FPGEE Pharmacy Grad Prep

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Practice Questions

Try all 30 first, then check the answer key at the back.

1. Which of the following best describes the role of negative feedback in maintaining blood glucose homeostasis?

A. Low blood glucose triggers insulin release, which promotes glucose uptake
B. Elevated blood glucose triggers glucagon release, which promotes glucose uptake
C. Low blood glucose triggers insulin and glucagon release simultaneously
D. Elevated blood glucose triggers insulin release, which promotes glucose uptake and reduces blood glucose levels

2. Which enzyme class is responsible for breaking peptide bonds in proteins?

A. Transferases
B. Isomerases
C. Hydrolases
D. Oxidoreductases

3. What type of immune response is characterized by the production of antibodies by plasma cells?

A. Passive immunity
B. Humoral immunity
C. Cell-mediated immunity
D. Innate immunity

4. Which cell organelle is primarily responsible for ATP production through oxidative phosphorylation?

A. Mitochondria
B. Golgi apparatus
C. Endoplasmic reticulum
D. Lysosomes

5. What type of hypersensitivity reaction is most commonly associated with penicillin allergy?

A. Type II hypersensitivity
B. Type III hypersensitivity
C. Type IV hypersensitivity
D. Type I hypersensitivity

6. Which bacterial structure is the primary target of beta-lactam antibiotics?

A. Ribosomes
B. Plasmids
C. Peptidoglycan cell wall
D. Cell membrane

7. What is the primary function of P-glycoprotein in cell membranes?

A. Hormone receptor
B. Drug efflux pump
C. Glucose transport
D. Ion channel

8. Which coenzyme is essential for the transfer of methyl groups in biochemical reactions?

A. S-adenosyl methionine
B. Coenzyme Q10
C. NAD+
D. FAD

9. Which cytokine is primarily responsible for inducing fever during infection?

A. Interferon-gamma
B. Tumor necrosis factor-beta
C. Interleukin-10
D. Interleukin-1

10. What is the role of microRNA in cell function?

A. Protein synthesis
B. Cell membrane maintenance
C. Regulation of gene expression
D. Energy production

11. Which phase of the action potential is responsible for the rapid depolarization of neurons?

A. Chloride channel opening
B. Sodium channel opening
C. Potassium channel opening
D. Calcium channel closing

12. What is the primary function of toll-like receptors (TLRs)?

A. Recognition of pathogen-associated molecular patterns
B. Neurotransmitter release
C. Hormone synthesis
D. Drug metabolism

13. Which process is responsible for the production of antibody diversity?

A. RNA splicing
B. DNA replication
C. Translation
D. V(D)J recombination

14. What is the role of the renin-angiotensin-aldosterone system in blood pressure regulation?

A. Regulates blood glucose levels
B. Controls body temperature
C. Increases blood pressure through vasoconstriction and sodium retention
D. Decreases blood pressure through vasodilation

15. Which enzyme is responsible for converting glucose-6-phosphate to fructose-6-phosphate in glycolysis?

A. Aldolase
B. Glucose-6-phosphate isomerase
C. Hexokinase
D. Phosphofructokinase

16. What is the primary function of regulatory T cells?

A. Suppression of immune responses
B. Antibody production
C. Antigen presentation
D. Cytokine secretion

17. Which bacterial characteristic makes Gram-negative bacteria more resistant to certain antibiotics?

A. Thick peptidoglycan layer
B. Presence of teichoic acids
C. Spore formation
D. Outer membrane presence

18. What is the role of CD4+ T cells in the immune response?

A. Antibody production
B. Phagocytosis
C. Helper T cell functions and cytokine production
D. Direct cell killing

19. Which process is involved in the cellular response to heat shock?

A. Decreased ATP production
B. Increased heat shock protein synthesis
C. Decreased protein synthesis
D. Increased cell division

20. What is the primary function of the glomerular filtration barrier?

A. Selective filtration of blood components based on size and charge
B. Production of erythropoietin
C. Regulation of blood pH
D. Synthesis of vitamin D

21. Which of the following properties most significantly affects a drug's ability to cross the blood-brain barrier?

A. Molecular size
B. pKa
C. Protein binding
D. Lipophilicity

22. Which phase of drug metabolism typically results in increased water solubility of the drug?

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

23. A drug showing nonlinear pharmacokinetics exhibits which of the following characteristics?

A. First-order kinetics
B. Saturable elimination
C. Constant half-life
D. Proportional concentration changes

24. Which type of drug interaction occurs when two drugs compete for the same metabolizing enzyme?

A. Competitive inhibition
B. Additive effect
C. Physical incompatibility
D. Physiological antagonism

25. What is the primary reason for using preservatives in liquid pharmaceutical preparations?

A. Improve taste
B. Increase stability
C. Adjust pH
D. Prevent microbial growth

26. Which of the following best describes the concept of bioavailability?

A. Amount of drug bound to proteins
B. Time to reach peak concentration
C. Fraction of unchanged drug reaching systemic circulation
D. Rate of drug absorption

27. Which factor most significantly affects drug stability in aqueous solutions?

A. Container type
B. pH
C. Temperature
D. Light exposure

28. What is the primary difference between sustained-release and immediate-release drug formulations?

A. Rate of drug release
B. Drug potency
C. Route of administration
D. Active ingredient

29. Which process is most important for determining the rate of passive drug absorption across biological membranes?

A. Active transport
B. Facilitated diffusion
C. Endocytosis
D. Diffusion

30. What is the primary purpose of excipients in tablet formulations?

A. Enhance absorption
B. Mask taste
C. Improve manufacturability and stability
D. Increase drug potency

Answer Key & Explanations

1. D — Elevated blood glucose triggers insulin release, which promotes glucose uptake and reduces blood glucose levels
Negative feedback is a key homeostatic mechanism where elevated blood glucose stimulates insulin release from pancreatic beta cells, leading to increased glucose uptake by cells and restoration of normal blood glucose levels.

