CSIR-NET / SET LIFE SCIENCES

4000+ PRACTICE MCQs BANK

• Topic-Wise MCQs • Concept Builders • Analytical Questions • PYQs • Detailed Explanations •

TARGET ASPIRANTS

- ✓ Designed for aspirants preparing for:
  - ✓ JRF – Junior Research Fellowship
  - ✓ LS – Lectureship / Assistant Professor Eligibility

STRUCTURED QUESTION LEVELS (PART &, C ORIENTED)

LEVEL 1 (FOUNDATION)	LEVEL 2 (CONCEPTUAL)	LEVEL 3 (ADVANCED)
Basic factual & conceptual recall questions.	Application-based & statement-combination MCQs.	High-level analytical, experimental, and numerical problems.

COMPLETE 13 UNITS COVERED

Molecules & Their Interaction Relevant to Biology	Cellular Organization	Fundamental Processes	Cell Communication & Cell Signaling	Developmental Biology
System Physiology	Inheritance Biology (Genetics)	Ecological Principles	Evolution & Behavior	Applied Biology

SMART PREPARATION WORKFLOW

PRACTICE → ANALYZE → REVISE → MASTER

[CONCEPTS] → [MCQs PRACTICE] → [DETAILED ANALYSIS] → [MOCK TESTS] → [QUALIFICATION]

YOUR COMPLETE QUESTION BANK COMPANION FOR CSIR-UGC NET & SET LIFE SCIENCES EXAMINATION

- Step-by-step solutions
- Experimental logic breakdowns
- Numerical problems solved

CSIR-NET Life Sciences MCQs

(These MCQs cover at Easy, Moderate and Difficult levels.)

Pattern: Four Options (A–D) | Correct Answer | Detailed Explanation

2. CELLULAR ORGANIZATION

A) Membrane structure and function- Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

Easy Level

1. The plasma membrane is best described by the fluid mosaic model because it:
A. Is rigid and composed only of lipids
B. Contains proteins embedded in a fluid lipid bilayer
C. Has no proteins
D. Is made of cellulose
Answer: B
Explanation: The fluid mosaic model describes a dynamic lipid bilayer with proteins moving laterally within it.

2. The main structural component of biological membranes is:
A. Triglyceride
B. Phospholipid bilayer
C. Glycogen
D. DNA
Answer: B
Explanation: Membranes are primarily made of phospholipid bilayers with proteins and carbohydrates.

3. Which molecule crosses a lipid bilayer most easily by simple diffusion?
A. Na^+
B. Glucose
C. O_2
D. Protein
Answer: C
Explanation: Small nonpolar molecules like O_2 diffuse rapidly through lipid bilayers.

4. Membranes are highly impermeable to ions mainly because:
A. Ions are too large
B. Ions are charged and highly hydrated
C. Ions are hydrophobic
D. Ions are proteins
Answer: B

Explanation: Charged ions cannot enter the hydrophobic core of the bilayer easily due to hydration and charge.

5. The diffusion of water across a semipermeable membrane is called:
A. Endocytosis
B. Osmosis
C. Exocytosis
D. Filtration
Answer: B
Explanation: Osmosis is diffusion of water across a semipermeable membrane.

6. Aquaporins are:
A. Lipid-synthesizing enzymes
B. Water channel proteins
C. ATPases
D. DNA pores
Answer: B
Explanation: Aquaporins are specific membrane channels that facilitate water movement.

7. Facilitated diffusion is:
A. Movement against gradient using ATP
B. Movement down gradient with help of a protein
C. Movement by vesicles
D. Movement only in bacteria
Answer: B
Explanation: Facilitated diffusion moves substances down their gradient through channels or carriers without energy input.[1][2]

8. Ion channels transport ions:
A. Against electrochemical gradient using ATP
B. Down electrochemical gradient
C. Only into the cell
D. Only out of the cell
Answer: B
Explanation: Ion channels mediate passive movement of ions down their electrochemical gradients.

