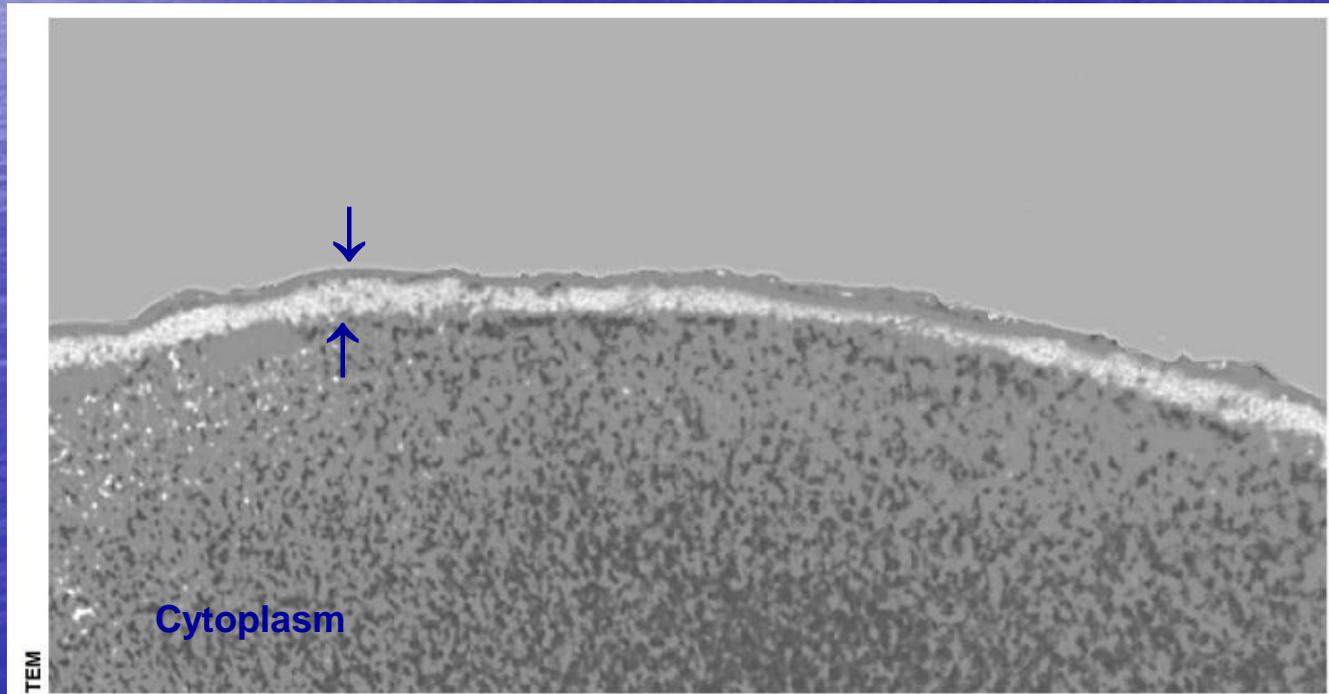
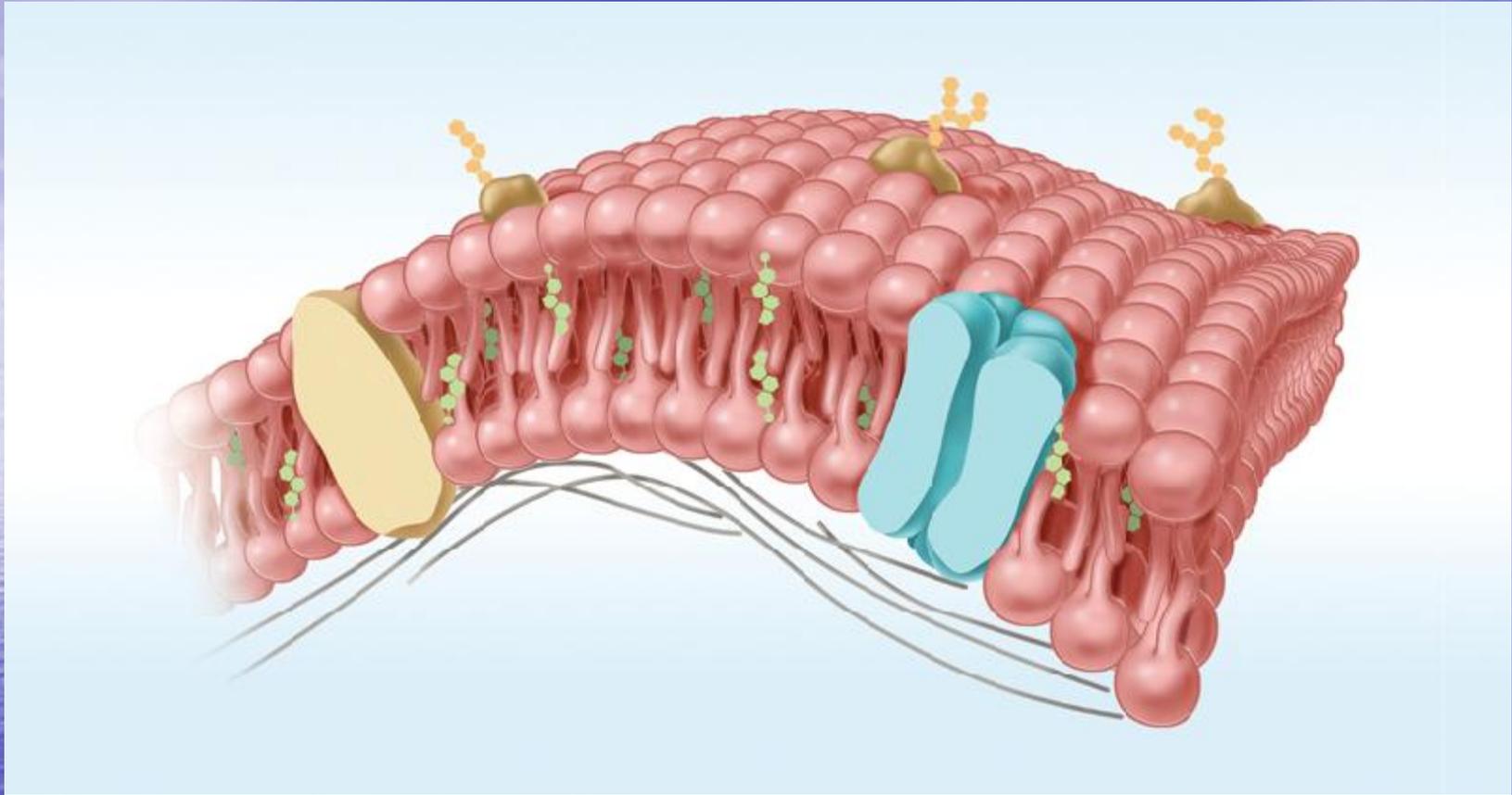


