prototypical drug that can be classified in different ways. Which of the following classifications applies to morphine?

A) Central nervous system depressant  
B) Central nervous system stimulant
C) Anti-inflammatory
D) Antihypertensive
Ans:A

**Feedback:**

Drugs are classified according to their effects on particular body systems, their therapeutic uses, and their chemical characteristics. For example, morphine can be classified as a central nervous system depressant and a narcotic or opioid analgesic. A central nervous system stimulant increases attention and raises mood. An anti-inflammatory agent decreases inflammation at the site of tissue or joint inflammation. An antihypertensive agent reduces blood pressure.

4. A patient is administered amoxicillin (Amoxil). The generic name of this medication indicates that it belongs to which drug group?

A) Selective serotonin reuptake inhibitors
B) Diuretics
C) Penicillins
D) ACE inhibitors
Ans:C

**Feedback:**

The generic name often indicates the drug group (e.g., drugs with generic names ending in “cillin” are penicillins). Selective serotonin reuptake inhibitors are medications that have antidepressant effects; SSRI is a broad classification, not a generic name. Diuretics are medications that increase urine output; diuretic is a broad classification, not a generic name. ACE inhibitor is the broad classification for the angiotensin-converting enzyme inhibitors, not the generic name.
5. The administration of diphenhydramine (Benadryl), which is an over-the-counter medication, is regulated by which government agency?

A) Public Health Service
B) Federal Trade Commission
C) Occupational Safety and Health Administration
D) Food and Drug Administration

Ans:D

**Feedback:**

The Food and Drug Administration approves drugs for over-the-counter availability, including the transfer of drugs from prescription to OTC status, and may require clinical trials to determine the safety and effectiveness of OTC use. The Public Health Service is regulated by the state to maintain the health of individual citizens of the state. The Federal Trade Commission regulates imports and exports throughout the nation. The Occupational Safety and Health Administration regulates safety within the workplace.

6. The administration of anabolic steroids is regulated by which of the following laws?

A) The Food, Drug, and Cosmetic Act of 1938
B) The Comprehensive Drug Abuse Prevention and Control Act
C) The Harrison Narcotic Act
D) The Shirley Amendment

Ans:B

**Feedback:**
A nurse is responsible for maintaining an accurate count and record of the controlled substances on the nursing unit. This nursing action is regulated by which of the following laws or agencies?

A) Food, Drug, and Cosmetic Act of 1938  
B) Public Health Service  
C) Drug Enforcement Administration  
D) Shirley Amendment  

Ans: C  

**Feedback:**  
The Drug Enforcement Administration enforces the Controlled Substances Act. Under this enforcement, nurses are responsible for storing controlled substances in locked containers, administering them only to the people for whom they are prescribed, recording each dose given, and maintaining an accurate inventory. The Food, Drug, and Cosmetic Act of 1938 revised and broadened FDA powers and responsibilities, giving the FDA control over drug safety. The Public Health Service is regulated by the state to maintain the health of individual citizens of the state. The Shirley Amendment of 1912 prohibited fraudulent claims of drug effectiveness.

In Phase I clinical trials, the potential uses and effects of a new drug are determined by which of the following methods?
A) Administering doses to healthy volunteers
B) Administering doses to people with the disease
C) Administering in placebo-controlled design
D) Calculating the risk-to-benefit ratio

Ans:A

Feedback:

Phase I studies allow for the administration of the medication to healthy volunteers to determine safe dosages, routes of administration, absorption, metabolism, excretion, and toxicity. In Phase II studies, a few doses are given to a certain number of subjects with the disease or symptom for which the drug is being studied and responses are compared with those of healthy subjects. Placebo-controlled designs are used in the Phase III studies, in which half of the subjects receive the new drug and half receive the placebo. Calculating the risk-to-benefit ratio is used in Phase II studies to determine whether the potential benefits of the drug outweigh the risks.

