MIDTERM MADE EASY

ANAS NASER SULIMAN

0790028580

PHARMACOKINETICS

1. **What does pharmacokinetics study?**
    - A) The therapeutic effects of drugs
    - B) The body's effect on drugs, including absorption, distribution, metabolism, and excretion
    - C) Drug toxicity and adverse effects
    - D) Drug development and manufacturing

    Correct Answer: B) The body's effect on drugs, including absorption, distribution, metabolism, and excretion
2. **Which process describes the movement of drugs from the circulation to tissues?**
    - A) Absorption
    - B) Distribution
    - C) Biotransformation
    - D) Excretion

    Correct Answer: B) Distribution

3. **Which property increases a drug's ability to permeate lipid membranes?**
    - A) High hydrophilicity
    - B) High lipid solubility
    - C) High molecular weight
    - D) Binding to plasma proteins

    Correct Answer: B) High lipid solubility

4. **What is the primary determinant of passive diffusion according to Fick's Law?**
    - A) The type of receptor the drug binds to
    - B) The permeability coefficient of the membrane
    - C) The drug's molecular weight
    - D) The rate of renal clearance

    Correct Answer: B) The permeability coefficient of the membrane
5. **What happens to weak acids in an acidic environment?**
    - A) They become ionized and water-soluble
    - B) They remain unionized and lipid-soluble
    - C) They are metabolized by enzymes
    - D) Their pKa increases

    Correct Answer: B) They remain unionized and lipid-soluble
6. **Which equation relates pKa, pH, and the ratio of ionized to unionized drug?**
    - A) Michaelis-Menten equation
    - B) Fick's Law
    - C) Henderson-Hasselbalch equation
    - D) First-order elimination equation

    Correct Answer: C) Henderson-Hasselbalch equation
7. **What happens during the first-pass effect?**
    - A) Drugs are eliminated unchanged in the bile
    - B) Drugs are metabolized in the liver before reaching systemic circulation
    - C) Drugs bypass the liver entirely

- D) Drugs are distributed into tissues directly from the gut

Correct Answer: B) Drugs are metabolized in the liver before reaching systemic circulation

8. **How can the first-pass effect impact oral drug administration?**
    - A) It increases bioavailability
    - B) It decreases the dose required
    - C) It may necessitate a larger oral dose
    - D) It prolongs the drug's half-life

    Correct Answer: C) It may necessitate a larger oral dose

9. **What is bioavailability?**
    - A) The fraction of the drug absorbed from the gut
    - B) The extent and rate of drug reaching systemic circulation
    - C) The degree of drug binding to plasma proteins
    - D) The drug’s elimination rate from the liver

    Correct Answer: B) The extent and rate of drug reaching systemic circulation

10. **Which factor does NOT affect oral drug bioavailability?**
    - A) First-pass metabolism
    - B) Incomplete absorption
    - C) Low plasma protein binding
    - D) Destruction of the drug in the GI tract

    Correct Answer: C) Low plasma protein binding

11. **Which type of elimination removes a constant fraction of the drug per unit time?**
    - A) First-order elimination
    - B) Zero-order elimination
    - C) Saturable elimination
    - D) Flow-dependent elimination

    Correct Answer: A) First-order elimination

12. **What is the half-life of a drug?**
    - A) The time required for the drug to reach peak concentration
    - B) The time required for 50% of the drug to be eliminated from the body
    - C) The time needed for a drug to bind plasma proteins
    - D) The time taken to eliminate all traces of the drug

    Correct Answer: B) The time required for 50% of the drug to be eliminated from the body

13. **What does a high volume of distribution (VD) indicate about a drug?**
    - A) It is restricted to plasma
    - B) It is distributed extensively into tissues
    - C) It is highly protein-bound
    - D) It has a high rate of renal clearance

    Correct Answer: B) It is distributed extensively into tissues

14. **Which equation relates volume of distribution (VD) to plasma concentration?**
    - A) VD = Ab / Cp
    - B) CL = Cu / Cp

- C) F = (f)(1 - ER)
- D) k = 0.693 / t½

Correct Answer: A) VD = Ab / Cp

15. **Which mechanism is responsible for the transport of glucose and amino acids across membranes?**
    - A) Lipid diffusion
    - B) Carrier-mediated transport
    - C) Aqueous diffusion
    - D) Endocytosis

    Correct Answer: B) Carrier-mediated transport
16. **What characteristic is NOT true about special carriers?**
    - A) They are selective
    - B) They are saturable
    - C) They bind ATP for energy in all cases
    - D) They can be inhibited

    Correct Answer: C) They bind ATP for energy in all cases
17. **What is an example of endocytosis in drug transport?**
    - A) Passive diffusion of small drugs
    - B) Transport of vitamin B12 complexed with intrinsic factor
    - C) Diffusion of weak acids across membranes
    - D) Excretion of drugs into bile

    Correct Answer: B) Transport of vitamin B12 complexed with intrinsic factor

18. **What happens to a drug with a high extraction ratio during first-pass metabolism?**
    - A) It undergoes minimal hepatic metabolism
    - B) Most of the drug is eliminated on its first passage through the liver
    - C) The drug is directly excreted into bile
    - D) The drug's systemic concentration increases significantly

    Correct Answer: B) Most of the drug is eliminated on its first passage through the liver

19. **Which factor can increase a drug's bioavailability?**
    - A) High first-pass effect
    - B) Alkalinization of gastric pH
    - C) Inhibition of P-glycoprotein
    - D) High plasma protein binding

    Correct Answer: C) Inhibition of P-glycoprotein

20. **What is a consequence of enterohepatic cycling?**
    - A) Increased renal clearance of drugs
    - B) Prolonged half-life of elimination
    - C) Decreased volume of distribution
    - D) Reduced plasma protein binding

    Correct Answer: B) Prolonged half-life of elimination

21. **What is the role of activated charcoal in cases of drug overdose?**
    - A) It enhances lipid solubility of the drug

- B) It prevents enterohepatic reabsorption of drugs excreted into bile
- C) It increases the rate of drug metabolism in the liver
- D) It reduces renal clearance of drugs

Correct Answer: B) It prevents enterohepatic reabsorption of drugs excreted into bile

---

Drug Clearance

22. **What is the formula for calculating drug clearance (CL)?**
    - A) CL = rate of elimination / Cp
    - B) CL = Ab / Cp
    - C) CL = F × dose / Vd
    - D) CL = t½ × 0.693

