

Module 5: Membranes

Keys to Success & Study Guide

Learning Objectives

By the end of this module, you should be able to:

1. **Diagram** the structure of the plasma membrane according to the Fluid Mosaic Model.
2. **Predict** the movement of water and solutes across a membrane under various osmotic conditions.
3. **Compare** and **contrast** passive and active transport mechanisms.
4. **Explain** how large molecules traverse the membrane via bulk transport (endocytosis/exocytosis).

Key Terminology Checklist

Define these terms in your own words to ensure mastery.

- [] **Amphipathic**: Having both hydrophilic and hydrophobic regions (characteristic of phospholipids).
- [] **Concentration Gradient**: The difference in solute concentration across a distance.
- [] **Aquaporin**: A channel protein that facilitates rapid water transport.
- [] **Turgor Pressure**: The pressure exerted by water pushing the plasma membrane against the cell wall in plant cells.
- [] **Ligand**: A molecule that binds specifically to a receptor protein.

Concept Check

1. Membrane Structure

- **Question:** What are the three main components of the plasma membrane?

- **Key Answer:** Phospholipids (bilayer barrier), proteins (transport, signaling, structure), and cholesterol (membrane fluidity regulation). Cholesterol prevents membrane rigidity in cold and excess fluidity in heat.

2. Passive vs. Active Transport

- **Question:** When is active transport necessary?
- **Key Answer:** When solutes must move against their concentration gradient (low to high concentration). This requires ATP and transport proteins (e.g., Na^+/K^+ -ATPase).

3. Tonicity

- **Question:** Define isotonic, hypertonic, and hypotonic solutions.
- **Key Answer:**
 - **Hypertonic:** Higher solute concentration outside → water exits cell → cell shrinks (crenation in animal cells, plasmolysis in plant cells).
 - **Hypotonic:** Lower solute concentration outside → water enters cell → cell swells (lysis in animal cells, turgidity in plant cells).
 - **Isotonic:** Equal solute concentration → no net water movement.

4. Bulk Transport

- **Question:** How do large substances cross the membrane?
- **Key Answer:** Endocytosis (phagocytosis, pinocytosis) brings material in; exocytosis releases material. Both require membrane flexibility and ATP.