Advanced MCQs – Lecture 1 Part 2: Cellular Level of Organization

1. Which of the following best explains why the two sides of the plasma membrane lipid bilayer are asymmetric?

A. Cholesterol accounts for 20% of membrane lipids.
B. Peripheral proteins attach to polar heads.
C. Glycolipids exist only in the layer facing the extracellular fluid.
D. Phospholipids freely move between the two layers.

2. Which function is shared by both integral and peripheral membrane proteins?

A. Acting as ion channels.
B. Serving as linkers.
C. Acting as receptors.
D. Transporting molecules.

3. The selective permeability of the plasma membrane mainly depends on:

A. The osmotic pressure across the membrane.
B. The chemical composition of its lipids and proteins.
C. The presence of carbohydrate chains.
D. The thickness of the bilayer.

4. The primary role of cholesterol in the plasma membrane is to:

A. Facilitate ion movement.
B. Maintain membrane fluidity under temperature changes.
C. Anchor transmembrane proteins.
D. Increase the permeability to polar molecules.

5. Which molecule can pass freely through the lipid bilayer without assistance?

A. Sodium ions.
B. Glucose.
C. Oxygen.
D. Amino acids.

6. Glycolipids in the plasma membrane are important for:

A. ATP synthesis.
B. Cell identity and communication.
C. Vesicle transport.
D. Protein anchoring.

7. Which statement correctly distinguishes integral from peripheral proteins?

A. Integral proteins are loosely attached to the surface.
B. Peripheral proteins extend across the entire membrane.
C. Integral proteins are embedded within the lipid bilayer.
D. Peripheral proteins are amphipathic.

8. The movement of most phospholipids and many proteins within the same layer of the bilayer is described as:

A. Rotation and lateral diffusion.
B. Vertical flipping.
C. Hydrophobic transition.
D. Electrostatic migration.

9. The hydrophobic interior of the plasma membrane primarily restricts:

A. Nonpolar molecules.
B. Small uncharged molecules.
C. Ions and large polar molecules.
D. Lipid-soluble gases.

10. Water can cross the plasma membrane because:

A. It dissolves lipids.
B. It moves through transient small gaps within the hydrophobic core.
C. It is actively transported by ATPases.
D. It passes only through carrier proteins.

11. Which best describes the cytosol?

A. It includes only the nucleus and organelles.
B. It is mainly composed of lipids.
C. It is the intracellular fluid surrounding organelles.
D. It is identical to the extracellular fluid.

12. Which process occurs primarily in the cytosol?

A. DNA replication.
B. Glycolysis.
C. Protein packaging.
D. Lipid digestion.

13. The cytoskeleton provides:

A. A rigid, immobile framework.
B. A dynamic network for movement and support.
C. Only structural stability for the nucleus.
D. Channels for nutrient diffusion.

14. Microfilaments are mainly composed of:

A. Tubulin.
B. Actin and myosin.
C. Keratin.
D. Lamin.

15. Which of the following is a function of microfilaments?

A. Organelle stabilization.
B. Protein synthesis.
C. Generating movement and providing support.
D. Storing calcium.

16. Intermediate filaments are especially abundant in cells:

A. That perform active secretion.
B. Exposed to mechanical stress.

C. Lacking a nucleus.
D. Involved in gas exchange.

17. The main role of intermediate filaments is to:

A. Stabilize organelle position and cell attachments.
B. Facilitate vesicle transport.
C. Form spindle fibers.
D. Catalyze ATP production.

18. Microtubules differ from microfilaments in that they:

A. Are smaller and more flexible.
B. Are made of actin.
C. Help determine cell shape and organelle movement.
D. Do not form part of the cytoskeleton.

19. Which cytoskeletal component is primarily responsible for moving organelles within the cell?

A. Microfilaments.
B. Intermediate filaments.
C. Microtubules.
D. Microvilli.

20. The nucleus controls cellular activity mainly by:

A. Producing enzymes directly.
B. Storing and expressing genetic information (DNA).
C. Controlling the cytoskeleton.
D. Maintaining membrane integrity.