    Correct Answer: A) CL = rate of elimination / Cp

23. **What does renal clearance depend on?**
    - A) Plasma protein binding
    - B) Volume of distribution
    - C) Concentration of drug in urine (Cu) and urine flow rate (V)
    - D) Ionization state of the drug in plasma

    Correct Answer: C) Concentration of drug in urine (Cu) and urine flow rate (V)

24. **Which statement about zero-order drug elimination is TRUE?**
    - A) A constant fraction of the drug is eliminated per unit time
    - B) The rate of elimination is directly proportional to plasma concentration

- C) Saturation of the elimination process occurs at high concentrations
- D) It is the most common elimination process for therapeutic drugs

Correct Answer: C) Saturation of the elimination process occurs at high concentrations

25. **What is the elimination rate constant (k) in first-order elimination?**
    - A) It is constant and unrelated to the dose
    - B) It varies with drug concentration
    - C) It is dependent on renal clearance alone
    - D) It increases over time as the drug concentration decreases

    Correct Answer: A) It is constant and unrelated to the dose

26. **How many half-lives are required to eliminate approximately 93.75% of a drug from the body?**
    - A) 2
    - B) 3
    - C) 4
    - D) 5

    Correct Answer: C) 4

27. **When is steady-state achieved during repeated drug administration?**
    - A) After 1 half-life
    - B) After 2 half-lives
    - C) After 4 half-lives
    - D) After 8 half-lives

    Correct Answer: C) After 4 half-lives

28. **What is the purpose of a loading dose?**

- A) To reduce the half-life of the drug
- B) To maintain steady-state drug concentration
- C) To achieve the desired therapeutic concentration rapidly
- D) To increase the rate of drug metabolism

Correct Answer: C) To achieve the desired therapeutic concentration rapidly

29. **What is the formula for calculating a maintenance dose (MD)?**

- A) MD = VD × Cssdesired
- B) MD = CL × Cssdesired
- C) MD = k × t½ × Cssdesired
- D) MD = AUC / Cssdesired

Correct Answer: B) MD = CL × Cssdesired

30. **Which family of transporters is responsible for drug resistance in some tumors?**

- A) Solute carrier families (SLC)
- B) ATP-binding cassette (ABC) family
- C) Carrier-mediated transporters
- D) Ion channel transporters

Correct Answer: B) ATP-binding cassette (ABC) family

31. **What is a key characteristic of the solute carrier families (SLC)?**

- A) They use ATP for energy
- B) They mediate active transport only
- C) They rely on ion gradients for transport energy

- D) They are specialized for lipid-soluble drugs

Correct Answer: C) They rely on ion gradients for transport energy

---

Barriers Against Drug Permeation

32. **What is one factor that creates a barrier against drug permeation?**
    - A) Drug's high lipid solubility
    - B) Presence of tight junctions between endothelial cells
    - C) Absence of carrier proteins in the cell membrane
    - D) High pKa of the drug molecule

    Correct Answer: B) Presence of tight junctions between endothelial cells

33. **Which structure in the brain contributes to its barrier against drug permeation?**
    - A) Absence of tight junctions
    - B) Connective tissue cells like astrocytes
    - C) High plasma protein concentration
    - D) High hepatic blood flow

    Correct Answer: B) Connective tissue cells like astrocytes

34. **What is a potential consequence of liver cirrhosis on first-pass metabolism?**
    - A) Reduced systemic drug concentration
    - B) Increased drug excretion through bile
    - C) Increased risk of drug toxicity due to reduced metabolism
    - D) Decreased drug absorption from the gut

    Correct Answer: C) Increased risk of drug toxicity due to reduced metabolism

35. **Which factor does NOT reduce the bioavailability of an orally administered drug?**
    - A) Faulty manufacturing of the dosage form
    - B) Gastric acid destruction of the drug
    - C) Enterohepatic cycling
    - D) Presence of food in the stomach

    Correct Answer: D) Presence of food in the stomach

36. **Which type of drug is most likely to have a small volume of distribution (VD)?**
    - A) A drug highly bound to plasma proteins
    - B) A drug with high lipid solubility
    - C) A drug that distributes into fat tissues
    - D) A drug with rapid renal clearance

    Correct Answer: A) A drug highly bound to plasma proteins

37. **What does a very high volume of distribution, such as 13,000 L for chloroquine, indicate?**
    - A) The drug is confined to the plasma
    - B) The drug distributes extensively into tissues
    - C) The drug is poorly absorbed from the gut
    - D) The drug undergoes rapid first-pass metabolism

    Correct Answer: B) The drug distributes extensively into tissues

38. **What is the significance of plasma protein binding for a drug?**
    - A) It reduces the drug's therapeutic effects
    - B) It acts as a reservoir, releasing the drug slowly

- C) It accelerates the drug's renal clearance
- D) It increases the drug's volume of distribution

Correct Answer: B) It acts as a reservoir, releasing the drug slowly

39. **What is the likely effect of a drug being displaced from plasma proteins by another drug?**
    - A) Increased free drug concentration and potential toxicity
    - B) Decreased free drug concentration
    - C) No effect on drug concentration or activity
    - D) Reduced elimination rate of the displaced drug

    Correct Answer: A) Increased free drug concentration and potential toxicity

40. **Which parameter affects hepatic clearance of a drug?**
    - A) Concentration of drug in the urine
    - B) Hepatic blood flow and extraction ratio
    - C) Drug's volume of distribution
    - D) Protein binding of the drug in plasma

    Correct Answer: B) Hepatic blood flow and extraction ratio

41. **What happens to the clearance of a drug with a high hepatic extraction ratio when liver blood flow decreases?**
    - A) Clearance increases
    - B) Clearance decreases
    - C) Clearance remains unchanged
    - D) Clearance depends on renal function

    Correct Answer: B) Clearance decreases

42. **What happens to steady-state concentration (Css) when the dosing rate increases?**
    - A) Css decreases
    - B) Css increases
    - C) Css remains the same
    - D) Css becomes unpredictable

    Correct Answer: B) Css increases

43. **If a drug's half-life is prolonged due to impaired renal function, what adjustment is needed to the dosing regimen?**
    - A) Increase the maintenance dose
    - B) Increase the loading dose
    - C) Decrease the dosing interval
    - D) Decrease the dosing frequency

