

BIOL-8 Practice Test 02 — Answer Key

Modules 5-7: Membranes, Metabolism, & Genetics

Part A: Multiple Choice Answers

Q	Answer	Explanation
1	B	Proteins float within a flexible phospholipid bilayer — the "fluid mosaic"
2	C	Hydrophobic tails face inward, away from water, toward each other
3	B	Cholesterol buffers membrane fluidity — prevents too rigid in cold or too fluid in heat
4	B	Integral (transmembrane) proteins span the entire bilayer from one side to the other
5	B	Glycoproteins serve as identification markers for cell recognition and signaling
6	C	Selectively permeable = allows some substances through but not others based on size, charge, polarity
7	B	Simple diffusion moves molecules down their gradient, no energy, no proteins needed
8	C	Facilitated diffusion is passive but uses channel or carrier proteins to assist transport
9	B	Osmosis = water movement across a selectively permeable membrane toward higher solute concentration
10	C	Hypotonic = less solute outside → water enters the cell → swelling → possible lysis
11	B	Hypertonic = more solute outside → water leaves → plasma membrane pulls from cell wall (plasmolysis)
12	C	Na^+/K^+ pump uses ATP to move ions against their concentration gradient = active transport
13	C	

Q	Answer	Explanation
		Phagocytosis = "cell eating" — the membrane wraps around and engulfs large solid particles
14	B	Pure water is hypotonic to blood cells; water would rush in by osmosis, causing cells to lyse
15	C	Aquaporins are specialized channel proteins for rapid water transport across membranes
16	B	Catabolism = breaking down complex molecules, releasing energy (e.g., glucose → CO ₂ + ATP)
17	B	Anabolism = building complex molecules from simple ones, requiring energy input
18	C	ATP (adenosine triphosphate) is the cell's energy currency
19	C	Energy is stored in the phosphoanhydride bonds between the phosphate groups
20	B	Enzymes lower activation energy, allowing reactions to proceed faster at body temperature
21	B	Induced fit = the active site adjusts its shape slightly to bind the substrate more tightly
22	B	Competitive inhibitors mimic the substrate and bind directly to the active site, blocking it
23	B	Noncompetitive inhibitors bind elsewhere on the enzyme, distorting the active site shape
24	B	Feedback inhibition = the end product shuts down an earlier enzyme in its own production pathway

Q	Answer	Explanation
25	B	Glucose + 6O ₂ → 6CO ₂ + 6H ₂ O + ATP (the overall equation for cellular respiration)
26	C	Glycolysis occurs in the cytoplasm (does not require mitochondria)
27	B	The citric acid cycle occurs in the mitochondrial matrix
28	B	The ETC is embedded in the inner mitochondrial membrane (cristae)
29	C	Fermentation produces ATP without oxygen (anaerobic pathway)
30	D	Aerobic respiration yields approximately 36-38 ATP per glucose molecule
31	C	Adenine pairs with Thymine in DNA (A-T)
32	C	Replication makes an exact copy of DNA
33	B	DNA Polymerase adds nucleotides during replication
34	A	Transcription occurs in the nucleus (in eukaryotes)
35	B	Transcription produces mRNA from DNA template
36	C	mRNA is the template read by ribosomes
37	C	A codon is 3 nucleotides
38	B	Translation occurs at ribosomes in the cytoplasm
39	B	tRNA brings amino acids to the ribosome
40	C	Silent mutations do not change the amino acid sequence
41	D	Both DNA and RNA have phosphate groups (backbone)
42	B	DNA → RNA → Protein

Q	Answer	Explanation
43	B	Complementary to TAC is AUG (A pairs with U in RNA)
44	A	Sickle cell is a point mutation (Glu -> Val)
45	C	Signals the ribosome to stop knowing translation

Part B: Fill in the Blank Answers

Q	Answer
46	proteins
47	passive
48	hypertonic
49	exocytosis
50	pinocytosis
51	metabolism
52	catalysts
53	electron transport chain
54	lactic acid
55	electron
56	ribose
57	helicase
58	anticodon
59	mutation
60	nucleus

Part C: Short Answer Key

61. Passive vs. Active Transport:

- **Passive:** No ATP, moves down gradient (e.g., Osmosis).
- **Active:** Requires ATP, moves against gradient (e.g., Na⁺/K⁺ pump).

62. Tonicity:

- **Isotonic:** No net movement.
- **Hypertonic:** Water leaves (Crenation).
- **Hypotonic:** Water enters (Lysis).

63. Enzymes:

- Catalysts with **active site**.
- **Induced Fit:** Changes shape to bind substrate.
- **Denatured:** Shape lost, active site destroyed (temp/pH).

64. Respiration Stages:

1. **Glycolysis** (Cytoplasm): Glucose → Pyruvate + 2 ATP.
2. **Citric Acid Cycle** (Matrix): Acetyl-CoA → CO₂ + 2 ATP + NADH/FADH₂.
3. **ETC** (Inner Membrane): NADH/FADH₂ + O₂ → H₂O + ~32-34 ATP.

65. Fermentation vs Aerobic:

- **Lactic Acid:** Produces lactic acid (muscles).
- **Alcoholic:** Produces ethanol + CO₂ (yeast).
- Less ATP (2 vs 36) because no ETC/Oxygen to fully oxidize glucose.

66. Central Dogma:

- **DNA** (in nucleus) is transcribed into **mRNA**.
- **mRNA** travels to cytoplasm/ribosome.
- **Ribosome** translates mRNA into **Protein** (using tRNA).

67. Point vs Frameshift:

- **Point:** Change one base. Can be silent, missense, or nonsense.
- **Frameshift:** Insertion/Deletion. Changes reading frame.
- **Frameshift is worse** because it alters every amino acid downstream, usually resulting in a nonfunctional protein.

End of Answer Key