اسئلة الوزاري

1- Which of the following is the accurate method of eliminating a toxic dose of phenobarbital?
a) Alkalinization of urine
b) Administering bicarbonate to decrease urine pH
c) Acidification by NH4Cl
d) Administering ammonium chloride to increase urine pH
e) None of the above

2- A drug, given as an 800 mg single dose, results in a peak plasma concentration of 40 µg/mL. The apparent volume of distribution is (assume a rapid distribution and negligible elimination prior to measuring the peak plasma level):
a) 0.2 L
b) 1 L
c) 2 L
d) 5 L
e) 20 L

3- Which of the following is related to P-glycoprotein expression?
a) Transporting drugs into cells
b) Reducing drug resistance
c) Reducing drug absorption
d) Metabolizing drugs
e) All of the above

4- Which of the following conditions may lead to an increased drug half-life?
a) Decreased plasma volume
b) Decreased renal blood flow
c) Decreased protein binding
d) Increased metabolism
e) Increased hepatic blood flow

5- If drug X has low molecular weight and is hydrophilic, the drug will distribute to:
a) Extracellular fluid
b) Plasma compartment
c) Total body water
d) Plasma proteins
e) Intracellular compartment

6- An 18-year-old female patient is brought to the emergency department due to a drug overdose. Which of the following routes of administration is the most desirable for administering the antidote for the drug overdose?
a) Oral
b) Subcutaneous
c) Intramuscular
d) Intravenous
e) Transdermal

7- Which route of administration is used to directly impact the central nervous system, bypassing the blood-brain barrier?
a) Oral
b) Intrathecal
c) Subcutaneous
d) Intranasal
e) Intravenous

8- Which of the following is a Phase I reaction involved in drug metabolism?
a) Methylation
b) Glucuronidation
c) Sulfation

d) Oxidation
e) Acetylation

9- The drug clearance is affected by:
a) Age
b) Gender
c) Liver function
d) Kidney function
e) All of the above

اسئلة تجميع للجابتر الاول من مختلف الجامعات (امتحان المد)

Pharmacokinetics Questions

1. **A placement of the drug between the gum and cheek is termed ……. route of administration.**
   A) Buccal
   B) Sublingual
   C) Intrathecal
   D) Intravenous
   E) Intradermal
2. **All of the following are characteristics of extended-release preparations except:**
   A) Provide prolonged duration of action
   B) Less frequent doses are required
   C) Improve patient compliance
   D) Intended to protect the drug from destruction by gastric acid
   E) Maintain drug concentration within therapeutic range over a longer duration
3. **Advantages of the parenteral route of administration include all of the following except:**
   A) Used for drugs that are poorly absorbed
   B) Useful for drugs that are unstable in the GIT
   C) Has a rapid onset of action
   D) Subjected to first-pass metabolism
   E) Provides the highest bioavailability
4. **Characteristics of facilitated diffusion include all of the following except:**
   A) Involves a carrier protein
   B) Can be saturated
   C) Requires energy
   D) May be inhibited by compounds that compete for the carrier
   E) All of the above
5. **The form of the drugs that is absorbed more readily is (are):**
   A) The protonated form of a weak acid
   B) The unprotonated form of a weak acid
   C) The unprotonated form of a weak base
   D) Both A and C
   E) Both B and C

6. **The distribution of a drug that has a low molecular weight but is hydrophilic is confined to:**
   A) Plasma compartment
   B) Plasma and interstitial fluid
   C) Plasma, interstitium, and intracellular fluid (IC)
   D) Interstitial and IC
   E) Plasma and IC
7. **What is the primary purpose of pharmacokinetics?**
   A) Study of drug absorption
   B) Study of drug metabolism
   C) Study of drug clearance
   D) Study of drug distribution
   E) All of the above
8. **Which process describes the amount of drug cleared from the body per unit of time?**
   A) Distribution
   B) Volume of distribution
   C) Half-life
   D) Bioavailability
   E) Clearance
9. **Which of the following is NOT a factor affecting drug bioavailability?**
   A) Total surface area
   B) First-pass effect
   C) Solubility of the drug
   D) Chemical instability
   E) Nature of drug formulation
10. **Which of the following routes does not require absorption to produce an effect?**
    A) Intramuscular (IM) route
    B) Intradermal route
    C) Sublingual route
    D) Intravenous (IV) route
    E) Inhalation route
11. **Which physiological process refers to the transport of a drug from the bloodstream into extracellular fluid and tissues?**
    A) Absorption
    B) Distribution
    C) Metabolism
    D) Excretion
    E) Pharmacokinetics

