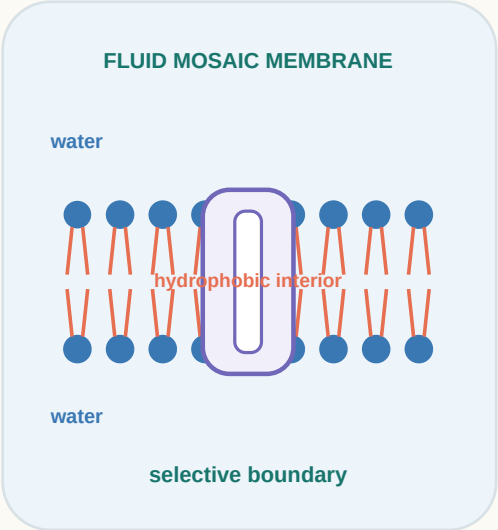
AP BIOLOGY | UNIT 2

TOPIC 2.3

Plasma Membrane

A dynamic phospholipid bilayer separates the cell from its environment and controls molecular exchange.



THE CORE CAUSAL CHAIN

AMPHIPATHIC heads + tails → **BILAYER** forms in water → **SELECTIVE** controlled crossing → **HOMEOSTASIS** stable conditions

BY THE END, YOU SHOULD BE ABLE TO...

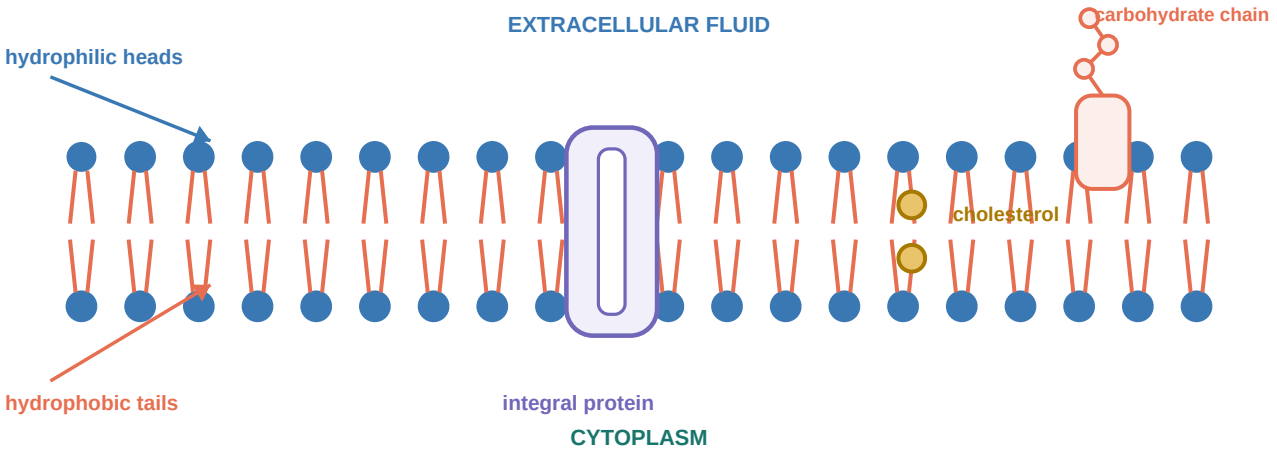
1. Relate phospholipid structure to bilayer formation.
2. Identify the roles of proteins, cholesterol, and carbohydrates.
3. Predict which substances cross the bilayer most easily.

BIG IDEA

Membrane structure creates selective permeability: the lipid interior blocks many substances while specific proteins provide controlled routes.

1 The fluid mosaic membrane

The membrane is a moving mixture of lipids, proteins, and carbohydrates rather than a rigid wall.



COMPONENTS AND JOBS

PHOSPHOLIPIDS	**Amphipathic; form the bilayer**	Create the basic selective boundary.
PROTEINS	**Embedded or attached**	Transport, signal, anchor, or catalyze.
CHOLESTEROL	**Fits among phospholipid tails**	Buffers membrane fluidity in animal cells.
CARBOHYDRATES	**Attached to lipids or proteins**	Support recognition and communication.

WHY 'FLUID MOSAIC'?

Fluid: many components move laterally. Mosaic: different molecules form a changing patchwork across the membrane.

2 Selective permeability

The hydrophobic core favors some substances and excludes others unless a membrane protein provides a route.

+ CROSS DIRECTLY

- **Small nonpolar: O2, CO2**
- **Small uncharged: H2O (limited)**

Small nonpolar molecules dissolve in the lipid interior most easily. Water can cross slowly and also uses aquaporins.

! NEED PROTEINS

- **Ions: Na+, K+, Cl-**
- **Large polar: glucose**

Charge and polarity make the hydrophobic core a barrier. Specific proteins provide selective pathways.

PREDICTING PERMEABILITY

1 IS IT SMALL?

Smaller usually crosses more easily.

2 IS IT NONPOLAR?

Nonpolar favors the lipid core.

3 IS IT CHARGED?

Ions require a protein pathway.

MEMBRANE FLUIDITY

UNSATURATED TAILS

Kinks reduce tight packing.

+

CHOLESTEROL

Buffers fluidity as temperature changes.

A functional membrane must remain flexible but intact.

COMMON ERROR

Selective does not mean sealed. The membrane permits controlled exchange, and different substances cross by different routes.