Do U C What I C?

Membrane Notes

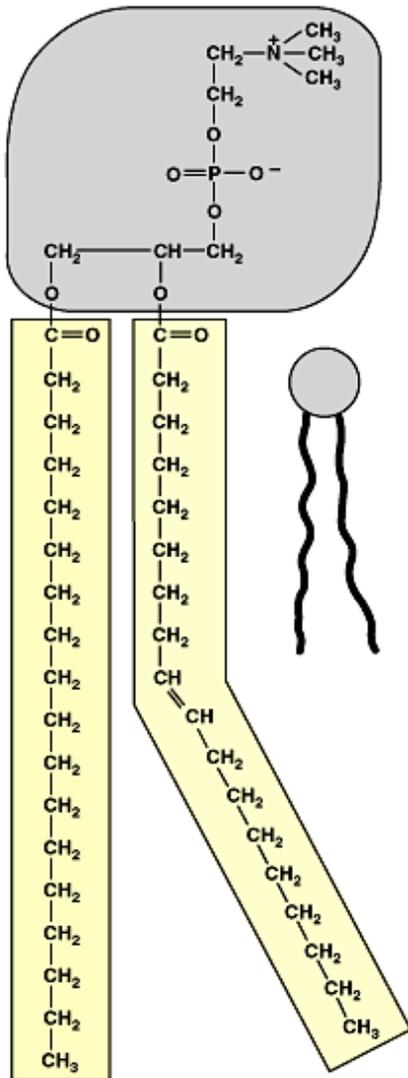


A closer look at the **Cell Membrane**



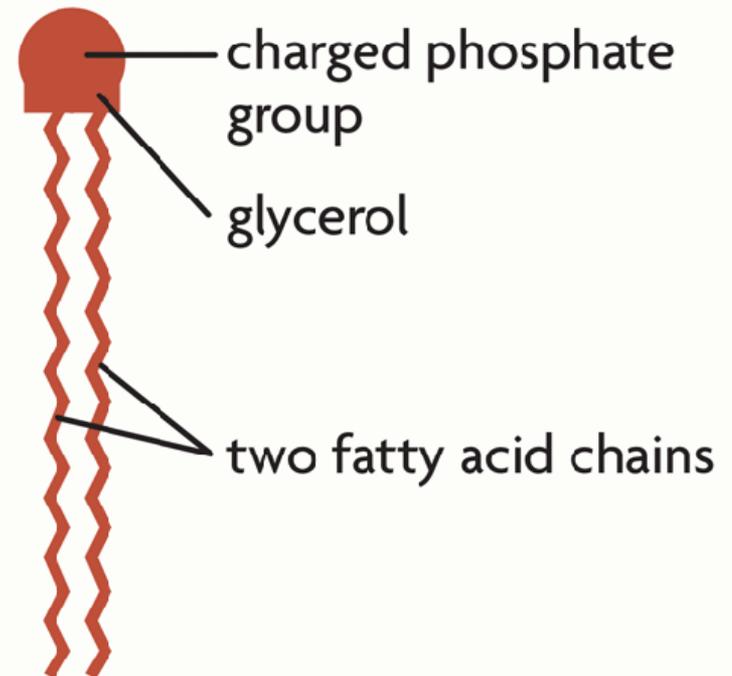
KEY IDEA: The membrane is a flowing barrier that separates a cell from the external environment