    Correct Answer: D) Decrease the dosing frequency

44. **What influences the ionization of weak acids and bases?**
    - A) The drug's molecular weight
    - B) The pH of the medium and the drug's pKa
    - C) The presence of plasma proteins
    - D) The lipid solubility of the drug

    Correct Answer: B) The pH of the medium and the drug's pKa

45. **What happens to weak bases in an acidic environment?**
    - A) They become unionized and lipid-soluble
    - B) They become protonated and water-soluble
    - C) They are metabolized into weak acids

- D) They remain unaffected

Correct Answer: B) They become protonated and water-soluble

46. **Which of the following drugs is excreted faster in alkaline urine?**
    - A) Weak acids
    - B) Weak bases
    - C) Neutral drugs
    - D) Lipid-soluble drugs

    Correct Answer: A) Weak acids

47. **How can urine alkalinization be achieved to enhance drug excretion?**
    - A) Administer ascorbic acid
    - B) Administer ammonium chloride
    - C) Administer sodium bicarbonate
    - D) Administer activated charcoal

    Correct Answer: C) Administer sodium bicarbonate

48. **What term is used to describe the incomplete delivery of a drug to systemic circulation due to metabolism in the liver and gut wall?**
    - A) Bioavailability
    - B) Hepatic elimination
    - C) First-pass effect
    - D) Plasma protein binding

    Correct Answer: C) First-pass effect

49. **Why are oral drug doses usually higher than intravenous doses?**
    - A) To compensate for reduced absorption in the GI tract

- B) To overcome the first-pass metabolism effect
- C) To prevent drug excretion through bile
- D) To reduce the risk of toxicity

Correct Answer: B) To overcome the first-pass metabolism effect

50. **Which drug is eliminated via zero-order kinetics?**
    - A) Morphine
    - B) Aspirin at high doses
    - C) Atenolol
    - D) Phenobarbital

Correct Answer: B) Aspirin at high doses

51. **What is the elimination rate constant (k) used for in pharmacokinetics?**
    - A) Calculating bioavailability
    - B) Determining drug clearance
    - C) Predicting the rate of first-order elimination
    - D) Measuring the drug's therapeutic effect

Correct Answer: C) Predicting the rate of first-order elimination

52. **What does bioequivalence assess between two formulations of the same drug?**
    - A) The therapeutic effects of the drug
    - B) The rate and extent of drug absorption
    - C) The plasma protein binding of the drug
    - D) The volume of distribution of the drug

Correct Answer: B) The rate and extent of drug absorption

53. **Which parameter is used to compare the rate of absorption in bioequivalence studies?**
    - A) Volume of distribution (VD)
    - B) Peak plasma concentration (Cmax)
    - C) Clearance (CL)
    - D) Half-life (t½)

    Correct Answer: B) Peak plasma concentration (Cmax)

54. **What proportion of unionized to ionized drug is present in the blood (pH = 7.4) for pyrimethamine (a weak base with pKa = 7.0)?**
    - A) 1:1
    - B) 0.4:1
    - C) 10:1
    - D) 25:1

    Correct Answer: B) 0.4:1

55. **How can the proportion of ionized and unionized drug in a medium be determined?**
    - A) Using Fick's Law
    - B) Using the Henderson-Hasselbalch equation
    - C) By measuring the drug's elimination rate constant
    - D) By calculating drug clearance

    Correct Answer: B) Using the Henderson-Hasselbalch equation

56. **What is the result of altering a drug's ionization in the renal tubules?**
    - A) Increased plasma protein binding
    - B) Reduced drug excretion
    - C) Increased reabsorption into the systemic circulation

- D) Enhanced excretion from the body

Correct Answer: D) Enhanced excretion from the body

ROUTES OF DRUG ADMINSTRATION

1. **What are the main categories of drug administration routes?**
    - A) Oral, parenteral, and rectal
    - B) Enteral, parenteral, and other routes
    - C) Topical, transdermal, and sublingual
    - D) Inhalational, rectal, and intravenous

    Correct Answer: B) Enteral, parenteral, and other routes
2. **What is the most commonly used route of drug administration?**
    - A) Intravenous
    - B) Oral
    - C) Sublingual
    - D) Rectal

    Correct Answer: B) Oral
3. **Where is the major site of drug absorption in the oral route?**
    - A) Stomach
    - B) Duodenum
    - C) Ileum
    - D) Colon

    Correct Answer: B) Duodenum

4. **Which is NOT a disadvantage of the oral route?**
    - A) Absorption variability
    - B) Risk of first-pass effect
    - C) Requires aseptic technique
    - D) Possible destruction by gastric acid

    Correct Answer: C) Requires aseptic technique
5. **Which enteral route is commonly used to avoid the first-pass effect?**
    - A) Oral
    - B) Sublingual
    - C) Rectal
    - D) Intramuscular

    Correct Answer: B) Sublingual
6. **Why does the rectal route avoid only 50% of the first-pass effect?**
    - A) It bypasses the stomach
    - B) The upper rectum drains into the portal circulation
    - C) The drug dissolves in intestinal flora
    - D) The drug is absorbed too rapidly

    Correct Answer: B) The upper rectum drains into the portal circulation

---

Parenteral Routes

7. **Which parenteral route is best for a rapid onset of action?**
    - A) Intramuscular
    - B) Subcutaneous
    - C) Intravenous

- D) Transdermal

Correct Answer: C) Intravenous

8. **Which of the following can NOT be administered via the intravenous route?**
    - A) Aqueous solutions
    - B) Oily suspensions
    - C) Drugs for rapid action
    - D) Water-soluble drugs

    Correct Answer: B) Oily suspensions
9. **What is a disadvantage of the intravenous route?**
    - A) Requires patient compliance
    - B) Slow onset of action
    - C) Produces high initial drug concentrations
    - D) Risk of first-pass metabolism

    Correct Answer: C) Produces high initial drug concentrations
10. **Which parenteral route can be used for depot preparations for sustained drug release?**
    - A) Intravenous
    - B) Intramuscular
    - C) Sublingual
    - D) Topical

    Correct Answer: B) Intramuscular
11. **What is a characteristic of subcutaneous drug administration?**
    - A) Accommodates large volumes of drugs

- B) Rapid absorption compared to intramuscular injections
- C) Suitable for solid pellets for sustained effects
- D) Risk of first-pass effect