12. **The bioavailability of a drug administered orally is best defined as:**
    A) The proportion of the administered drug dose that reaches systemic circulation unchanged.
    B) The speed at which a drug enters the systemic circulation.
    C) The extent of drug metabolism in the liver.
    D) The total time a drug stays in the bloodstream.
    E) The percentage of drug excreted unchanged.
13. **Increase in weak acid drug elimination by the kidneys in cases of toxicity can be achieved by:**
    A) Acidification of urine
    B) Alkalinization of urine
    C) Neutralizing urine pH
    D) Adding a drug that competes for the same renal transporter
    E) None of the above
14. **Vitamin B12 is transported across the gut wall through:**
    A) Passive diffusion
    B) Active transport
    C) Endocytosis
    D) Facilitated transport
15. **The half-life of a drug is primarily influenced by which two pharmacokinetic parameters?**
    A) Absorption and distribution
    B) Distribution and clearance
    C) Metabolism and bioavailability
    D) Absorption and clearance
    E) Volume of distribution and clearance
16. • **Which of the following cytochrome isoforms is responsible for metabolizing the largest number of drugs?**
    A) CYP1A2
    B) CYP2C9
    C) CYP2C19
    D) CYP2D6
    E) CYP3A4
17. • **The IV administration of drugs has:**
    A) 100% first-pass metabolism
    B) Rapid first-pass metabolism
    C) Undergoes first-pass metabolism
    D) Rapidly excreted by the renal system
    E) 0% first-pass metabolism

18. • **When the same dose of a drug is repeated at half-life intervals, the steady-state plasma drug concentration is reached after:**
A) 2-3 half-lives
B) 4-5 half-lives
C) 6-7 half-lives
D) 8-10 half-lives
E) 11-12 half-lives

19. • **Parenteral administration is used for all the following except:**
A) Drugs that are poorly absorbed from the GI tract (e.g., heparin)
B) Drugs unstable in the GI tract (e.g., insulin)
C) Patients unable to take oral medications (e.g., unconscious patients)
D) Circumstances that require a rapid onset of action
E) When a local effect of the drug is desired

20. • **A drug (D) has a half-life of about 3 hours. What percentage of the original plasma load of drug D will remain in the blood after 6 hours?**
A) 0%
B) 12.5%
C) 25%
D) 50%
E) 75%

21. • **Which of the following routes of administration is the most desirable for administering an antidote for drug overdose?**
A) Intramuscular
B) Intravenous
C) Oral
D) Subcutaneous
E) Transdermal

22. • **Which term describes the process by which a drug moves from its site of administration into the bloodstream?**
A) Metabolism
B) Distribution
C) Absorption
D) Elimination

23. • **What is the term for the fraction of the administered dose that reaches systemic circulation unchanged?**
A) Bioavailability
B) Clearance
C) Distribution
D) Metabolism

24. • **Which organ is primarily responsible for drug excretion?**
    A) Liver
    B) Kidneys
    C) Lungs
    D) Skin
25. • **What is the term for the time required for the plasma concentration of a drug to decrease by half?**
    A) Absorption time
    B) Distribution time
    C) Elimination half-life
    D) Bioavailability time
26. • **Which route of drug administration typically results in the fastest onset of action?**
    A) Oral
    B) Topical
    C) Intramuscular
    D) Intravenous
27. • **Which of the following factors can affect drug absorption?**
    A) pH of the gastrointestinal tract
    B) Blood flow to the absorption site
    C) Presence of food in the stomach
    D) All of the above
28. • **What is the term for the process by which a drug is transported from the bloodstream to tissues and organs?**
    A) Absorption
    B) Metabolism
    C) Distribution
    D) Excretion
29. • **Which of the following factors can affect drug metabolism?**
    A) Age
    B) Genetics
    C) Disease states
    D) All of the above
30. • **Which of the following is an example of first-pass metabolism?**
    A) Intravenous administration
    B) Oral administration
    C) Subcutaneous administration
    D) Inhalation administration

31. • **Which pharmacokinetic parameter determines the dosing interval for a drug?**
A) Bioavailability
B) Clearance
C) Volume of distribution
D) Half-life

32. • **Which of the following routes of administration has the slowest onset of action?**
A) Intravenous
B) Intramuscular
C) Subcutaneous
D) Oral

33. • **Which of the following statements about drug distribution is true?**
A) Lipophilic drugs distribute poorly into tissues
B) Protein-bound drugs are readily available for pharmacological effects
C) Distribution is primarily determined by drug solubility in water
D) Distribution is uniform throughout all tissues in the body

34. • **Which route of administration is most likely to subject a drug to first-pass metabolism?**
A) Intravenous
B) Sublingual
C) Oral
D) Inhalation
E) Intramuscular

35. • **For intravenous (IV) dosages, what is the bioavailability assumed to be?**
A) 0%
B) 25%
C) 50%
D) 75%
E) 100%

36. • **A pro-drug is:**
A) The prototype member of a class of drugs.
B) The oldest member of a class of drugs.
C) An inactive drug that is transformed in the body to an active metabolite.
D) A drug that is stored in the body tissues and is then gradually released in the circulation.
E) An ionized drug trapped in breast milk.