One Phospholipid Molecule



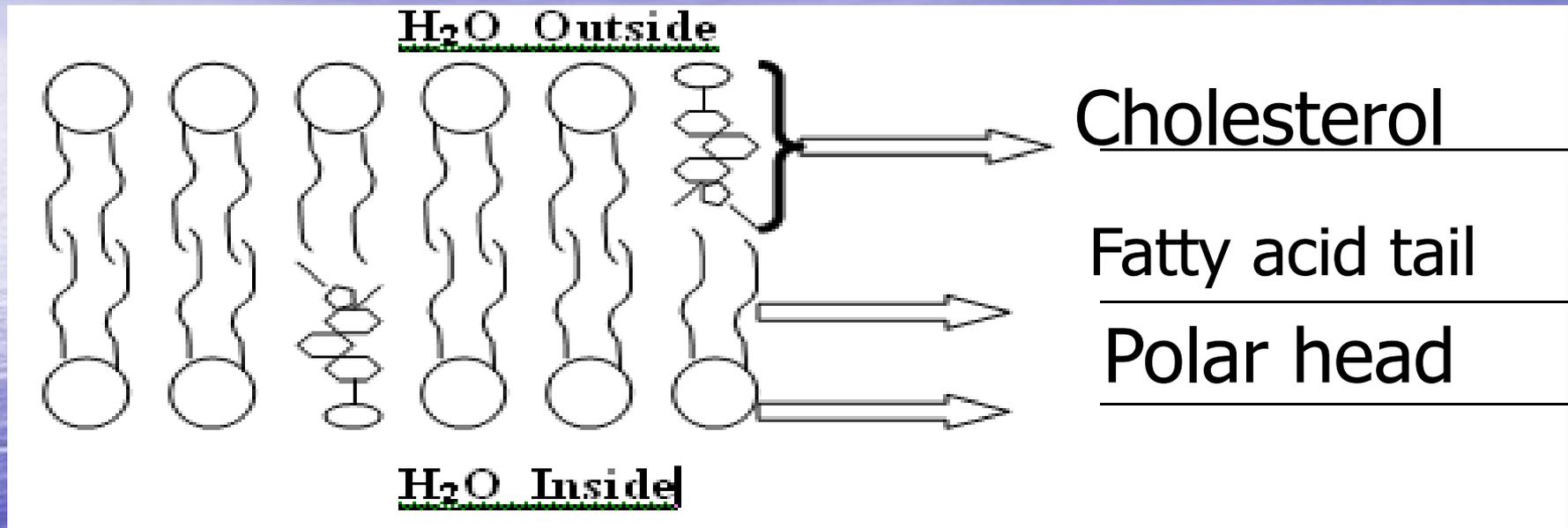
VISUAL VOCAB

A **phospholipid** is composed of three basic parts:



