BIOL-8 Practice Test 02

Modules 5-7: Membranes, Metabolism, & Genetics

Instructions: This practice test covers material from Modules 5 and 6. Answer all questions to the best of your ability. This test is designed to help you prepare for the second exam.

Part A: Multiple Choice (30 questions)

Choose the best answer for each question.

Module 5: Membranes

1. The plasma membrane is described as a "fluid mosaic" because:

A) It is made entirely of phospholipids B) Proteins float and move within a flexible lipid bilayer C) It is rigid and tightly packed D) Water flows freely through it

2. The hydrophobic tails of phospholipids face:

A) Toward the extracellular fluid B) Toward the cytoplasm C) Toward each other, inside the bilayer D) Toward the membrane proteins

3. Cholesterol in the plasma membrane functions to:

A) Transport oxygen across the membrane B) Maintain membrane fluidity across temperature changes C) Act as a receptor for hormones D) Provide energy for active transport

4. Which type of membrane protein spans the entire lipid bilayer?

A) Peripheral protein B) Integral (transmembrane) protein C) Glycoprotein D) Glycolipid

5. Glycoproteins on the cell surface are important for:

A) ATP production B) Cell recognition and signaling C) DNA replication D) Lipid synthesis

6. A membrane is described as "selectively permeable" because it:

A) Allows all molecules to pass through freely B) Blocks all molecules from entering C) Allows some substances to cross but not others D) Only permits water molecules to pass

7. Simple diffusion moves molecules:

A) Against their concentration gradient using ATP B) Down their concentration gradient without energy or transport proteins C) Through channel proteins only D) By vesicle transport

8. Facilitated diffusion differs from simple diffusion because it:

A) Requires ATP B) Moves molecules against their concentration gradient C) Requires transport proteins (channels or carriers) D) Only moves water

9. Osmosis is best defined as the movement of:

A) Solute from high to low concentration B) Water across a selectively permeable membrane toward higher solute concentration C) Proteins through channel proteins D) Ions using ATP

10. A red blood cell placed in a hypotonic solution will:

A) Shrink (crenate) B) Remain unchanged C) Swell and possibly burst (lyse) D) Divide

11. A plant cell placed in a hypertonic solution will:

A) Swell and burst B) Undergo plasmolysis as water leaves the cell C) Remain unchanged due to the cell wall D) Begin dividing

12. The sodium-potassium pump is an example of:

A) Passive transport B) Simple diffusion C) Active transport D) Osmosis

13. Which process involves the cell membrane engulfing a large solid particle?

A) Pinocytosis B) Exocytosis C) Phagocytosis D) Facilitated diffusion

14. A hospital patient receives an IV of normal saline (0.9% NaCl), which is isotonic to blood cells. What would happen if pure water were used instead?

A) Red blood cells would shrink B) Red blood cells would swell and burst C) Nothing — cells would remain the same D) Red blood cells would stop producing ATP

15. Aquaporins are channel proteins that specifically allow rapid movement of:

A) Glucose B) Sodium ions C) Water D) Amino acids

Module 07: Genetics & Central Dogma

31. In DNA, which base pairs with Adenine? A) Cytosine B) Guanine C) Thymine D) Uracil

32. The process of copying DNA to make new DNA is called: A) Transcription B) Translation C) Replication D) Mutation

33. Which enzyme is responsible for adding new nucleotides during DNA replication? A) Helicase B) DNA Polymerase C) Ligase D) RNA Polymerase

34. Transcription occurs in the: A) Nucleus B) Cytoplasm C) Ribosome D) Mitochondria

35. The product of transcription is: A) A new DNA strand B) An mRNA molecule C) A protein D) An amino acid

36. Which molecule serves as the "template" for translation? A) DNA B) tRNA C) mRNA D) rRNA

37. A codon is a sequence of how many nucleotides? A) 1 B) 2 C) 3 D) 4

38. Translation takes place at the: A) Nucleus B) Ribosome C) Golgi apparatus D) Smooth ER

39. The role of tRNA is to: A) Carry the genetic message from the nucleus B) Bring amino acids to the ribosome C) Make up the ribosome structure D) Unzip the DNA

40. A point mutation that changes one base but does not change the amino acid is called a: A) Missense mutation B) Nonsense mutation C) Silent mutation D) Frameshift mutation

41. Which of the following is NOT a difference between DNA and RNA? A) DNA is double-stranded; RNA is single-stranded B) DNA has Thymine; RNA has Uracil C) DNA has deoxyribose; RNA has ribose D) DNA has phosphate groups; RNA does not

42. Central Dogma states that information flows from: A) Protein → RNA → DNA B) DNA → RNA → Protein C) RNA → DNA → Protein D) DNA → Protein → RNA

43. If a DNA strand is **3'-TAC-5'**, the complementary mRNA codon is: A) 5'-ATG-3' B) 5'-AUG-3' C) 5'-UAC-3' D) 5'-UTC-3'

44. Sickle cell anemia is caused by: A) A single base substitution (point mutation) B) A missing chromosome C) An extra chromosome D) A viral infection

45. What is the function of a stop codon? A) To start transcription B) To add the last amino acid C) To signal the end of translation D) To repair DNA errors

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Part B: Fill in the Blank (15 questions)

Write the correct term in the blank.

46. The two main components of the plasma membrane are phospholipids and _____.

47. Transport that requires no cellular energy is called _____ transport.

48. A solution with a higher solute concentration than the cell is called _____.

49. The process of a cell releasing materials by fusing vesicles with the membrane is called _____.

50. The type of endocytosis that takes in fluids and small dissolved molecules is called _____.

51. The sum of all chemical reactions in a cell is called _____.

52. Enzymes are biological _____ that speed up chemical reactions without being consumed.

53. The three stages of cellular respiration are glycolysis, the citric acid cycle, and the _____.

54. In the absence of oxygen, muscle cells produce ATP and _____ through fermentation.

55. The role of oxygen in cellular respiration is to serve as the final _____ acceptor in the electron transport chain.

56. The sugar found in RNA is called _____.

57. _____ is the enzyme that unzips the DNA double helix during replication.

58. A group of three nucleotides on tRNA that pairs with a codon is called an _____.

59. Changes in the DNA sequence are known as _____.

60. In eukaryotes, mRNA must be processed and exported from the _____ before translation.

Part C: Short Answer (7 questions)

Answer each question in 2-4 complete sentences.

61. Compare and contrast passive transport and active transport. Include the role of ATP and give one specific example of each.

62. Explain what happens to an animal cell in each type of solution: isotonic, hypertonic, and hypotonic. Use the terms "crenation" and "lysis" in your answer.

63. Describe how enzymes work, including the role of the active site and the induced fit model. What happens when an enzyme is denatured?

64. Outline the three main stages of cellular respiration. For each stage, state where it occurs and what it produces.

65. Compare lactic acid fermentation and alcoholic fermentation. Why does fermentation produce far less ATP than aerobic respiration?

66. Summarize the Central Dogma of Biology. Describe the path of genetic information from the nucleus to the ribosome.

67. Explain the difference between a point mutation and a frameshift mutation. Which one is likely to have a more severe effect on the protein, and why?

End of Practice Test 02