A new medication for the treatment of Alzheimer’s disease is being administered to a group of subjects with the disease. The subjects receiving this medication are unaware of whether they are being administered the medication or whether they are receiving a placebo. This testing occurs in which phase of the drug approval process?

A) Phase I
B) Phase II
C) Phase III
D) Phase IV

Ans:C
Feedback:

In Phase III, the drug is given to a larger and more representative group of subjects. In double-blind, placebo-controlled designs, half of the subjects receive the new drug and half receive a placebo (an inactive substance similar in appearance to the actual drug), with neither subjects nor researchers knowing which subjects receive which formulation. In Phase I, a few doses are given to a certain number of healthy volunteers to determine safe dosages, routes of administration, absorption, metabolism, excretion, and toxicity. In Phase II, a few doses are given to a certain number of subjects with the disease or symptom for which the drug is being studied and responses are compared with those of healthy subjects. In Phase IV, the FDA evaluates the data from the first three phases for drug safety and effectiveness, allows the drug to be marketed for general use, and requires manufacturers to continue monitoring the drug’s effects.

10. Which organization is responsible for approving new drugs in the United States?

A) American Medical Association
B) American Pharmaceutical Association
C) Food and Drug Administration
D) United States Pharmacopeia

Ans: C

Feedback:

The Food and Drug Administration is responsible for approving new drugs in the United States. The American Medical Association represents the physicians of the United States. The American Pharmaceutical Association represents the pharmacists of the United States. The United States Pharmacopeia was adopted in 1906 and is issued every 5 years under the supervision of a national committee of pharmacists, scientists, and physicians.

11. Which of the following reference books provides information from the drug
manufacturers’ inserts?

A) *American Formulary Service*

B) *Drug Facts and Comparisons*

C) *Physicians’ Desk Reference*

D) *Lippincott’s Nursing Drug Guide*

Ans:C

**Feedback:**

The *Physicians’ Desk Reference* is published yearly and contains manufacturers’ published inserts for selected drugs. *American Formulary Service* is an authoritative source of drug information. *Drug Facts and Comparisons* is an authoritative source of drug information. *Lippincott’s Nursing Drug Guide* is an example of a drug handbook, not a compilation of manufacturers’ inserts.

12. A nursing student in a pharmacology class should be encouraged to study the medications according to which categorization?

A) Prototype

B) Controlled substance

C) Drug use

D) Generic names

Ans:A

**Feedback:**

The nursing student should concentrate on therapeutic classifications and their prototypes. Controlled substances limit the medications studied to one broad classification. Drug use is only one part of the broad classification. Generic names
A patient with a long-standing dermatological health problem has been advised to use a drug with a local effect. The nurse should recognize what characteristic of this drug?

A) It affects only the organ system in which it is metabolized.

B) The drug requires application at multiple sites.

C) It is effective only as long as it is in contact with skin.

D) The drug acts primarily at the site where it is applied.

Ans:D

**Feedback:**

Drugs with local effects, such as sunscreen lotions and local anesthetics, act mainly at the site of application. Those with systemic effects are taken into the body, circulated through the bloodstream to their sites of action in various body tissues, and eventually eliminated from the body. A drug with local effect does not necessarily have to be applied at multiple sites, and its action may affect tissues long after contact.

A patient with an autoimmune disorder has just been prescribed a synthetic drug. Which of the following characteristics is a noted advantage of synthetic drugs?

A) Synthetic drugs are less likely to cause an allergic reaction than naturally occurring substances.

B) Synthetic drugs typically require less frequent dosing than naturally occurring substances.

C) Synthetic drugs are normally available on an over-the-counter basis.

D) Synthetic drugs are available in a wider variety of administration routes than
naturally occurring substances.

Ans: A

**Feedback:**

Synthetic drugs are more standardized in their chemical characteristics, more consistent in their effects, and less likely to produce allergic reactions. They do not necessarily require less frequent dosing and may or may not be available OTC. They are not noted to be available in a wider variety of administration routes than naturally occurring substances.