37. • **Which of the following factors affect renal elimination of drugs?**
A) Protein binding
B) pH of urine
C) Tubular reabsorption
D) Blood flow to the renal system
E) All of the above

38. • **First-pass effect means:**
A) Inactivation of drugs before reaching systemic circulation
B) Rapid absorption of drugs
C) Drugs exposed to high first-pass effect have high bioavailability
D) Nitroglycerine exposed to low first-pass effect
E) Large doses of drugs are given sublingually to avoid first-pass effect

39. • **Which statement regarding drug elimination is false?**
A) Patients with renal dysfunction may be unable to excrete drugs and are at risk for drug accumulation and adverse effects
B) Aspirin in high doses is eliminated according to first-order kinetics
C) Most drugs are eliminated according to first-order kinetics
D) The three major routes of elimination are hepatic metabolism, biliary elimination, and urinary elimination
E) Elimination estimates the amount of drug cleared from the body per unit of time

40. • **What does the volume of distribution depend on?**
A) Hydrophilicity of the drug
B) High molecular weight allowing easy CNS penetration
C) Protein binding of the drug
D) High lipophilicity of the drug

41. • **Which of the following is true regarding bioavailability?**
A) It is the fraction of unchanged drug reaching systemic circulation
B) It is equal for all drugs when administered orally
C) First-pass metabolism increases bioavailability
D) Sublingual administration reduces bioavailability

42. • **Which physiological process determines the transport of drugs across membranes?**
A) Passive diffusion
B) Active transport
C) Facilitated diffusion
D) Endocytosis
E) All of the above

43. • **Which of the following drugs has a high first-pass metabolism?**
A) Nitroglycerin
B) Insulin
C) Propranolol
D) All of the above

44. In relation to the volume of distribution, one is false:
- a. Vd is used to determine the loading dose.
- b. Vd may be elevated in patients with renal failure.
- c. Vd is not affected by age.
- d. The dimension of Vd is a liter or milliliter.

45. In relation to clearance, one is false:
- a. The clearance is increased in patients with heart failure.
- b. Clearance is used to determine the maintenance dose.
- c. The clearance is increased in patients with hypoalbuminemia.
- d. Children have high clearance.

46. In relation to half-life, one is false:
- a. It is important in determining the dose interval.
- b. It is correlated with clearance.
- c. Drugs with high Vd have a long half-life.
- d. None of the above.

47. If a drug with a low hepatic extraction ratio (100% liver metabolized) is given to a patient with liver cirrhosis, one is false:
- a. Clearance intrinsic is decreased, the half-life is increased, and the effect is increased.
- b. Clearance intrinsic is decreased, total liver clearance is increased, and the effect is increased.
- c. Clearance intrinsic is decreased, the total serum concentration of the drug is increased, and the effect is increased.

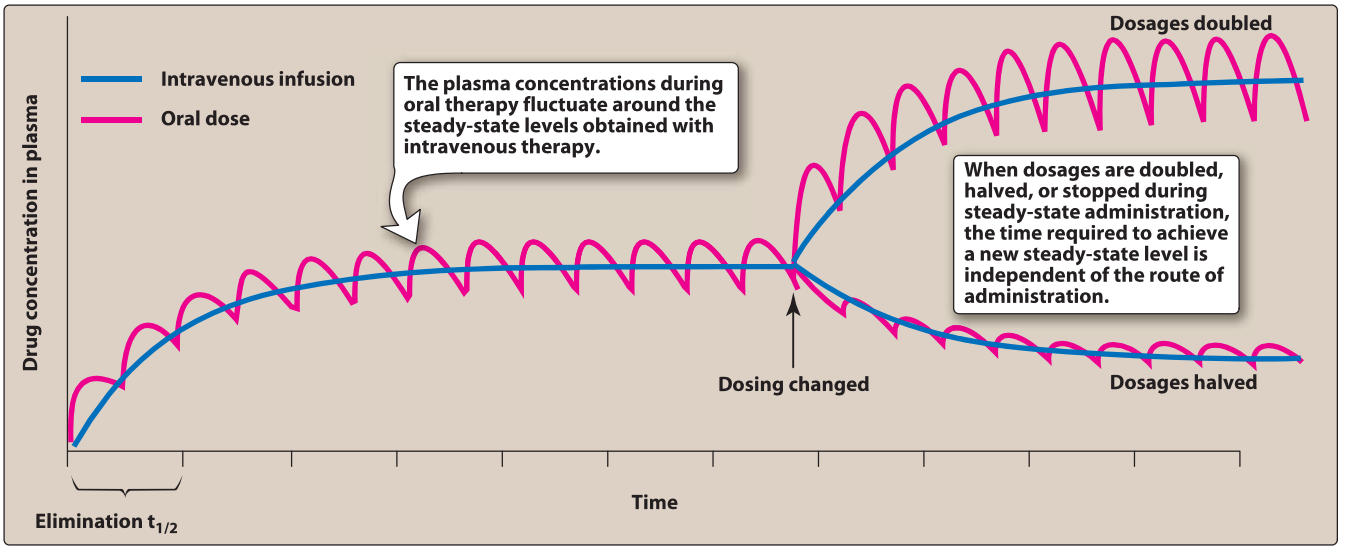

Figure 1.26
Accumulation of drug following sustained administration and following changes in dosing. Oral dosing was at intervals of 50% of $t_{1/2}$.

Study Questions

Choose the ONE best answer.

1.1 An 18-year-old female patient is brought to the emergency department due to drug overdose. Which of the following routes of administration is the most desirable for administering the antidote for the drug overdose?