Correct Answer: C) Suitable for solid pellets for sustained effects

12. **Which route is used for gaseous or volatile drugs like general anesthetics?**
    - A) Intravenous
    - B) Inhalational
    - C) Sublingual
    - D) Transdermal

    Correct Answer: B) Inhalational
13. **What is a key advantage of the transdermal route?**
    - A) Avoids systemic absorption
    - B) Ensures rapid onset of action
    - C) Avoids first-pass metabolism
    - D) Is suitable for local effects only

    Correct Answer: C) Avoids first-pass metabolism
14. **What happens when a drug is applied topically to inflamed or abraded skin?**
    - A) It is not absorbed
    - B) It undergoes systemic absorption
    - C) It is metabolized in the epidermis
    - D) It causes localized toxicity

Correct Answer: B) It undergoes systemic absorption

15. **Which route is ideal for sustained drug effects over weeks or months?**
    - A) Intramuscular
    - B) Subcutaneous with solid pellets
    - C) Intravenous infusion
    - D) Oral slow-release formulations

    Correct Answer: B) Subcutaneous with solid pellets

16. **Which route is most economical and convenient for patients?**
    - A) Intramuscular
    - B) Oral
    - C) Rectal
    - D) Transdermal

    Correct Answer: B) Oral

17. **Which route provides the fastest absorption?**
    - A) Oral
    - B) Intramuscular
    - C) Sublingual
    - D) Inhalational

    Correct Answer: D) Inhalational

18. **What is a disadvantage of the rectal route of drug administration?**
    - A) Risk of gastric acid destruction
    - B) Requires cooperative patients
    - C) Irregular and unpredictable absorption

- D) Limited to unconscious patients

Correct Answer: C) Irregular and unpredictable absorption

19. **Which route requires the drug to be highly lipid-soluble for systemic absorption through the skin?**
    - A) Transdermal
    - B) Intramuscular
    - C) Sublingual
    - D) Oral

    Correct Answer: A) Transdermal
20. **Which route is particularly suitable for unconscious or vomiting patients?**
    - A) Oral
    - B) Rectal
    - C) Intravenous
    - D) Inhalational

    Correct Answer: B) Rectal

DRUG BIOTRANSFORMATION

1. **What are xenobiotics?**
    - A) Substances naturally produced in the body
    - B) Foreign compounds like drugs and toxins introduced into the body
    - C) Proteins that bind drugs in plasma
    - D) Enzymes that metabolize drugs in the liver

Correct Answer: B) Foreign compounds like drugs and toxins introduced into the body

2. **Why are lipophilic drugs metabolized in the liver?**
    - A) They are highly reactive and need detoxification
    - B) They cannot be directly excreted by the kidney
    - C) They are toxic to plasma proteins
    - D) They bypass glomerular filtration

    Correct Answer: B) They cannot be directly excreted by the kidney

3. **Which of the following is NOT a typical outcome of drug metabolism?**
    - A) Drug inactivation
    - B) Conversion of a drug into a prodrug
    - C) Increased lipophilicity of the drug
    - D) Formation of toxic metabolites

    Correct Answer: C) Increased lipophilicity of the drug

4. **What is the main goal of Phase I biotransformation reactions?**
    - A) To conjugate drugs with endogenous molecules
    - B) To introduce or unmask polar functional groups
    - C) To increase drug stability in the plasma
    - D) To increase the molecular size of drugs

    Correct Answer: B) To introduce or unmask polar functional groups

5. **Which enzyme system is most commonly involved in oxidation reactions during Phase I?**
    - A) N-acetyltransferases
    - B) Cytochrome P450 enzymes

- C) Sulfotransferases
- D) Glutathione transferases

Correct Answer: B) Cytochrome P450 enzymes

6. **Which of the following is an example of a Phase I reaction?**
   - A) Glucuronidation
   - B) Hydrolysis of esters
   - C) Acetylation
   - D) Sulfation

   Correct Answer: B) Hydrolysis of esters
7. **What is a key characteristic of Phase II reactions?**
   - A) They produce non-polar metabolites
   - B) They conjugate drugs with endogenous substrates
   - C) They are catalyzed by cytochrome P450 enzymes
   - D) They are limited to oxidation and hydrolysis

   Correct Answer: B) They conjugate drugs with endogenous substrates
8. **Which enzyme is most dominant in glucuronidation during Phase II metabolism?**
   - A) UDP-glucuronosyl transferase (UGT)
   - B) Cytochrome P450
   - C) N-acetyltransferase (NAT)
   - D) Glutathione transferase (GST)

   Correct Answer: A) UDP-glucuronosyl transferase (UGT)
9. **What is the source of sulfate in sulfation reactions?**

- A) Dietary fats
- B) Sulfur-containing amino acids
- C) Glutathione
- D) N-acetylcysteine

Correct Answer: B) Sulfur-containing amino acids

10. **What conjugation pathway detoxifies electrophiles using glutathione?**
    - A) Sulfation
    - B) Glucuronidation
    - C) Glutathione conjugation
    - D) Acetylation

    Correct Answer: C) Glutathione conjugation

11. **What is the major cause of hepatotoxicity in acetaminophen overdose?**
    - A) Inhibition of sulfation
    - B) Accumulation of a toxic P450-dependent metabolite
    - C) Overproduction of glucuronide conjugates
    - D) Impaired glutathione synthesis

    Correct Answer: B) Accumulation of a toxic P450-dependent metabolite

12. **Which antidote is used to prevent hepatotoxicity in acetaminophen overdose?**
    - A) N-acetylcysteine
    - B) Sulfate supplements
    - C) Vitamin C
    - D) Glutathione injections

    Correct Answer: A) N-acetylcysteine

13. **What is a likely result of enzyme induction?**
    - A) Accumulation of the drug in plasma
    - B) Decreased pharmacological action of the drug
    - C) Slower metabolism of the drug
    - D) Reduced formation of toxic metabolites

    Correct Answer: B) Decreased pharmacological action of the drug

14. **Which of the following is an enzyme inducer?**
    - A) Grapefruit juice
    - B) Phenytoin
    - C) Erythromycin
    - D) N-acetylcysteine

    Correct Answer: B) Phenytoin

15. **What is the term for a drug inducing its own metabolism?**
    - A) Autoinduction
    - B) Enzyme inhibition
    - C) Phase II metabolism
    - D) Competitive binding