Topic 1: Membrane Structure

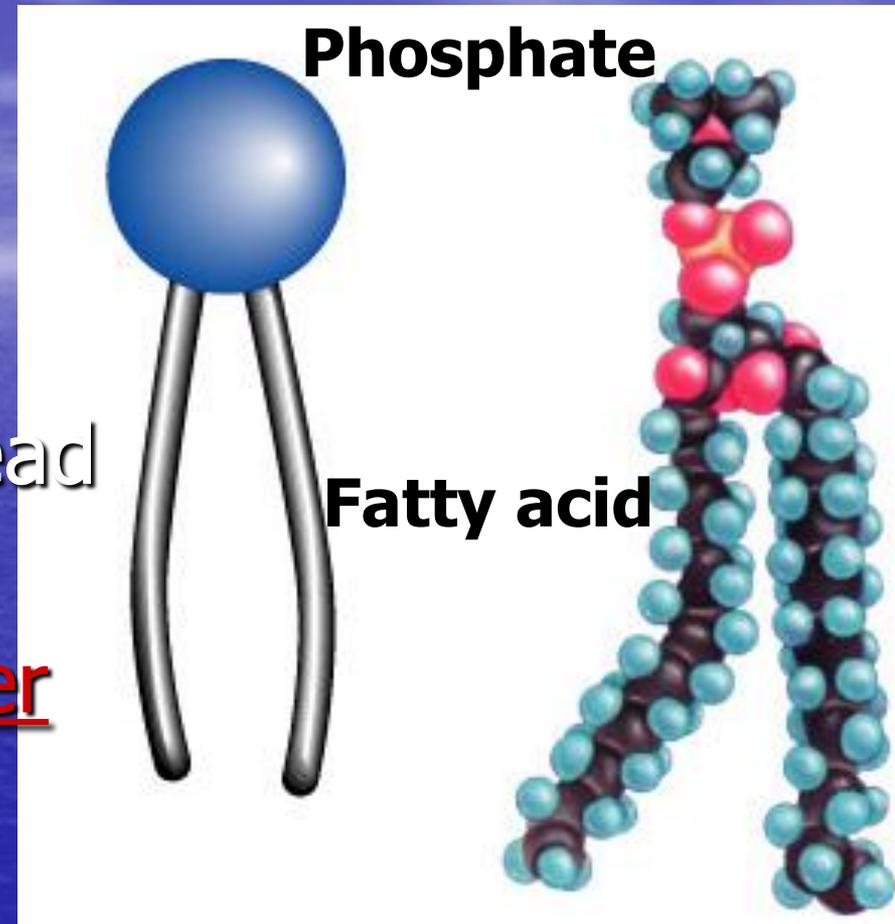
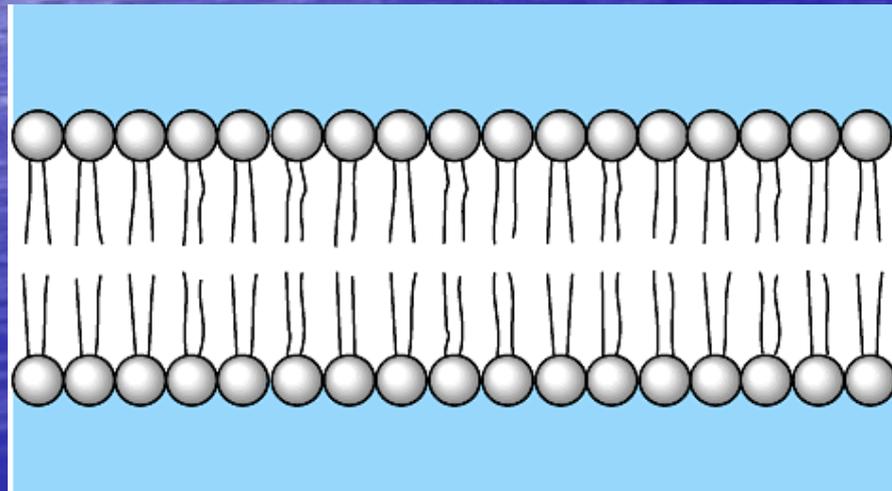
A) Lipid Bilayer → 2 parallel rows of phospholipids