A. Intramuscular
B. Intravenous
C. Oral
D. Subcutaneous
E. Transdermal

Correct answer = B. The intravenous route of administration is the most desirable because it results in achievement of therapeutic plasma levels of the antidote rapidly.

1.2 Drug A is a weakly basic drug with a pK_a of 7.8. If administered orally, at which of the following sites of absorption will the drug be able to readily pass through the membrane?

A. Mouth (pH approximately 7.0)
B. Stomach (pH of 2.5)
C. Duodenum (pH approximately 6.1)
D. Jejunum (pH approximately 8.0)
E. Ileum (pH approximately 7.0)

Correct answer = D. Because Drug A is a weakly basic drug (pK_a = 7.8), it will be predominantly in the nonionized form in the jejunum (pH of 8.0). For weak bases, the nonionized form will permeate through the cell membrane readily.

1.3 KR2250 is an investigational cholesterol-lowering agent. KR2250 has a high molecular weight and is extensively bound to albumin. KR2250 will have a(n) _____ apparent volume of distribution (V_d).

A. High
B. Low
C. Extremely high
D. Normal

Correct answer = B. Because of its high molecular weight and high protein binding, KR2250 will be effectively trapped within the plasma (vascular) compartment and will have a low apparent volume of distribution.

1.4 A 40-year-old male patient (70 kg) was recently diagnosed with infection involving methicillin-resistant *S. aureus*. He received 2000 mg of vancomycin as an IV loading dose. The peak plasma concentration of vancomycin was 28.5 mg/L. The apparent volume of distribution is:

A. 1 L/kg
B. 7 L/kg
C. 10 L/kg
D. 14 L/kg
E. 70 L/kg

Correct answer = A. V_d = dose/C = 2000 mg/28.5 mg/L = 70.1 L. Because the patient is 70 kg, the apparent volume of distribution in L/kg will be approximately 1 L/kg (70.1 L/70 kg).

1.5 A 55-year-old woman is brought to the emergency department because of seizures. She has a history of renal disease and currently undergoes dialysis. She receives an intravenous infusion of antiseizure Drug X. Which of the following is likely to be observed with use of Drug X in this patient?

	Half-life	Dosage
A.	↑	↑
B.	↓	↓
C.	↑	↔
D.	↑	↓
E.	↔	↔

Correct answer = D. Because the patient has a renal disorder, she may not be able to excrete the drug effectively. Therefore, the half-life of Drug X will be prolonged. As the half-life is prolonged, the dosage must be reduced so the patient will not have serious toxic effects of Drug X.

1.6 A 68-year-old woman is brought to the emergency department for treatment of a myocardial infarction. She is currently taking clopidogrel (antiplatelet agent) and aspirin daily, as well as omeprazole (potent CYP inhibitor) for heartburn. Which of the following is the most likely contributor to her myocardial infarction today?

A. Reduced antiplatelet activity of clopidogrel due to aspirin
B. Reduced antiplatelet activity of clopidogrel due to omeprazole
C. Hypersensitivity reaction due to clopidogrel
D. Increased antiplatelet activity of clopidogrel due to omeprazole
E. Increased antiplatelet activity of clopidogrel due to aspirin

Correct answer = B. Clopidogrel is a prodrug and requires CYP2C19 activity for conversion to an active metabolite. Because omeprazole is a potent CYP inhibitor, clopidogrel is not converted to the active metabolite, and therefore the antiplatelet activity is reduced, potentially contributing to myocardial infarction.

1.7 Which of the following reactions represents Phase II of drug metabolism?

A. Amidation
B. Hydrolysis
C. Oxidation
D. Reduction
E. Sulfation

Correct answer = E. Phase II metabolic reactions involve conjugation reactions to make phase I metabolites more polar. Sulfation and glucuronidation are the most common phase II conjugation reactions.

1.8 A pharmacokinetic study of a new antihypertensive drug is being conducted in healthy human volunteers. The half-life of the drug after administration by continuous intravenous infusion is 12 hours. Which of the following best approximates the time for the drug to reach steady state?

A. 24 hours
B. 48 hours
C. 72 hours
D. 120 hours
E. 240 hours

Correct answer = B. A drug will reach steady state in about 4 to 5 half-lives. Therefore, for this drug with a half-life of 12 hours, the approximate time to reach steady state will be 48 hours.

1.9 A 64-year-old female patient (60 kg) is treated with experimental Drug A for type 2 diabetes. Drug A is available as tablets with an oral bioavailability of 90%. If the V_d is 2 L/kg and the desired steady-state plasma concentration is 3.0 mg/L, which of the following is the most appropriate oral loading dose of Drug A?

A. 6 mg
B. 6.66 mg
C. 108 mg
D. 360 mg
E. 400 mg

Correct answer = E. For oral dosing, loading dose = [(V_d) × (desired steady-state plasma concentration)/F]. The V_d in this case is corrected to the patient's weight is 120 L. The F value is 0.9 (because bioavailability is 90%, that is, 90/100 = 0.9). Thus, loading dose = (120 L × 3.0 mg/L)/0.9 = 400 mg.