    Correct Answer: A) Autoinduction

16. **Which of the following is an example of enzyme inhibition?**
    - A) Accelerated metabolism of prodrugs
    - B) Reduced drug metabolism due to grapefruit juice
    - C) Increased protein binding of drugs
    - D) Tolerance to drug action

Correct Answer: B) Reduced drug metabolism due to grapefruit juice

17. **What happens to prodrugs in the case of enzyme inhibition?**
    - A) Enhanced pharmacological effects
    - B) Failure of drug activation
    - C) Increased risk of toxicity
    - D) Acceleration of drug metabolism

    Correct Answer: B) Failure of drug activation

18. **Which cytochrome P450 isoenzyme is responsible for metabolizing >50% of prescription drugs?**
    - A) CYP2D6
    - B) CYP3A4
    - C) CYP1A2
    - D) CYP2C9

    Correct Answer: B) CYP3A4

19. **What conjugation reaction is more active in infants than adults?**
    - A) Glucuronidation
    - B) Sulfation
    - C) Methylation
    - D) Acetylation

    Correct Answer: B) Sulfation

20. **What are the outcomes of Phase I and Phase II reactions combined?**
    - A) Activation of all drugs
    - B) Formation of highly lipophilic metabolites
    - C) Conversion of drugs to polar, excretable forms

- D) Production of reactive intermediates only

Correct Answer: C) Conversion of drugs to polar, excretable forms

1. **Which endogenous reactant is involved in glucuronidation?**
   - A) Acetyl-CoA
   - B) UDP glucuronic acid
   - C) Glutathione
   - D) Phosphoadenosyl phosphosulfate

   Correct Answer: B) UDP glucuronic acid
2. **What enzyme catalyzes the glucuronidation reaction?**
   - A) GSH-S-transferase
   - B) Sulfotransferase
   - C) UDP glucuronosyltransferase
   - D) Transmethylase

   Correct Answer: C) UDP glucuronosyltransferase
3. **Where does glucuronidation occur?**
   - A) Mitochondria
   - B) Cytosol
   - C) Microsomes
   - D) Plasma membrane

   Correct Answer: C) Microsomes
4. **What types of substrates undergo glucuronidation?**
   - A) Catecholamines and phenols
   - B) Phenols, alcohols, carboxylic acids, hydroxyamines, sulfonamides

- C) Amines only
- D) Epoxides and nitro groups

Correct Answer: B) Phenols, alcohols, carboxylic acids, hydroxyamines, sulfonamides

5. **What is the endogenous reactant for acetylation?**
    - A) UDP glucuronic acid
    - B) Glutathione
    - C) Acetyl-CoA
    - D) S-Adenosylmethionine

    Correct Answer: C) Acetyl-CoA
6. **Which enzyme is responsible for acetylation?**
    - A) Sulfotransferase
    - B) GSH-S-transferase
    - C) N-Acetyltransferase
    - D) UDP glucuronosyltransferase

    Correct Answer: C) N-Acetyltransferase
7. **What types of substrates are acetylated?**
    - A) Aromatic amines
    - B) Amines
    - C) Hydroxyamines
    - D) Phenols

Correct Answer: B) Amines

8. **What is the endogenous reactant in glutathione conjugation?**
    - A) UDP glucuronic acid
    - B) Glutathione (GSH)
    - C) Acetyl-CoA
    - D) Phosphoadenosyl phosphosulfate

    Correct Answer: B) Glutathione (GSH)
9. **Which enzyme catalyzes glutathione conjugation?**
    - A) UDP glucuronosyltransferase
    - B) N-Acetyltransferase
    - C) GSH-S-transferase
    - D) Transmethylase

    Correct Answer: C) GSH-S-transferase
10. **What types of substrates undergo glutathione conjugation?**
    - A) Phenols and amines
    - B) Aromatic amines and alcohols
    - C) Epoxides, arene oxides, nitro groups, hydroxyamines
    - D) Catecholamines and sulfonamides

    Correct Answer: C) Epoxides, arene oxides, nitro groups, hydroxyamines
11. **Which reactant is required for sulfation?**
    - A) Glutathione (GSH)
    - B) Acetyl-CoA
    - C) Phosphoadenosyl phosphosulfate

- D) UDP glucuronic acid

Correct Answer: C) Phosphoadenosyl phosphosulfate

12. **What enzyme catalyzes sulfation?**
    - A) GSH-S-transferase
    - B) N-Acetyltransferase
    - C) Sulfotransferase
    - D) UDP glucuronosyltransferase

Correct Answer: C) Sulfotransferase

13. **What types of substrates undergo sulfation?**
    - A) Catecholamines and alcohols
    - B) Phenols, alcohols, aromatic amines
    - C) Epoxides and nitro groups
    - D) Carboxylic acids and sulfonamides

Correct Answer: B) Phenols, alcohols, aromatic amines

14. **Which reactant is required for methylation?**
    - A) S-Adenosylmethionine
    - B) UDP glucuronic acid
    - C) Acetyl-CoA
    - D) Glutathione (GSH)

Correct Answer: A) S-Adenosylmethionine

15. **What enzyme is involved in methylation reactions?**
    - A) UDP glucuronosyltransferase
    - B) Transmethylases

- C) N-Acetyltransferase
- D) Sulfotransferase

Correct Answer: B) Transmethylases

16. **Which types of substrates are methylated?**
    - A) Catecholamines, phenols, amines
    - B) Aromatic amines and nitro groups
    - C) Alcohols and carboxylic acids
    - D) Hydroxyamines and sulfates

Correct Answer: A) Catecholamines, phenols, amines

PHARMACODYNAMICS

1. **What is pharmacodynamics?**
    - A) The study of how the body affects drugs
    - B) The study of how drugs exert their effects on the body
    - C) The study of drug absorption and distribution
    - D) The process of drug excretion from the body

Correct Answer: B) The study of how drugs exert their effects on the body

2. **Which of the following is a goal of pharmacodynamics?**
    - A) Predicting how drugs interact with other drugs
    - B) Understanding how drugs are metabolized in the liver
    - C) Predicting drug effects at different doses and in different patients
    - D) Determining the solubility of drugs in plasma

Correct Answer: C) Predicting drug effects at different doses and in different patients

3. **What is a receptor in pharmacodynamics?**
    - A) A protein that binds to a drug to initiate a biological response
    - B) A lipid that facilitates drug absorption in cells
    - C) A molecule responsible for drug metabolism
    - D) A structure that stores drugs in tissues

    Correct Answer: A) A protein that binds to a drug to initiate a biological response