21. Which feature allows the plasma membrane to be described as a 'fluid mosaic'?

A. The random orientation of DNA.
B. Fixed proteins surrounded by moving lipids.
C. Dynamic movement of lipids and proteins within the bilayer.
D. Presence of carbohydrate channels.

22. A transmembrane protein differs from other integral proteins because it:

A. Spans the entire lipid bilayer.
B. Is only attached to one surface.
C. Is not amphipathic.
D. Is always a receptor.

23. Peripheral proteins often function as:

A. Enzymes and mechanical linkers.
B. Transport channels.
C. DNA carriers.
D. Hormone receptors.

24. Which organelle would be most affected by drugs that disrupt microtubule formation?

A. Nucleus.
B. Mitochondria.
C. Golgi complex.
D. Lysosomes.

25. The cell’s flexible outer boundary is essential for:

A. DNA replication.
B. Separation of internal and external environments.
C. ATP production.
D. Enzyme synthesis.

26. Which of the following is true about membrane fluidity?

A. It prevents lateral movement of molecules.
B. It allows dynamic rearrangement of lipids and proteins.
C. It is independent of temperature.
D. It results solely from cholesterol.

27. Which combination of lipids forms most of the plasma membrane?

A. Phospholipids, cholesterol, glycolipids.
B. Cholesterol, triglycerides, proteins.
C. Glycolipids, fatty acids, amino acids.
D. Phospholipids, steroids, carbohydrates.

28. The amphipathic nature of phospholipids means that they:

A. Have identical polar and nonpolar regions.
B. Contain hydrophilic heads and hydrophobic tails.
C. Are completely water-soluble.
D. Can only exist in aqueous environments.

29. Which event would be directly impaired if microfilaments were disrupted?

A. Muscle contraction.
B. Nuclear envelope formation.
C. Protein synthesis.
D. ATP generation.

30. Which structure is responsible for anchoring cells to one another?

A. Microtubules.
B. Intermediate filaments.
C. Glycolipids.
D. Nucleolus.

31. Which statement about membrane permeability is correct?

A. All small molecules diffuse freely.
B. Nonpolar molecules pass easily, ions do not.
C. Polar molecules move faster than nonpolar ones.
D. Large charged particles cross unaided.

32. Which of the following helps maintain cell shape?

A. Ribosomes.
B. Microtubules.
C. Nucleolus.
D. Lysosomes.

33. The cytoskeleton contributes to:

A. Cell movement and internal transport.
B. ATP synthesis.
C. Protein secretion only.
D. Nuclear replication.

34. A cell lacking microtubules would lose its ability to:

A. Generate ATP.
B. Maintain its shape and move organelles.
C. Store genetic material.
D. Digest waste products.

35. The asymmetry of the plasma membrane is important because it:

A. Maintains uniform polarity across the bilayer.
B. Allows specialized interactions on each side.
C. Increases permeability.
D. Prevents communication.

36. The nucleus is sometimes called the control center because:

A. It synthesizes all enzymes.
B. It determines cellular structure and function through DNA.
C. It produces ATP directly.
D. It regulates ion movement.

37. Which of the following best defines the cytoplasm?

A. The contents inside the nucleus only.
B. All cellular contents between the plasma membrane and nucleus.
C. Only organelles suspended in extracellular fluid.
D. The lipid portion of the cell membrane.

38. The main component of cytosol is:

A. Lipids.
B. Water (75–90%).
C. Nucleic acids.
D. Carbohydrates.

39. A cell that experiences reduced cytoskeletal integrity would likely show:

A. Enhanced stability and rigidity.
B. Impaired movement and structural weakness.
C. Increased enzyme activity.
D. Improved DNA replication.

40. The functional significance of transmembrane proteins acting as receptors is that they:

A. Transmit extracellular signals into intracellular responses.
B. Form ATP directly.
C. Maintain osmotic balance.
D. Break down macromolecules.

Answer Key

1. C
2. B
3. B
4. B
5. C
6. B
7. C
8. A
9. C
10. B
11. C
12. B
13. B
14. B
15. C
16. B
17. A
18. C
19. C
20. B
21. C
22. A
23. A
24. C
25. B
26. B
27. A
28. B
29. A
30. B
31. B
32. B
33. A
34. B
35. B
36. B
37. B
38. B
39. B
40. A