1.10 A 74-year-old man was admitted to the hospital for treatment of heart failure. He received 160 mcg of digoxin intravenously, and the plasma digoxin level was 0.4 ng/mL. If the desired plasma concentration of digoxin for optimal therapeutic activity in heart failure is 1.2 ng/mL, and the patient has an estimated V_d of 400 L, calculate the additional dose of digoxin needed for this patient to achieve the desired plasma concentration.

A. 128 mcg
B. 160 mcg
C. 320 mcg
D. 480 mcg
E. 640 mcg

Correct answer = C. The additional dosage of digoxin needed to achieve the desired plasma concentration can be calculated using the equation V_d ($C_2 - C_1$). C_1 is the current plasma concentration (0.4 ng/mL) and C_2 is the desired plasma concentration (1.2 ng/mL). Therefore, the additional dosage of digoxin is [400 L × (1.2 – 0.4) ng/mL)] = 320 mcg.

اسئلة نفس نمط الوزاري تم انشاؤها بناءا على اسئلة الوزاري

1. **Pharmacology can be defined as the study of substances that interact with living systems through:**
   a- Electrical processes
   b- Chemical processes
   c- Biological processes
   d- Mechanical processes
   e- Thermal processes
   Answer: b
2. **The actions of the drug on the body are termed:**
   a- Pharmacokinetic processes
   b- Pharmacodynamic processes
   c- Biotransformation processes
   d- Metabolic processes
   e- Excretory processes
   Answer: b
3. **The actions of the body on the drug are called:**
   a- Pharmacokinetic processes
   b- Pharmacodynamic processes
   c- Elimination processes
   d- Absorption processes
   e- Distribution processes
   Answer: a
4. **Pharmacokinetic processes govern the:**
   a- Bioavailability of the drug
   b- Absorption, distribution, and elimination of drugs
   c- Drug receptor binding
   d- Enzymatic reactions
   e- Biotransformation
   Answer: b
5. **Which of the following is NOT part of the pharmacokinetic process?**
   a- Absorption
   b- Distribution
   c- Metabolism
   d- Elimination
   e- Receptor binding
   Answer: e
6. **Absorption from the site of administration allows entry of the drug into:**
   a- Extracellular fluid

b- Plasma
c- Liver
d- Urine
e- Bile
Answer: b

7. **Which of the following describes the distribution process of drugs?**
   a- Drugs enter the plasma compartment and distribute into tissues
   b- Drugs are metabolized in the liver
   c- Drugs are eliminated through the kidneys
   d- Drugs are absorbed into the stomach
   e- Drugs enter through the blood-brain barrier
   Answer: a
8. **Metabolism of drugs usually occurs in the:**
   a- Stomach
   b- Kidneys
   c- Liver
   d- Lungs
   e- Heart
   Answer: c
9. **Drugs and their metabolites are eliminated from the body via:**
   a- Bloodstream
   b- Nervous system
   c- Urine, bile, or feces
   d- Lymphatic system
   e- Skin
   Answer: c
10. **The major routes of drug administration include:**
    a- Inhalation, transdermal, rectal
    b- Enteral, parenteral, and topical
    c- Nasal, intravenous, oral
    d- Buccal, intravenous, oral
    e- Subcutaneous, intradermal, transdermal
    Answer: b
11. **Which of the following is the most common and convenient method of drug administration?**
    a- Sublingual
    b- Parenteral
    c- Intravenous
    d- Oral

e- Intramuscular
Answer: d

12. **Which route of administration bypasses the gastrointestinal (GI) tract entirely?**
    a- Oral
    b- Sublingual
    c- Rectal
    d- Parenteral
    e- Transdermal
    Answer: d
13. **Enteric-coated preparations protect the drug from:**
    a- Liver enzymes
    b- Stomach acid
    c- Kidney filtration
    d- Intestinal absorption
    e- Metabolism
    Answer: b
14. **Extended-release formulations are designed to:**
    a- Release drugs rapidly
    b- Achieve a prolonged duration of action
    c- Avoid drug metabolism
    d- Increase drug elimination
    e- Absorb faster in the stomach
    Answer: b
15. **The sublingual route involves placing the drug:**
    a- Under the tongue
    b- Between the cheek and gum
    c- In the stomach
    d- Under the skin
    e- In the bloodstream
    Answer: a
16. **Which of the following is NOT a major parenteral route of drug administration?**
    a- Intravenous
    b- Intramuscular
    c- Subcutaneous
    d- Intra-arterial
    e- Oral
    Answer: e

17. **Which parenteral route of administration provides the most rapid drug effect?**
    a- Subcutaneous
    b- Intramuscular
    c- Intravenous
    d- Intradermal
    e- Oral
    Answer: c
18. **Intramuscular (IM) injection may involve drugs that are:**
    a- Only absorbed rapidly
    b- Only absorbed slowly
    c- Absorbed both rapidly and slowly depending on the preparation
    d- Not absorbed at all
    e- Metabolized immediately
    Answer: c
19. **Subcutaneous injections are typically absorbed:**
    a- More rapidly than intravenous
    b- More slowly than intravenous
    c- Instantly
    d- Not at all
    e- Only when compounded with other drugs
    Answer: b
20. **Which of the following is an example of a drug administered via the subcutaneous route?**
    a- Insulin
    b- Morphine
    c- Aspirin
    d- Omeprazole
    e- Heparin
    Answer: a
21. **The intradermal route involves injecting drugs into the:**
    a- Blood vessels
    b- Epidermis
    c- Dermis
    d- Muscles
    e- Subcutaneous tissue
    Answer: c
22. **Drugs administered by oral inhalation are effective for treating:**
    a- Asthma
    b- Osteoarthritis

c- Skin infections
d- HIV
e- Hepatitis
Answer: a

23. **The nasal route of administration is often used to treat:**
a- Respiratory infections
b- Asthma
c- Allergic rhinitis
d- Heart failure
e- Cancer
Answer: c