4. **What does "efficacy" mean in drug-receptor interactions?**
    - A) The strength of the drug-receptor binding
    - B) The ability of a drug to produce a desired effect once bound to a receptor
    - C) The concentration of a drug required to bind to 50% of receptors
    - D) The rate at which a drug is metabolized

    Correct Answer: B) The ability of a drug to produce a desired effect once bound to a receptor

5. **Which of the following is an example of a G-protein coupled receptor (GPCR)?**
    - A) GABA receptor
    - B) Nicotinic receptor
    - C) Adrenergic receptor
    - D) Steroid hormone receptor

    Correct Answer: C) Adrenergic receptor

6. **Where are intracellular receptors located?**
    - A) On the cell membrane
    - B) Inside the nucleus or cytoplasm of a cell

- C) In the blood plasma
- D) In extracellular fluid

Correct Answer: B) Inside the nucleus or cytoplasm of a cell

7. **Which of the following best describes an agonist?**
   - A) A drug that binds to a receptor and blocks its activation
   - B) A drug that binds to a receptor and activates it
   - C) A drug that inhibits the metabolism of another drug
   - D) A drug that increases drug excretion

   Correct Answer: B) A drug that binds to a receptor and activates it

8. **What is an example of a partial agonist?**
   - A) Adrenaline
   - B) Buprenorphine
   - C) Beta-blockers
   - D) Warfarin

   Correct Answer: B) Buprenorphine

9. **Which drug type binds to a receptor but does not activate it?**
   - A) Agonist
   - B) Partial agonist
   - C) Antagonist
   - D) Synergist

   Correct Answer: C) Antagonist

10. **What does the dose-response relationship describe?**
    - A) The rate of drug absorption and elimination
    - B) The relationship between drug dose and the magnitude of effect
    - C) The binding affinity of drugs to their receptors
    - D) The onset of drug side effects

    Correct Answer: B) The relationship between drug dose and the magnitude of effect

11. **What is the threshold dose?**
    - A) The dose required to produce the maximum effect
    - B) The dose above which toxic effects occur
    - C) The smallest dose that produces an effect
    - D) The average dose needed for therapeutic response

    Correct Answer: C) The smallest dose that produces an effect

12. **What is the therapeutic window?**
    - A) The range of drug doses that produces a therapeutic response without significant adverse effects
    - B) The time it takes for a drug to reach therapeutic levels
    - C) The ratio between toxic and therapeutic doses of a drug
    - D) The dose required to achieve 50% of the maximum effect

    Correct Answer: A) The range of drug doses that produces a therapeutic response without significant adverse effects

13. **Which drug is an example of having a narrow therapeutic index (TI)?**
    - A) Penicillin
    - B) Warfarin
    - C) Paracetamol

- D) Ibuprofen

Correct Answer: B) Warfarin

14. **Which factor does NOT contribute to pharmacodynamic variability?**
    - A) Age
    - B) Disease state
    - C) Plasma protein binding
    - D) Genetics

    Correct Answer: C) Plasma protein binding

15. **What is the result of synergistic drug interaction?**
    - A) Enhanced effects of each drug
    - B) Opposing effects of two drugs
    - C) Decreased therapeutic effect of the drugs
    - D) Increased rate of drug metabolism

    Correct Answer: A) Enhanced effects of each drug

16. **How do beta-blockers decrease blood pressure?**
    - A) By increasing heart rate
    - B) By blocking adrenergic receptors
    - C) By binding to intracellular receptors
    - D) By inhibiting vitamin K-dependent clotting factors

    Correct Answer: B) By blocking adrenergic receptors

17. **What is the mechanism of action for insulin?**
    - A) It inhibits glucose production in the liver
    - B) It binds to receptors on muscle and fat cells to facilitate glucose uptake

- C) It activates adrenergic receptors to increase glucose metabolism
- D) It binds to intracellular receptors to promote protein synthesis

Correct Answer: B) It binds to receptors on muscle and fat cells to facilitate glucose uptake

18. **What is the primary focus of pharmacodynamics?**
    - A) Optimizing drug absorption in the gut
    - B) Explaining how drugs exert their effects through receptor binding, efficacy, and potency
    - C) Predicting how drugs are metabolized in the liver
    - D) Determining the excretion rate of drugs

Correct Answer: B) Explaining how drugs exert their effects through receptor binding, efficacy, and potency

19. **Which receptor type does morphine bind to in its role as a pain reliever?**

- A) Ion channel receptor
- B) Enzyme-linked receptor
- C) G-protein coupled receptor
- D) Intracellular receptor

Correct Answer: C) G-protein coupled receptor

20. **How does warfarin exert its anticoagulant effect?**

- A) By activating platelet aggregation
- B) By binding to adrenergic receptors
- C) By inhibiting vitamin K-dependent clotting factors
- D) By facilitating glucose uptake in cells

Correct Answer: C) By inhibiting vitamin K-dependent clotting factors

1. **What are the key elements of pharmacodynamics?**
    - A) Bioavailability, clearance, and half-life
    - B) Drug-receptor interaction, dose-response relationship, therapeutic window
    - C) First-pass effect, plasma protein binding, renal clearance
    - D) Drug formulation, distribution, and toxicity

    Correct Answer: B) Drug-receptor interaction, dose-response relationship, therapeutic window

3. **Which of the following is NOT a type of drug effect?**
    - A) Agonist
    - B) Antagonist
    - C) Partial agonist
    - D) Prodrug

    Correct Answer: D) Prodrug

4. **What is the mechanism of action of an agonist?**
    - A) It binds to a receptor but prevents activation.
    - B) It binds to a receptor and activates it, mimicking endogenous ligands.
    - C) It competes with other drugs for metabolism.
    - D) It partially activates a receptor but blocks other drugs.

    Correct Answer: B) It binds to a receptor and activates it, mimicking endogenous ligands.

5. **Which of the following is an example of an antagonist?**
    - A) Morphine
    - B) Naloxone
    - C) Buprenorphine

- D) Paracetamol

Correct Answer: B) Naloxone

6. **What is the effect of a partial agonist in the presence of a full agonist?**
   - A) It enhances the effect of the full agonist.
   - B) It acts as an antagonist by reducing the maximal response.
   - C) It completely blocks the receptor.
   - D) It prevents the full agonist from binding.

   Correct Answer: B) It acts as an antagonist by reducing the maximal response.