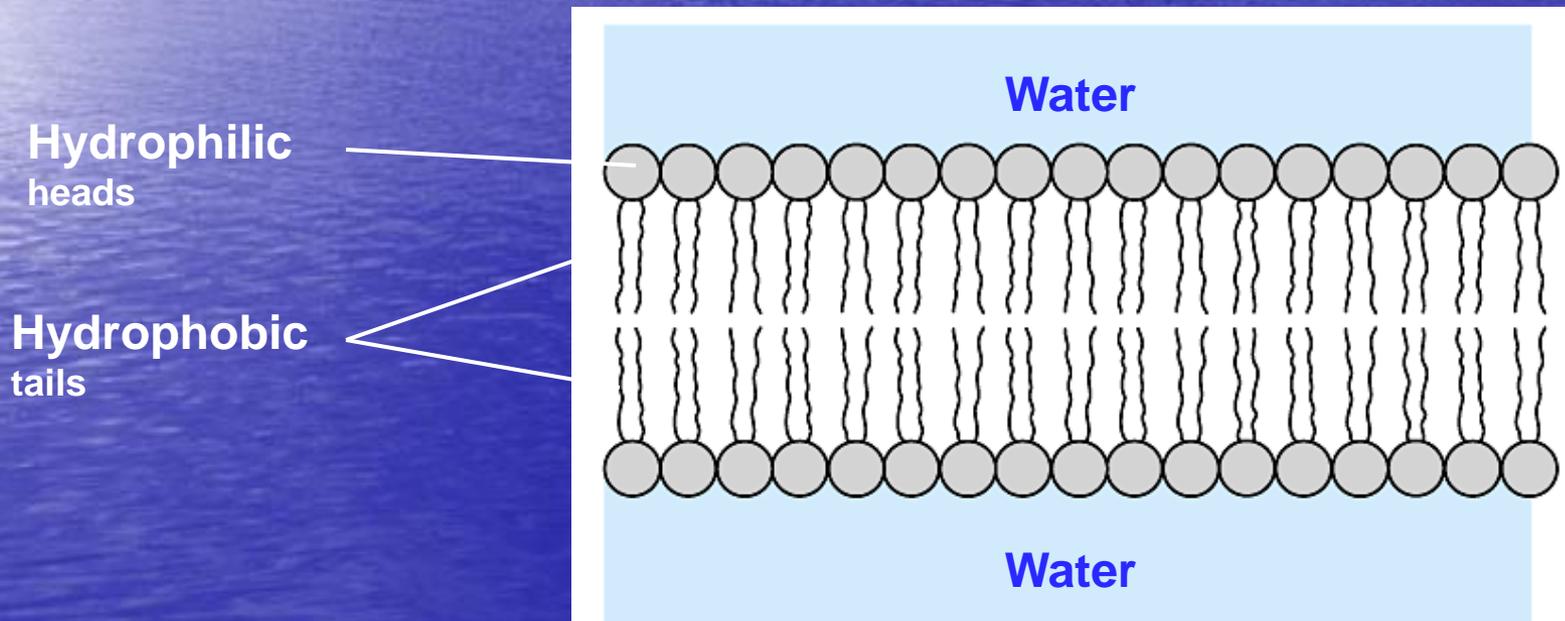
- Polar head → hydrophilic = Water-loving
- Fatty Acid Tail → hydrophobic = Water-fearing
- Cholesterol → Adds strength and stability to the membrane