24. **Which route involves the introduction of drugs directly into the cerebrospinal fluid?**
a- Oral
b- Intrathecal
c- Sublingual
d- Nasal
e- Topical
Answer: b

25. **Topical drug application is used to achieve:**
a- Systemic effects
b- Local effects
c- Both systemic and local effects
d- Immediate systemic effects
e- Rapid absorption
Answer: b

26. **Transdermal drug administration is commonly achieved using:**
a- Intravenous injections
b- Oral tablets
c- Transdermal patches
d- Intramuscular injections
e- Inhalers
Answer: c

27. **Rectal administration has the advantage of:**
a- Directly entering the bloodstream
b- Minimizing first-pass metabolism
c- Rapid onset of action
d- Avoiding all GI problems
e- Reaching the liver directly
Answer: b

28. **Which of the following absorption mechanisms does NOT require energy?**
    a- Active transport
    b- Endocytosis
    c- Facilitated diffusion
    d- Pinocytosis
    e- Exocytosis
    Answer: c
29. **Passive diffusion occurs from an area of:**
    a- Low concentration to high concentration
    b- High concentration to low concentration
    c- Equal concentration to equal concentration
    d- Acidic to basic environment
    e- Solvent to solute
    Answer: b
30. **Which mechanism of drug absorption requires a carrier protein but does not require energy?**
    a- Active transport
    b- Passive diffusion
    c- Facilitated diffusion
    d- Endocytosis
    e- Exocytosis
    Answer: c
31. **Active transport is energy-dependent and can move drugs:**
    a- With the concentration gradient
    b- Against the concentration gradient
    c- Across a semipermeable membrane
    d- Only within the gastrointestinal tract
    e- Without a carrier protein
    Answer: b
32. **Endocytosis is used to transport drugs of:**
    a- Small size
    b- Moderate size
    c- Exceptionally large size
    d- Any size
    e- Medium size
    Answer: c
33. **Which of the following is true about exocytosis?**
    a- It transports substances into the cell
    b- It involves drug engulfment by the cell membrane

c- It is used to secrete substances out of the cell
d- It requires ATP but does not involve carrier proteins
e- It occurs only in neurons
Answer: c

34. **Which type of drug absorption involves the engulfment of the drug by the cell membrane?**
a- Active transport
b- Passive diffusion
c- Facilitated diffusion
d- Endocytosis
e- Exocytosis
Answer: d

35. **The majority of drugs are absorbed by which mechanism?**
a- Active transport
b- Endocytosis
c- Facilitated diffusion
d- Passive diffusion
e- Exocytosis
Answer: d

36. **Which of the following is characteristic of facilitated diffusion?**
a- It requires energy
b- It moves drugs against a concentration gradient
c- It involves carrier proteins
d- It is non-saturable
e- It does not require a carrier protein
Answer: c

37. **Which of the following is a type of absorption mechanism in which drugs are transported by specialized carrier proteins?**
a- Passive diffusion
b- Active transport
c- Endocytosis
d- Exocytosis
e- Facilitated diffusion
Answer: e

38. **Which of the following best describes active transport?**
a- Energy-independent
b- Moves drugs with the concentration gradient
c- Involves carrier proteins
d- Occurs in only the gastrointestinal tract

e- Involves passive diffusion
Answer: c

39. **Which absorption mechanism is most likely to be inhibited by compounds competing for the same carrier protein?**
a- Active transport
b- Passive diffusion
c- Facilitated diffusion
d- Endocytosis
e- Exocytosis
Answer: c

40. **Which of the following best describes the absorption mechanism of passive diffusion?**
a- Requires energy
b- Moves drugs from low to high concentration
c- Involves a carrier protein
d- Occurs across a concentration gradient
e- Is selective and saturable
Answer: d

1. What happens when acidic drugs release a proton (H+)? a) They form a neutral molecule
b) They form a charged anion (A−)
c) They become more lipid-soluble
d) They increase absorption
e) They lose their effectiveness

Answer: b) They form a charged anion (A−)

---

2. Which form of a weak base can permeate through cell membranes? a) Protonated form (BH+)
b) Uncharged base form (B)
c) Both protonated and uncharged forms
d) Charged anion (A−)
e) Neither form

Answer: b) Uncharged base form (B)

---

3. What factor primarily determines the effective concentration of a drug at its absorption site? a) Drug solubility
b) pH at the absorption site
c) Blood flow to the absorption site
d) Volume of distribution
e) Drug formulation