2. C — Hydrolases
Hydrolases are enzymes that break chemical bonds using water. Specifically, they break peptide bonds in proteins through hydrolysis reactions, making them crucial for protein digestion and metabolism.

3. B — Humoral immunity
Humoral immunity involves B-lymphocytes differentiating into plasma cells that produce specific antibodies against antigens, representing a key component of the adaptive immune response.

4. A — Mitochondria
Mitochondria are known as the powerhouse of the cell because they produce most of the cell's ATP through the process of oxidative phosphorylation in their inner membrane.

5. D — Type I hypersensitivity
Type I hypersensitivity reactions are immediate, IgE-mediated allergic responses commonly seen with penicillin allergies, involving mast cell degranulation and histamine release.

6. C — Peptidoglycan cell wall
Beta-lactam antibiotics target the peptidoglycan cell wall synthesis in bacteria, interfering with cell wall cross-linking and leading to bacterial cell lysis.

7. B — Drug efflux pump
P-glycoprotein functions as an ATP-dependent efflux pump that transports various drugs out of cells, playing a crucial role in drug resistance and absorption.

8. A — S-adenosyl methionine
S-adenosyl methionine (SAM) is the primary methyl group donor in biological methylation reactions, essential for various cellular processes including drug metabolism.

9. D — Interleukin-1
Interleukin-1 is a key pyrogen that acts on the hypothalamus to increase body temperature during infection, helping to create an unfavorable environment for pathogens.

10. C — Regulation of gene expression
MicroRNAs are small non-coding RNA molecules that regulate gene expression post-transcriptionally by binding to specific messenger RNAs.

11. B — Sodium channel opening
The rapid depolarization phase of the action potential is caused by the opening of voltage-gated sodium channels, allowing sodium ions to rush into the cell.

12. A — Recognition of pathogen-associated molecular patterns
TLRs are pattern recognition receptors that recognize specific molecular patterns associated with pathogens, initiating innate immune responses.

13. D — V(D)J recombination
V(D)J recombination is a genetic recombination process that combines different gene segments to create diverse antibody sequences, enabling recognition of many different antigens.

14. C — Increases blood pressure through vasoconstriction and sodium retention
The renin-angiotensin-aldosterone system increases blood pressure by promoting vasoconstriction through angiotensin II and sodium retention through aldosterone.

15. B — Glucose-6-phosphate isomerase
Glucose-6-phosphate isomerase catalyzes the isomerization of glucose-6-phosphate to fructose-6-phosphate in the second step of glycolysis.

16. A — Suppression of immune responses
Regulatory T cells (Tregs) maintain immune homeostasis by suppressing immune responses, preventing autoimmune diseases and excessive immune reactions.

17. D — Outer membrane presence
The outer membrane of Gram-negative bacteria provides an additional permeability barrier that makes them more resistant to certain antibiotics compared to Gram-positive bacteria.

18. C — Helper T cell functions and cytokine production
CD4+ T cells function as helper T cells, coordinating immune responses by producing cytokines and activating other immune cells.

19. B — Increased heat shock protein synthesis
Heat shock response involves increased synthesis of heat shock proteins, which act as molecular chaperones to protect other proteins from denaturation during stress.

20. A — Selective filtration of blood components based on size and charge
The glomerular filtration barrier selectively filters blood components based on their size and electrical charge, preventing the loss of essential proteins while allowing waste products to be filtered.

21. D — Lipophilicity
Lipophilicity is the most important factor for blood-brain barrier penetration. Highly lipophilic drugs can more easily pass through the lipid-rich barrier, while hydrophilic drugs typically have poor penetration.

22. C — Phase II
Phase II metabolism involves conjugation reactions that add polar groups to drugs, making them more water-soluble and easier to excrete through the kidneys.

23. B — Saturable elimination
Nonlinear pharmacokinetics occurs when drug elimination mechanisms become saturated, causing

disproportionate changes in drug concentration with dose changes.

24. A — Competitive inhibition
Competitive inhibition occurs when two drugs compete for the same enzyme binding site, typically resulting in decreased metabolism of one or both drugs.

25. D — Prevent microbial growth
Preservatives are added to prevent microbial growth in liquid preparations, which could lead to product contamination and degradation.

26. C — Fraction of unchanged drug reaching systemic circulation
Bioavailability is the fraction of an administered drug that reaches systemic circulation unchanged, which determines the drug's therapeutic effectiveness.

27. B — pH
pH is typically the most critical factor affecting drug stability in aqueous solutions, as it can influence the rate of hydrolysis and other degradation reactions.

28. A — Rate of drug release
Sustained-release formulations are designed to release the drug slowly over time, maintaining therapeutic levels for longer periods compared to immediate-release formulations.

29. D — Diffusion
Diffusion is the primary process for passive drug absorption, with the rate determined by the concentration gradient across the membrane.

30. C — Improve manufacturability and stability
Excipients serve multiple purposes in tablet formulations, but their primary role is to improve the manufacturability and stability of the dosage form.

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