A patient is confused about her care provider’s advice and has stated to the nurse, “I wasn’t sure whether he recommended Tylenol or whether he recommended acetaminophen.” The nurse should include which of the following information in an explanation of generic and trade names?

A) Prescribers should refer solely to generic names in their recommendations and written prescriptions.

B) A generic name is independent of any particular drug manufacturer.

C) Generic names change frequently, but trade names are more consistent.

D) Prescribers should refer solely to trade names in their recommendations and written prescriptions.

Ans: B

**Feedback:**

A generic name is related to the chemical or official name and is independent of the manufacturer. Drugs may be prescribed and dispensed by generic or trade name. Generic names do not change, while trade names vary according to time and place.

16. A nurse is aware that American drug laws have a long and complex history, with numerous jurisdictions being involved. What is the primary purpose of drug laws in
A nurse who provides care on a postsurgical unit frequently administers Schedule II drugs to patients. Which of the following aspects of administering these drugs falls under the auspices of the Drug Enforcement Agency?

A) Performing a thorough patient assessment prior to administration
B) Recording each dose administration on an agency narcotic sheet
C) Informing patients of the potential risks and benefits of Schedule II drugs prior to the first dose
D) Assessing the patient shortly after administration to ensure therapeutic effect

Ans:B

Feedback:

Nurses are responsible for storing controlled substances in locked containers, administering them only to people for whom they are prescribed, recording each dose given on agency narcotic sheets and on the patient’s medication.
administration record, maintaining an accurate inventory, and reporting discrepancies to the proper authorities. The other given actions are appropriate nursing activities, but they are not within the scope of the DEA authority.

Trials of a new drug are scheduled to soon begin and the testing methodology will integrate the stipulations of the National Institutes of Health (NIH) Revitalization Act. According to this act, the manufacturer must

A) independently fund the entire testing process.

B) make the results of the testing process publicly available.

C) include women and minorities in the testing process.

D) exclude any potential for financial gain during the testing process.

Ans:C

Feedback:

In 1993, Congress passed the National Institutes of Health (NIH) Revitalization Act, which formalized a policy of the NIH that women and minorities be included in human subject research studies funded by the NIH and that women and minorities be included in clinical drug trials. This act does not specifically address the financial structure of testing or the accessibility of information.

A hospital nurse is vigilant in ensuring the safe use of medications and consistently applies the rights of medication administration. Which of the following is one of the traditional rights of medication administration?

A) Right to refuse

B) Right route

C) Right education

D) Right evaluation
Feedback:

The traditional rights of medication administration (right drug, right dose, right patient, right route, right time, right reason, and right documentation) now include additional rights that should also be considered (right education, right evaluation, and right to refuse the medication).

A patient’s current medication administration record includes a drug that the nurse recognizes as an Institute for Safe Medication Practices (ISMP) high-alert medication. This designation signals the nurse to what characteristic of the drug?

A) It can only be administered by a physician or advanced practice nurse.
B) Administration must be cosigned by a second registered nurse or practical/vocational nurse.
C) It is currently undergoing Phase IV testing and is pending full FDA approval.
D) Administration errors carry a heightened risk of causing significant patient harm.

Ans:D

Feedback:

The Institute for Safe Medication Practices (ISMP) identifies drugs that when used in error have a heightened risk of causing significant patient harm. Such drugs are not limited to physician or advanced practice nurse administration. The drug would have completed the testing and approval procedure and administration does not necessarily require a cosignature.

CHAPTER 2:  BASIC CONCEPTS AND PROCESSES
1. Which cellular structure stores hormones and other substances and packages these substances into secretory granules?
A) Golgi apparatus
B) Endoplasmic reticulum
C) Mitochondria
D) Lysosome
Ans: A
Feedback:
The golgi apparatus stores hormones and other substances. The endoplasmic reticulum contains ribosomes, which synthesize proteins, including enzymes that synthesize glycogen, triglycerides, and steroids and those that metabolize drugs and other chemicals. The mitochondria generate energy for cellular activities and require oxygen. Lysosomes are membrane-enclosed vesicles that contain enzymes capable of digesting nutrients (proteins, carbohydrates, fats), damaged cellular structures, foreign substances (bacteria), and the cell itself.