9. Na^+/K^+-ATPase pumps:
A. 2 Na^+ in and 3 K^+ out
B. 3 Na^+ out and 2 K^+ in
C. 3 K^+ out and 2 Na^+ in
D. Equal Na^+ and K^+
Answer: B
Explanation: The Na^+/K^+ pump exports 3 Na^+ and imports 2 K^+ per ATP.

10. The resting membrane potential in most animal cells is mainly due to:
A. Na^+ leak channels
B. K^+ leak channels
C. Cl^- pumps
D. Ca^{2+} channels

Answer: B
Explanation: K^+ leak channels are the main contributors to resting membrane potential.

Moderate Level

11. Which best describes a carrier protein?
A. Forms a permanent open pore
B. Binds solute and changes conformation
C. Always transports water only
D. Works only in the nucleus
Answer: B
Explanation: Carrier proteins bind the solute and undergo conformational change to move it across the membrane.

12. Channel proteins differ from carriers because channels:
A. Bind substrates tightly
B. Transport very slowly
C. Form aqueous pores and move ions rapidly
D. Use ATP directly
Answer: C
Explanation: Channels form hydrophilic pores and typically allow very rapid ion movement.[3][1]

13. Which transport process is saturable?
A. Simple diffusion
B. Facilitated diffusion by carrier
C. Osmosis only
D. Free diffusion of O_2
Answer: B
Explanation: Carrier-mediated transport is saturable because the carrier becomes limiting.

14. A hypotonic solution will cause a cell to:
A. Shrink
B. Swell
C. Remain unchanged
D. Burst only in plant cells
Answer: B
Explanation: Water enters the cell in a hypotonic solution, causing swelling.

15. A hypertonic solution causes a cell to:
A. Swell
B. Shrink
C. Divide
D. Become electrically neutral
Answer: B
Explanation: Water leaves the cell in a hypertonic solution, leading to shrinkage.

16. The selectivity filter of K^+ channels primarily allows:
A. Na^+ instead of K^+
B. K^+ by compensating for dehydration
C. Glucose transport
D. ATP binding

Answer: B
Explanation: The filter fits K^+ and helps strip its hydration shell, making it selective.

17. Voltage-gated Na^+ channels open in response to:
A. Ligand binding only
B. Membrane depolarization
C. ATP hydrolysis
D. Osmotic pressure
Answer: B
Explanation: Depolarization triggers voltage-gated Na^+ channels to open.

18. The membrane potential is a result of:
A. Equal ion distribution on both sides
B. Charge difference across the membrane
C. Only protein movement
D. Lipid synthesis
Answer: B
Explanation: Membrane potential arises from unequal charge distribution across the membrane.

19. Secondary active transport uses energy from:
A. ATP directly at the carrier
B. Ion gradient
C. DNA hydrolysis
D. Ribosomes
Answer: B
Explanation: Secondary active transport uses the gradient of one ion to drive transport of another solute.

20. Symport means that two solutes move:
A. In opposite directions
B. In the same direction
C. Only by diffusion
D. Without carriers
Answer: B
Explanation: Symport transports two substances in the same direction across the membrane.

21. Antiport means that two solutes move:
A. In opposite directions
B. In the same direction
C. Only into the nucleus
D. Only in plant cells
Answer: A
Explanation: Antiport exchanges solutes across the membrane in opposite directions.

22. The Na^+/K^+ pump is an example of:
A. Simple diffusion
B. Primary active transport
C. Secondary active transport
D. Endocytosis
Answer: B
Explanation: It uses ATP directly to move ions against their gradients.

23. The major function of membrane pumps is to:
A. Destroy proteins
B. Maintain ion gradients
C. Form ribosomes
D. Synthesize DNA
Answer: B
Explanation: Pumps maintain gradients of ions and other solutes across membranes.

24. The Nernst equation is used to calculate:
A. Protein synthesis rate
B. Equilibrium potential of an ion
C. Membrane thickness
D. Osmotic pressure only
Answer: B
Explanation: It gives the equilibrium electrical potential for a specific ion across a membrane.

