Module 5: Membranes

Comprehension & Critical Thinking Questions

Part 1: Core Concepts

1. **Membrane Architecture**
    - Describe the Fluid Mosaic Model. Why is the membrane described as "fluid"? What constitutes the "mosaic"?
    - Sketch a phospholipid. Label the hydrophilic head and hydrophobic tails. Explain why phospholipids self-assemble into a bilayer in aqueous environments.
2. **Permeability**
    - Membranes are selectively permeable. List molecules that pass freely (small, nonpolar) and those that require transport proteins (large, polar, ions).
3. **Transport Mechanisms**
    - Define diffusion. Does it require energy?
    - Define osmosis. In which direction does water move relative to solute concentration?

Part 2: Application

1. **Tonicity**
    - **Scenario**: Red blood cells are placed in three beakers:
        - Beaker A: Pure distilled water.
        - Beaker B: 0.9% saline (matches blood).
        - Beaker C: 10% saline solution.
    - **Apply**: Predict the outcome for cells in each beaker. Identify which solution is hypotonic, isotonic, and hypertonic.

2. **Active Transport**

    - Contrast passive transport (diffusion, facilitated diffusion) with active transport.
    - The Na^+ /K^+ -ATPase pumps 3 Na^+ out and 2 K^+ in per ATP hydrolyzed. Why does this require energy?

Part 3: Analysis & Evaluation

1. **Bulk Transport**

    - Distinguish endocytosis (phagocytosis, pinocytosis, receptor-mediated) from exocytosis.
    - How do these processes depend on membrane fluidity?

2. **Cell Signaling**

    - Explain the role of receptor proteins and glycoproteins in cell communication. How does a cell "know" a hormone is present in the extracellular fluid?