2. A patient is suffering from a cough associated with an upper respiratory infection. Which oral medication will likely produce the most therapeutic effect?
A) A tablet
B) An expectorant
C) A topical spray
D) A timed-release tablet
Ans: B
Feedback:
Liquid medications are absorbed faster than tablets or capsules. Expectorants are liquid medications. A tablet is an oral medication that has a slower onset of action than a liquid medication. A topical spray can be sprayed to the back of the throat and provides only a local effect. A timed-release tablet is an oral medication that has a slower onset and longer duration of action.

3. A patient is administered an oral contraceptive. Which of the following is the process that occurs between the time the drug enters the body and the time that it enters the bloodstream?
A) Absorption
B) Distribution
C) Metabolism
D) Excretion
Ans: A
Feedback:
Absorption is the process that occurs from the time the drug enters the body to the time it enters the bloodstream to be circulated. Distribution involves the transport of drug molecules within the body. Metabolism is the method by which drugs are inactivated or biotransformed by the body. Excretion refers to elimination of a drug from the body.

4. Which of the following sites of drug absorption is considered to have an exceptionally large surface area for drug absorption?
A) Rectum
B) Fundus of the stomach
C) Esophagus
D) Lungs
Ans: D
Feedback:
The lungs have a large surface area for absorption of anesthetic gases and a few other drugs. The rectum absorbs the medication through the mucous membranes and has a smaller surface area than the lungs. The fundus and esophagus have comparatively small surface areas.

5. A nurse is aware of the importance of adhering to the intended route of a medication. Which of the following drugs are formulated to be absorbed through the skin?
A) Amoxicillin, tetracycline, and penicillin
B) Clonidine, fentanyl, and nitroglycerin
C) Digoxin, lidocaine, and propranolol
D) Insulin, heparin, and morphine
Ans: B
Feedback:
Some drugs are formulated in adhesive skin patches for absorption through the skin. Clonidine, fentanyl, and nitroglycerin are examples of drugs that are formulated in adhesive skin patch form to be absorbed through the skin. Amoxicillin, tetracycline, and penicillin are administered orally. Digoxin and propranolol are administered orally, and lidocaine can be administered
intravenously, subcutaneously, or topically. Insulin and heparin are administered intravenously and subcutaneously. Morphine is administered orally, intramuscularly, and intravenously.

6. An 85-year-old patient has an elevated serum creatinine level, indicating impaired kidney function. When the patient is administered a medication, this patient is at risk for which of the following medication-related effects?
   A) Toxicity
   B) Increased absorption
   C) Delayed gastric emptying
   D) Idiosyncratic effects
   Ans: A
   Feedback:
   An elevated creatinine level is indicative of diminished kidney function, which will result in serum drug toxicity. The creatinine level indicates kidney function, does not affect absorption, and has no effect on gastric emptying.

7. Protein binding is an important aspect of pharmacokinetics. Protein binding ultimately has which of the following effects on drug action?
   A) Increases the drug’s speed of action
   B) Decreases the drug’s speed of action
   C) Increases the rate of excretion
   D) Averts adverse effects
   Ans: B
   Feedback:
   Protein binding allows part of a drug to be stored and released as needed. Drugs that are highly bound to plasma proteins or stored extensively in other tissues have a long duration of action. Protein binding does not increase the speed of action, increase the excretion rate, or avert adverse effects. Protein binding decreases the speed of action by storing the drug to be released when needed.

8. A patient is taking a medication that is metabolized by the CYP enzymes. Which of the following medications inhibits several of the CYP enzymes?
   A) Cisplatin
   B) Acebutolol hydrochloride
   C) Cimetidine
   D) Dicloxacillin sodium
Ans: C
Feedback:
Cimetidine is a gastric acid suppressor that inhibits several CYP enzymes and can greatly decrease drug metabolism. The other listed drugs do not have this specific effect.