25. Cl^- channels generally make a cell less excitable because they:
A. Depolarize the membrane strongly
B. Help stabilize membrane potential
C. Generate ATP
D. Stop osmosis
Answer: B
Explanation: Opening Cl^- channels often buffers membrane potential and reduces excitability.

Difficult Level

26. The lipid bilayer is a selective barrier mainly because of its:
A. Hydrophilic core
B. Hydrophobic core
C. Covalent protein bridges
D. RNA coating
Answer: B
Explanation: The hydrophobic interior prevents easy passage of polar and charged molecules.

27. In the fluid mosaic model, membrane proteins primarily move:
A. Only vertically
B. Laterally within the bilayer
C. Through the nucleus
D. By endocytosis only
Answer: B
Explanation: Membrane proteins can diffuse laterally in the plane of the membrane.

28. The greatest determinant of whether a molecule crosses the bilayer rapidly is its:
A. Color
B. Lipid solubility
C. Nuclear size
D. Charge only

Answer: B
Explanation: Small hydrophobic molecules cross fastest because they dissolve in the membrane core.

29. A membrane protein that moves solute uphill using ATP is called a:
A. Channel
B. Pump
C. Porin
D. Receptor only
Answer: B
Explanation: Active transport proteins that use metabolic energy are called pumps.

30. Which statement about channel proteins is correct?
A. They are always coupled to ATP hydrolysis
B. They transport molecules by conformational cycling only
C. They mediate passive transport only
D. They cannot be selective
Answer: C
Explanation: Channels conduct solutes passively down electrochemical gradients.

31. The electrical component of ion movement depends on:
A. Membrane thickness only
B. Membrane potential
C. Ribosome number
D. Glycolysis
Answer: B
Explanation: For charged solutes, membrane potential contributes to the electrochemical gradient.

32. The resting potential in animal cells is usually negative inside because:
A. K^+ tends to leak out, leaving negative charge behind
B. Na^+ enters freely through all channels
C. DNA is negatively charged
D. Cholesterol is absent
Answer: A
Explanation: K^+ efflux through leak channels leaves the cell interior relatively negative.

33. A voltage-gated ion channel is best described as a channel that opens in response to:
A. Ligand binding
B. Mechanical force
C. Membrane voltage change
D. pH only
Answer: C
Explanation: Voltage-gated channels respond to changes in membrane potential.

34. Patch-clamp technique is used to study:
A. DNA replication
B. Single ion channels
C. Lipid synthesis
D. Protein translation
Answer: B
Explanation: Patch clamp measures currents through individual channels.

35. Action potentials in neurons are primarily generated by:
A. Aquaporins
B. Voltage-gated Na^+ and K^+ channels
C. ABC transporters
D. Ribosomes
Answer: B
Explanation: Rapid depolarization and repolarization depend on voltage-gated Na^+ and K^+ channels.

36. Inactivation of voltage-gated Na^+ channels is important because it:
A. Prevents endless depolarization
B. Stops all transport permanently
C. Produces ATP
D. Increases osmotic pressure
Answer: A
Explanation: Inactivation helps terminate the action potential and reset excitability.

37. The main force driving water movement in osmosis is:
A. Protein synthesis
B. Water potential gradient
C. ATP gradient
D. DNA gradient
Answer: B
Explanation: Water moves from higher to lower water potential across a semipermeable membrane.

38. A transporter with high specificity and saturation kinetics is likely a:
A. Lipid bilayer defect
B. Carrier protein
C. Simple diffusion pathway
D. Nonselective pore
Answer: B
Explanation: Carrier proteins are specific and saturable, unlike simple diffusion.

39. The electrochemical gradient of an ion includes:
A. Only concentration gradient
B. Only electrical gradient
C. Both concentration and electrical gradients
D. Only osmotic pressure
Answer: C
Explanation: Electrochemical gradient combines chemical and electrical driving forces.

40. The Na^+/K^+ pump is electrogenic because it:
A. Moves equal charges in opposite directions
B. Moves 3 Na^+ out and 2 K^+ in per cycle
C. Transports neutral molecules
D. Does not use ATP
Answer: B
Explanation: Net export of one positive charge per cycle contributes to membrane potential.