7. **What is an example of acute toxicity?**
   - A) Chronic liver disease from amiodarone
   - B) Respiratory depression in opioid overdose
   - C) Hepatotoxicity due to long-term NSAID use
   - D) Tinnitus from aminoglycosides

   Correct Answer: B) Respiratory depression in opioid overdose

8. **Which drug can cause hepatotoxicity due to glutathione depletion?**
   - A) Methotrexate
   - B) Paracetamol
   - C) Amiodarone
   - D) Aspirin

   Correct Answer: B) Paracetamol

9. **What is the mechanism of nephrotoxicity caused by aminoglycosides?**
   - A) Inhibition of prostaglandin synthesis

- B) Accumulation in renal tubules causing oxidative damage
- C) Suppression of bone marrow activity
- D) Cytotoxic effects on renal cells

Correct Answer: B) Accumulation in renal tubules causing oxidative damage

10. **What is a synergistic effect?**
    - A) When one drug inhibits the effect of another
    - B) When two drugs enhance each other's effects
    - C) When one drug prevents the metabolism of another
    - D) When a drug increases the toxicity of another

    Correct Answer: B) When two drugs enhance each other's effects

11. **What is an example of additive drug effects?**
    - A) Warfarin + Aspirin increasing bleeding risk
    - B) Naloxone + Morphine reversing opioid overdose
    - C) Alcohol + Benzodiazepines causing profound sedation
    - D) Probenecid + Penicillin prolonging antibiotic effect

    Correct Answer: A) Warfarin + Aspirin increasing bleeding risk

12. **What happens when beta-blockers interact with beta-agonists like albuterol?**
    - A) The effect of beta-blockers is enhanced.
    - B) The effect of albuterol is reduced.
    - C) Both drugs lose their effects entirely.
    - D) Albuterol causes bradycardia.

    Correct Answer: B) The effect of albuterol is reduced.

---

13. **Which drug causes cardiotoxicity by oxidative stress in cardiac myocytes?**
    - A) Cisplatin
    - B) Doxorubicin
    - C) Amiodarone
    - D) Methotrexate

    Correct Answer: B) Doxorubicin

14. **What is a common pulmonary toxicity caused by amiodarone?**
    - A) Hypersensitivity pneumonitis
    - B) Pulmonary fibrosis
    - C) Asthma-like symptoms
    - D) Alveolar inflammation

    Correct Answer: B) Pulmonary fibrosis

15. **Which drug is a teratogen that causes limb malformations?**
    - A) Isotretinoin
    - B) Thalidomide
    - C) Methotrexate
    - D) Warfarin

    Correct Answer: B) Thalidomide

16. **Which of the following strategies can help prevent drug toxicity?**
    - A) Avoid using drugs with high therapeutic indexes
    - B) Use drug interaction databases and tools
    - C) Combine drugs with similar mechanisms of action
    - D) Disregard patient-specific factors like age

Correct Answer: B) Use drug interaction databases and tools

17. **What patient-specific factor is NOT typically associated with increased drug toxicity risk?**
    - A) Polypharmacy
    - B) Genetics
    - C) Age
    - D) Dosage form of the drug

    Correct Answer: D) Dosage form of the drug

18. **What is a key goal of understanding pharmacodynamics?**
    - A) To design drugs that avoid liver metabolism
    - B) To enhance therapeutic effects and manage drug interactions
    - C) To increase the plasma concentration of drugs
    - D) To reduce the absorption of toxic drugs

    Correct Answer: B) To enhance therapeutic effects and manage drug interactions

19. **What is an example of a drug-specific factor that increases the risk of toxicity?**

- A) Age
- B) Comorbidities
- C) Narrow therapeutic index
- D) Genetics

Correct Answer: C) Narrow therapeutic index

20. **Which strategy is NOT typically used to prevent drug toxicity?**

- A) Avoiding unnecessary polypharmacy
- B) Adjusting doses for interactions

- C) Ignoring therapeutic drug levels
- D) Educating patients on proper drug use

Correct Answer: C) Ignoring therapeutic drug levels

21. **Hyperkalemia Risk (ACE inhibitors + potassium-sparing diuretics): Not explicitly included.**
    New Question:
    What is the risk of combining ACE inhibitors with potassium-sparing diuretics?
    - A) Hypoglycemia
    - B) Severe hyperkalemia
    - C) Increased renal perfusion
    - D) Enhanced CNS depression

    Correct Answer: B) Severe hyperkalemia

22. **Hypoglycemia Risk (Insulin + sulfonylureas): Not explicitly included.**
    New Question:
    Why does combining insulin with sulfonylureas increase hypoglycemia risk?
    - A) Both drugs inhibit glucose production in the liver
    - B) Both lower blood glucose through different mechanisms
    - C) Insulin increases the metabolism of sulfonylureas
    - D) Sulfonylureas reduce insulin sensitivity

    Correct Answer: B) Both lower blood glucose through different mechanisms

23. **Which of the following is an example of a full agonist?**
    - A) Naloxone
    - B) Morphine
    - C) Buprenorphine
    - D) Aspirin

Correct Answer: B) Morphine

24. **What type of antagonist competes with an agonist for the same binding site on a receptor?**
    - A) Non-competitive antagonist
    - B) Competitive antagonist
    - C) Irreversible antagonist
    - D) Partial agonist

    Correct Answer: B) Competitive antagonist

25. **What type of toxicity involves cumulative damage over time?**
    - A) Acute toxicity
    - B) Chronic toxicity
    - C) Reversible toxicity
    - D) Dose-dependent toxicity

    Correct Answer: B) Chronic toxicity

26. **Which drug causes nephrotoxicity by inhibiting prostaglandin synthesis?**
    - A) Paracetamol
    - B) Methotrexate
    - C) NSAIDs
    - D) Doxorubicin

    Correct Answer: C) NSAIDs

27. **What is the mechanism of ototoxicity caused by aminoglycosides?**
    - A) Mitochondrial dysfunction
    - B) Oxidative damage to cochlear hair cells
    - C) Reduced blood flow to the auditory nerve

- D) Blockade of ion channels in the ear

Correct Answer: B) Oxidative damage to cochlear hair cells

28. **Which drug class is associated with causing Torsades de Pointes due to QT prolongation?**
    - A) Opioids
    - B) Beta-blockers
    - C) Anthracyclines
    - D) QT-prolonging drugs (e.g., Amiodarone, Sotalol)