9. A nurse is aware that the dosing scheduling of a patient’s new medication takes into account the serum half-life of the drug. What is the serum half-life of a medication?
A) The time required for IV medications to penetrate the brain tissue
B) The time needed for the serum level to fall by 50%
C) The safest margin to prevent toxicity
D) The dose adjustment that reduces the risk of adverse effects by one half
Ans: B
Feedback:
Serum half-life is the time required for the serum concentration of a drug to decrease by 50%. Although many IV medications penetrate the brain tissue, this action does not describe the half-life. The safest margin to prevent toxicity depends on the rate of metabolism and excretion. The half-life of the medication does not relate directly to a specific reduction in adverse effects.

10. A patient has increased intracranial pressure and is ordered to receive a diuretic. Which of the following diuretics does not act on receptor sites to produce diuresis?
A) Furosemide (Lasix)
B) Hydrochlorothiazide (HCTZ)
C) Spironolactone (Aldactone)
D) Mannitol (Osmitrol)
Ans: D
Feedback:
Mannitol (Osmitrol) is an osmotic diuretic that increases the osmolarity of plasma and pulls water out of the tissues into the bloodstream. It does not act on receptor sites. Furosemide (Lasix) is a loop diuretic that inhibits the reabsorption of sodium and chloride in the loop of Henle. Hydrochlorothiazide is associated with drug interference with absorption of sodium ions across the distal renal tubule. Spironolactone acts by competing with aldosterone for cellular receptor sites.
11. A patient older than 65 years is more likely to experience drug reaction than a much younger patient. Which of the following factors accounts for this variation?
A) Drugs more readily crossing the blood–brain barrier in older people
B) Age-related physiologic changes
C) Increased drug-metabolizing enzymes in older people
D) Diminished immune response
Ans: B
Feedback:
In older adults (65 years and older), physiologic changes may alter all pharmacokinetic processes. Although drugs crossing the blood–brain barrier affect drug reaction, this factor is important in all ages. Increased drug-metabolizing enzymes are key in all ages and do not relate to age variations. A diminished immune response is important in all ages and does not affect all medications.

12. A patient who is 6 feet tall and weighs 280 pounds will require which of the following doses?
A) Higher dose than a patient who weighs 180 pounds
B) Lower dose than a patient who weighs 180 pounds
C) Same dose as a patient who weighs 180 pounds
D) A parenteral rather than oral dose
Ans: A
Feedback:
In general, people heavier than average may need larger doses, provided their renal, hepatic, and cardiovascular functions are adequate.

13. A nurse has provided an oral dose of morphine, an opioid agonist, to a woman in early labor. The nurse should be aware of what characteristic of agonists?
A) Agonists alter the normal processes of distribution and metabolism.
B) Agonists counteract the action of specific neurotransmitters.
C) Agonists block the action of specific neurotransmitters.
D) Agonists bind to receptors and cause a physiological effect.
Ans: D
Feedback:
Agonists are drugs that produce effects similar to those produced by naturally occurring hormones, neurotransmitters, and other substances by activating (not
blocking or counteracting) a receptor. Classification of a drug as an agonist does not denote a change to metabolism or distribution.

14. A nurse is preparing to simultaneously administer two drugs to a patient. The nurse knows that the drugs have been ordered to be given together because of their synergistic effect. This means that
A) the adverse effects of one of the drugs are nullified by the other drug.
B) the combined effects are greater than the effects of either one of the drugs alone.
C) one of the drugs enhances metabolism, while the other drug enhances either distribution or absorption.
D) both drugs are toxic in isolation but therapeutic when administered together.
Ans: B
Feedback:
Synergism occurs when two drugs with different sites or mechanisms of action produce greater effects when taken together. This does not mean that potential toxicity or adverse effects are “canceled out.” The two drugs would not individually affect different aspects of pharmacokinetics.

