

Membrane Permeability

AP Biology · Unit 2: Cell Structure and Function

The Teaching Analogy

"Think of the cell membrane like a club with the world's pickiest bouncer. The hydrophobic interior — the fatty acid tails — literally hates water. Polar or charged molecules get bounced. Small nonpolar molecules like O_2 and CO_2 ? They're on the VIP list — they slip right through."

Key Concept: Selective Permeability

The plasma membrane is **selectively permeable** because its phospholipid bilayer has a hydrophobic interior (fatty acid tails) that repels polar and charged molecules. Small nonpolar molecules like O_2 and CO_2 pass freely; larger or polar molecules need protein channels or carriers. This selectivity is essential for maintaining homeostasis inside the cell.

What Gets Through?

Molecule Type	Passes Through?	Examples
Small, nonpolar	✓ Freely	O_2 , CO_2 , N_2
Small, polar	~ Slowly/via aquaporins	H_2O , NH_3
Ions & large polar	✗ Need protein	Na^+ , K^+ , glucose

Guided Practice

- Using the bouncer analogy: what "ID" does a molecule need to get past the membrane without a protein channel? What chemical property does that represent?
- Why would a large glucose molecule be "turned away at the door" even though it's an important energy source for the cell?
- If a cell's transport proteins were all destroyed, which molecules could still enter and exit freely? What would happen to the others?

Extension Activity

Design a "guest list" for your cell membrane. Give students a list of 10 molecules (mix of polar, nonpolar, large, small, ions) and have them sort them into "VIP Pass," "Needs Escort (protein)," and "Sorry, no entry." Then predict what would happen to the cell if the hydrophobic core was replaced with a hydrophilic one — would the membrane still be selectively permeable?