    Correct Answer: D) QT-prolonging drugs (e.g., Amiodarone, Sotalol)

29. **What is an example of pharmacokinetic interaction?**
    - A) Grapefruit juice inhibiting drug metabolism
    - B) Warfarin and aspirin increasing bleeding risk
    - C) Naloxone reversing opioid effects
    - D) Alcohol and benzodiazepines causing sedation

    Correct Answer: A) Grapefruit juice inhibiting drug metabolism

30. **What is the result of combining alcohol and benzodiazepines?**
    - A) Enhanced CNS stimulation
    - B) Increased respiratory depression
    - C) Reduced therapeutic effects of both drugs
    - D) Enhanced renal clearance of alcohol

    Correct Answer: B) Increased respiratory depression

31. **Why does combining loop diuretics and digoxin increase toxicity risk?**

- A) Loop diuretics increase sodium reabsorption.
- B) Hypokalemia enhances digoxin binding to Na+/K+ ATPase.
- C) Loop diuretics reduce the clearance of digoxin.
- D) Both drugs inhibit potassium excretion.

Correct Answer: B) Hypokalemia enhances digoxin binding to Na+/K+ ATPase.

32. **Which of the following drugs can cause bone marrow suppression leading to aplastic anemia?**
    - A) Methotrexate
    - B) Chloramphenicol
    - C) Cisplatin
    - D) NSAIDs

    Correct Answer: B) Chloramphenicol

33. **What clinical condition is caused by methotrexate-induced pulmonary toxicity?**
    - A) Pulmonary fibrosis
    - B) Hypersensitivity pneumonitis
    - C) Acute respiratory distress syndrome
    - D) Bronchospasm

    Correct Answer: B) Hypersensitivity pneumonitis

34. **What teratogenic effect is caused by isotretinoin?**
    - A) Neural tube defects
    - B) Limb malformations
    - C) Craniofacial abnormalities
    - D) Organogenesis failure

Correct Answer: C) Craniofacial abnormalities

35. **What strategy is crucial for managing drugs with a narrow therapeutic index?**
    - A) Using the lowest dose possible
    - B) Avoiding polypharmacy entirely
    - C) Frequent monitoring of drug levels
    - D) Increasing doses to overcome interactions

    Correct Answer: C) Frequent monitoring of drug levels

36. **What is an important step in preventing severe drug interactions?**
    - A) Using combination drugs for complex diseases
    - B) Educating patients on drug risks and proper use
    - C) Avoiding all drugs with potential side effects
    - D) Increasing the therapeutic index of drugs

    Correct Answer: B) Educating patients on drug risks and proper use

37. **What clinical effect results from the interaction between ACE inhibitors and potassium-sparing diuretics?**
    - A) Hypokalemia
    - B) Hyperkalemia
    - C) Hyponatremia
    - D) Enhanced water excretion

    Correct Answer: B) Hyperkalemia

38. **How does probenecid potentiate the effect of penicillin?**
    - A) By enhancing renal clearance
    - B) By reducing hepatic metabolism

- C) By inhibiting tubular excretion
- D) By increasing protein binding of penicillin

Correct Answer: C) By inhibiting tubular excretion

39. **What is the mechanism of paracetamol-induced hepatotoxicity?**
    - A) Inhibition of mitochondrial enzymes
    - B) Depletion of glutathione and accumulation of toxic metabolites
    - C) Blockade of bile excretion
    - D) Direct inhibition of liver enzymes

    Correct Answer: B) Depletion of glutathione and accumulation of toxic metabolites

40. **What liver-related toxicity can result from long-term amiodarone use?**
    - A) Acute hepatic necrosis
    - B) Chronic liver disease
    - C) Fatty liver disease
    - D) Hepatic fibrosis

    Correct Answer: B) Chronic liver disease

41. **What is the mechanism of nephrotoxicity caused by aminoglycosides?**

- A) Suppression of renal prostaglandin synthesis
- B) Accumulation in renal tubules causing oxidative damage
- C) Inhibition of renal ion channels
- D) Blockade of glomerular filtration

Correct Answer: B) Accumulation in renal tubules causing oxidative damage

42. **What condition can result from NSAID-induced nephrotoxicity?**

- A) Chronic renal failure
- B) Acute tubular necrosis
- C) Acute kidney injury due to reduced perfusion
- D) Kidney stones

Correct Answer: C) Acute kidney injury due to reduced perfusion

43. **What arrhythmia is linked to QT-prolonging drugs?**
    - A) Atrial fibrillation
    - B) Torsades de Pointes
    - C) Ventricular fibrillation
    - D) Sinus bradycardia

    Correct Answer: B) Torsades de Pointes

44. **What is a clinical example of opioid-induced neurotoxicity?**
    - A) Peripheral neuropathy
    - B) Respiratory depression
    - C) Cognitive impairment
    - D) Seizures

    Correct Answer: B) Respiratory depression

45. **What type of neurotoxicity is caused by cisplatin?**
    - A) Optic neuritis
    - B) Peripheral neuropathy
    - C) Tinnitus
    - D) Spinal cord injury

    Correct Answer: B) Peripheral neuropathy

46. **Which drug is associated with aplastic anemia?**

- A) NSAIDs
- B) Chloramphenicol
- C) Cisplatin
- D) Doxorubicin

Correct Answer: B) Chloramphenicol

47. **What is the mechanism of hematotoxicity caused by methotrexate?**

- A) Suppression of red blood cell formation
- B) Cytotoxic effects on rapidly dividing cells
- C) Inhibition of DNA synthesis
- D) Activation of bone marrow enzymes

Correct Answer: B) Cytotoxic effects on rapidly dividing cells

48. What lung condition can result from amiodarone toxicity?

- A) Pulmonary embolism
- B) Pulmonary fibrosis
- C) Bronchospasm
- D) Asthma

Correct Answer: B) Pulmonary fibrosis

49. **What is a clinical example of methotrexate-induced pulmonary toxicity?**

- A) Alveolar hemorrhage
- B) Hypersensitivity pneumonitis
- C) Pulmonary hypertension

- D) Pleural effusion

Correct Answer: B) Hypersensitivity pneumonitis

50. **What is a gastrointestinal toxicity caused by NSAIDs?**

- A) Diarrhea
- B) Peptic ulcers
- C) Crohn's disease
- D) Malabsorption syndrome

Correct Answer: B) Peptic ulcers