Phospholipids

- Fatty acid tails
 - hydrophobic
- Phosphate group head
 - hydrophilic
- Arranged as a bilayer



- In water, phospholipids form a stable bilayer
 - The heads face outward and the tails face inward

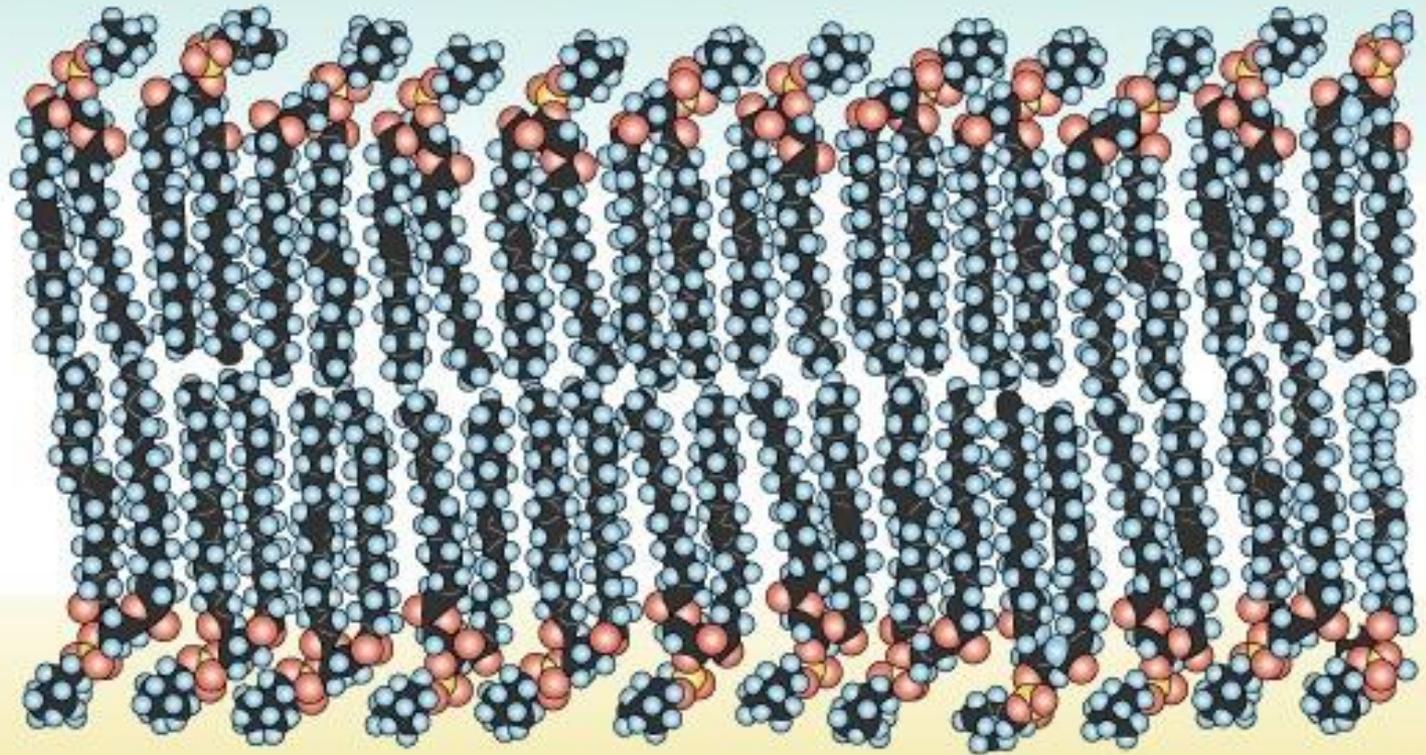


Phospholipid bilayer

polar
hydrophilic
heads

nonpolar
hydrophobic
tails

polar
hydrophilic
heads



B) Different **PROTEINS** are sandwiched in the membrane

- 1) **Transport** Proteins → help large particles get across when needed
- 2) **Enzyme** Proteins → speed up chemical reactions that occur at the membranes