15. A patient has been brought to the emergency department by ambulance, and his friend states that he has overdosed on methadone, a long-acting opioid. The care team is preparing to administer the appropriate antidote, naloxone, which has a shorter half-life than methadone. What are the implications of this aspect of pharmacokinetics?
A) Repeated doses of naloxone will likely be necessary.
B) A different antidote will be required after the serum level of naloxone decreases.
C) An increased dose of naloxone will be required.
D) The antidote is unlikely to have a therapeutic effect on the patient’s symptoms.
Ans: A
Feedback:
When an antidote is used, its half-life relative to the toxin’s half-life must be considered. For example, the half-life of naloxone, a narcotic antagonist, is relatively short compared with the half-life of the longer-acting opioids such as methadone, and repeated doses may be needed to prevent recurrence of the toxic state.

16. A patient tells the nurse, “I took my sleeping pill yesterday evening, but it didn’t seem to work for me like it usually does.” The nurse should consider which
of the following variables that can affect drug absorption? Select all that apply.
A) GI function
B) Blood flow to the site of administration
C) The presence of other drugs
D) Route of administration
E) The presence of receptor agonists
Ans: A, B, C, D
Feedback:
Numerous factors affect the rate and extent of drug absorption, including dosage form, route of administration, blood flow to the site of administration, GI function, the presence of food or other drugs, and other variables. Agonist activity is a relevant variable, but this is not an aspect of absorption.

17. A nurse has administered a dose of a drug that is known to be highly protein bound. What are the implications of this characteristic?
A) The patient must consume adequate protein in order to achieve a therapeutic effect.
B) The molecules of the drug that are bound to protein are inactive.
C) Increased levels of serum protein will increase the effect of the drug.
D) Each molecule of the drug must bind to a protein molecule to become effective.
Ans: B
Feedback:
Drug molecules bound to plasma proteins are pharmacologically inactive because the large size of the complex prevents their leaving the bloodstream through the small openings in capillary walls and reaching their sites of action, metabolism, and excretion. Only the free or unbound portion of a drug acts on body cells. The patient’s protein intake or levels of protein are not normally relevant.

18. A patient requires a high dose of his new antihypertensive medication because the new medication has a significant first-pass effect. This means that the drug
A) must pass through the patient’s bloodstream several times to generate a therapeutic effect.
B) passes through the renal tubules and is excreted in large amounts.
C) is extensively metabolized in the patient’s liver.
D) is ineffective following the first dose and increasingly effective with each subsequent dose.
Ans: C
Feedback:
Some drugs are extensively metabolized in the liver, with only part of a drug dose reaching the systemic circulation for distribution to sites of action. This is called the first-pass effect or presystemic metabolism. The first-pass effect is not related to renal function or the need to pass through the bloodstream multiple times.

19. A patient with a diagnosis of bipolar disorder has begun lithium therapy, and the nurse has explained the need for regular monitoring of the patient’s serum drug levels. What is the primary rationale for the nurse’s instruction?
A) It is necessary to regularly test for blood–drug incompatibilities that may develop during treatment.
B) It is necessary to ensure that the patient’s drug levels are therapeutic but not toxic.
C) It is needed to determine if additional medications will be needed to potentiate the effects of lithium.
D) It is needed in order to confirm the patient’s adherence to the drug regimen.
Ans: B
Feedback:
Measuring serum drug levels is useful when drugs with a narrow margin of safety are given, because their therapeutic doses are close to their toxic doses. This is the case during lithium therapy. Serum levels are not commonly taken to monitor adherence to treatment. Blood–drug incompatibilities are not a relevant consideration.

20. A patient in cardiovascular collapse requires pharmacological interventions involving a rapid drug action and response. What route of administration is most likely appropriate?
A) Intravenous
B) Oral
C) Rectal
D) Topical
Ans: A
Feedback:
For rapid drug action and response, the IV route is most effective because the drug is injected directly into the bloodstream.