Answer: b) pH at the absorption site

---

4. Which organ receives more blood flow, facilitating better drug absorption?
a) Liver
b) Stomach
c) Intestines
d) Skin
e) Kidneys

Answer: c) Intestines

---

5. The surface area for drug absorption is greater in which part of the digestive system? a) Stomach
b) Small intestine
c) Large intestine
d) Esophagus
e) Rectum

Answer: b) Small intestine

---

6. What condition can delay drug absorption by reducing contact time at the absorption surface? a) Constipation
b) Diarrhea
c) Hypertension
d) Tachycardia
e) Diabetes

Answer: b) Diarrhea

---

7. What role does P-glycoprotein play in drug absorption? a) Enhances drug absorption
b) Transports drugs into the cells
c) Pumps drugs out of cells, reducing absorption
d) Breaks down drugs into inactive metabolites
e) Aids in drug formulation

Answer: c) Pumps drugs out of cells, reducing absorption

---

8. Bioavailability is the rate and extent to which a drug reaches which circulation? a) Lymphatic
b) Systemic
c) Pulmonary
d) Renal
e) Hepatic

Answer: b) Systemic

---

9. Which method is used to determine bioavailability? a) Comparing plasma levels after oral and IV administration
b) Measuring renal clearance
c) Tracking drug degradation in the liver
d) Assessing drug metabolism rates
e) Monitoring plasma protein binding

Answer: a) Comparing plasma levels after oral and IV administration

---

10. Which of the following influences the bioavailability of orally administered drugs? a) First-pass metabolism
b) Intravenous route of administration
c) Plasma protein binding

d) Drug solubility
e) All of the above

Answer: a) First-pass metabolism

---

11. What is the result of first-pass hepatic metabolism? a) Increased drug bioavailability
b) Decreased drug absorption
c) Decreased amount of unchanged drug in systemic circulation
d) Faster drug elimination
e) Increased drug solubility

Answer: c) Decreased amount of unchanged drug in systemic circulation

---

12. Which of the following drug characteristics can decrease bioavailability?
a) Lipophilicity
b) Chemical instability
c) High solubility
d) Rapid absorption
e) High plasma protein binding

Answer: b) Chemical instability

---

13. What happens when a drug is very hydrophilic? a) It is poorly absorbed due to inability to cross lipid-rich cell membranes
b) It dissolves easily in aqueous solutions
c) It is rapidly absorbed through the intestine
d) It crosses cell membranes via active transport
e) It is metabolized quickly

Answer: a) It is poorly absorbed due to inability to cross lipid-rich cell membranes

---

14. How does the drug formulation affect absorption? a) Through chemical instability
b) By altering solubility and dissolution rate
c) By affecting liver metabolism
d) By increasing drug lipophilicity
e) By reducing plasma protein binding

Answer: b) By altering solubility and dissolution rate

---

15. What is the process of drug distribution? a) Drug moves from the bloodstream into tissues and interstitial fluid
b) Drug is metabolized by the liver
c) Drug is eliminated via the kidneys
d) Drug is absorbed from the gastrointestinal tract
e) Drug undergoes first-pass metabolism

Answer: a) Drug moves from the bloodstream into tissues and interstitial fluid

---

16. Blood flow to which organ is highest, allowing for quicker drug distribution? a) Brain
b) Liver
c) Heart
d) Kidneys
e) Skeletal muscle

Answer: a) Brain

---

17. What is the impact of capillary permeability on drug distribution? a) It allows all drugs to enter tissues freely
b) It restricts only lipophilic drugs from entering tissues
c) It determines whether a drug can pass into tissues based on drug properties
d) It prevents drugs from reaching the blood-brain barrier
e) It affects drug absorption only, not distribution

Answer: c) It determines whether a drug can pass into tissues based on drug properties

---

18. Which of the following factors affects the binding of drugs to plasma proteins? a) Capillary permeability
b) Cardiac output
c) Tissue lipophilicity
d) Free drug concentration
e) Plasma protein concentration

Answer: e) Plasma protein concentration

---

19. What is the effect of lipophilic drugs on distribution? a) They readily move across most biological membranes
b) They cannot cross capillary membranes
c) They stay in the bloodstream
d) They bind more to plasma proteins
e) They distribute into the extracellular fluid

Answer: a) They readily move across most biological membranes

---

20. What does the volume of distribution (Vd) represent? a) The rate at which a drug is metabolized
b) The volume of fluid required to contain the drug at the same concentration as in plasma
c) The elimination rate of a drug
d) The amount of drug absorbed
e) The degree of plasma protein binding

Answer: b) The volume of fluid required to contain the drug at the same concentration as in plasma

---

21. Which type of drug distribution occurs when a drug has high molecular weight or is protein-bound? a) Plasma compartment
b) Extracellular fluid
c) Total body water
d) Lipophilic compartment
e) Liver compartment

Answer: a) Plasma compartment

---

22. If a drug has low molecular weight and is hydrophilic, it distributes into which compartment? a) Plasma compartment
b) Extracellular fluid
c) Total body water
d) Cellular fluid
e) None of the above

Answer: b) Extracellular fluid

---

23. What is the apparent volume of distribution of ethanol? a) 4 L
b) 14 L
c) 42 L
d) 100 L
e) 60 L

Answer: c) 42 L

---

24. How can Vd be determined? a) By measuring the rate of metabolism
b) By comparing plasma drug concentrations at different times
c) By plotting the concentration of drug against the elimination rate
d) By calculating the volume of drug absorbed
e) By measuring kidney clearance

Answer: b) By comparing plasma drug concentrations at different times

---

25. What is first-order kinetics in drug clearance? a) A fixed fraction of the drug is eliminated per unit time
b) A fixed amount of drug is eliminated per unit time
c) The entire drug is eliminated at once
d) The drug is eliminated in phases
e) There is no elimination

Answer: a) A fixed fraction of the drug is eliminated per unit time

---

26. What does liver metabolism primarily do to drugs? a) Decreases their solubility
b) Converts them to more polar compounds for elimination
c) Increases their bioavailability
d) Increases their lipophilicity
e) Reduces their plasma concentration

Answer: b) Converts them to more polar compounds for elimination

---

27. What is the process that eliminates drugs via the kidneys? a) Metabolism
b) Glomerular filtration, active secretion, and reabsorption
c) Liver enzyme activity
d) Plasma protein binding
e) First-pass metabolism

Answer: b) Glomerular filtration, active secretion, and reabsorption

---

28. What happens during glomerular filtration? a) Lipid-soluble drugs are actively transported into the urine
b) Free drug enters the glomerular filtrate
c) Drugs are metabolized in the glomeruli
d) Drugs are secreted into the urine through active transport
e) Plasma proteins are eliminated from the body

Answer: b) Free drug enters the glomerular filtrate

---

29. Which process removes drugs from the body through energy-dependent active transport? a) Glomerular filtration
b) Proximal tubular secretion
c) Distal tubular reabsorption
d) First-pass metabolism
e) Enteric coating

Answer: b) Proximal tubular secretion

---

30. What happens when urine is alkalinized to increase elimination of weak acids? a) The acid remains non-ionized and gets reabsorbed
b) The acid becomes ionized and is excreted more easily
c) The acid is metabolized more rapidly
d) The drug binds to plasma proteins
e) The drug is absorbed more rapidly

Answer: b) The acid becomes ionized and is excreted more easily

---

31. What does renal clearance measure? a) The rate at which a drug is absorbed
b) The amount of drug eliminated through metabolism
c) The volume of plasma from which the drug is completely removed per unit time
d) The effect of the drug on body tissues
e) The distribution of the drug to tissues

Answer: c) The volume of plasma from which the drug is completely removed per unit time

---

32. What is the role of CYP450 enzymes in drug metabolism? a) They increase drug absorption
b) They convert drugs to more lipophilic forms
c) They convert drugs to more hydrophilic metabolites for excretion
d) They transport drugs into cells
e) They help drugs bind to plasma proteins

Answer: c) They convert drugs to more hydrophilic metabolites for excretion

---

33. What does pharmacokinetics study? a) The drug's interaction with receptors
b) The body's effects on the drug, including absorption, distribution, metabolism, and elimination
c) The body's response to drug therapy
d) Drug formulation and stability
e) The genetic factors influencing drug response

Answer: b) The body's effects on the drug, including absorption, distribution, metabolism, and elimination

---

34. How do drug interactions affect pharmacokinetics? a) They always enhance drug metabolism
b) They increase the rate of absorption
c) They may alter drug distribution or metabolism, affecting therapeutic outcomes
d) They have no effect on pharmacokinetics
e) They are limited to gastrointestinal interactions

Answer: c) They may alter drug distribution or metabolism, affecting therapeutic outcomes

---

35. What is the impact of drug half-life ($t_{1/2}$)? a) It is the time taken for half of the drug to be absorbed
b) It indicates how long a drug remains effective in the body
c) It represents the time for half of the drug to be eliminated
d) It determines the dose of a drug
e) It measures the peak concentration of the drug

Answer: c) It represents the time for half of the drug to be eliminated

---

36. What does the half-life of a drug depend on? a) The drug's absorption rate
b) The liver's metabolic capacity

c) The volume of distribution and clearance rate
d) The drug's solubility in water
e) The drug's formulation

Answer: c) The volume of distribution and clearance rate

---

37. Which pharmacokinetic property is critical for determining dosing frequency? a) Bioavailability
b) Half-life
c) Plasma protein binding
d) Metabolism rate
e) Distribution volume

Answer: b) Half-life

---

38. What does a high clearance rate indicate? a) The drug is metabolized and excreted rapidly
b) The drug is slowly absorbed
c) The drug has low plasma protein binding
d) The drug has low bioavailability
e) The drug stays in the bloodstream longer

Answer: a) The drug is metabolized and excreted rapidly

---

39. Which route of administration avoids the first-pass effect? a) Oral
b) Intravenous
c) Rectal
d) Sublingual
e) Intramuscular

Answer: b) Intravenous

---

40. Which factor influences drug absorption most significantly? a) Drug formulation
b) Blood flow to the absorption site
c) Plasma protein binding
d) Half-life of the drug
e) Clearance rate

Answer: b) Blood flow to the absorption site