- 3) **Marker** AKA GlycoProteins → have unique carbohydrate "antler" shapes that stick out and act like cell ID tags
- 4) **Receptor** Proteins → help the cell communicate with other cells as they catch and respond to different signals outside the cell like hormones

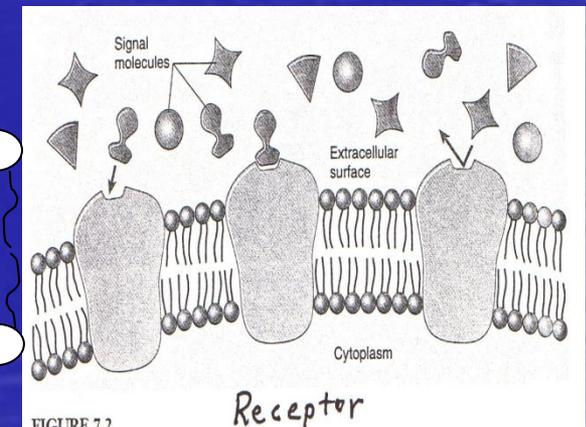
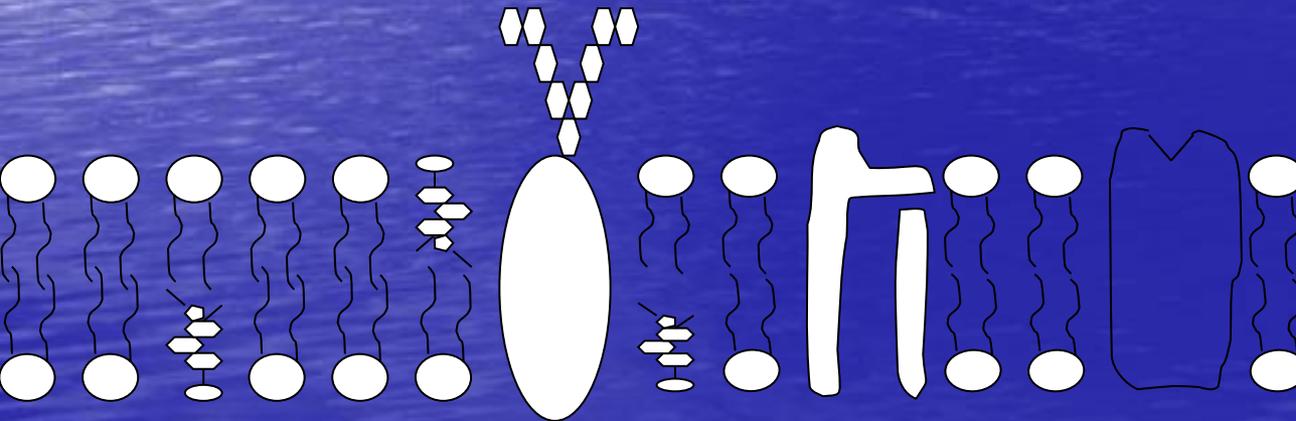


FIGURE 7.2

Cell surface receptors recognize only specific molecules. Signal molecules will bind only to those cells displaying receptor proteins with a shape into which they can fit snugly.

- The plasma membrane of an animal cell

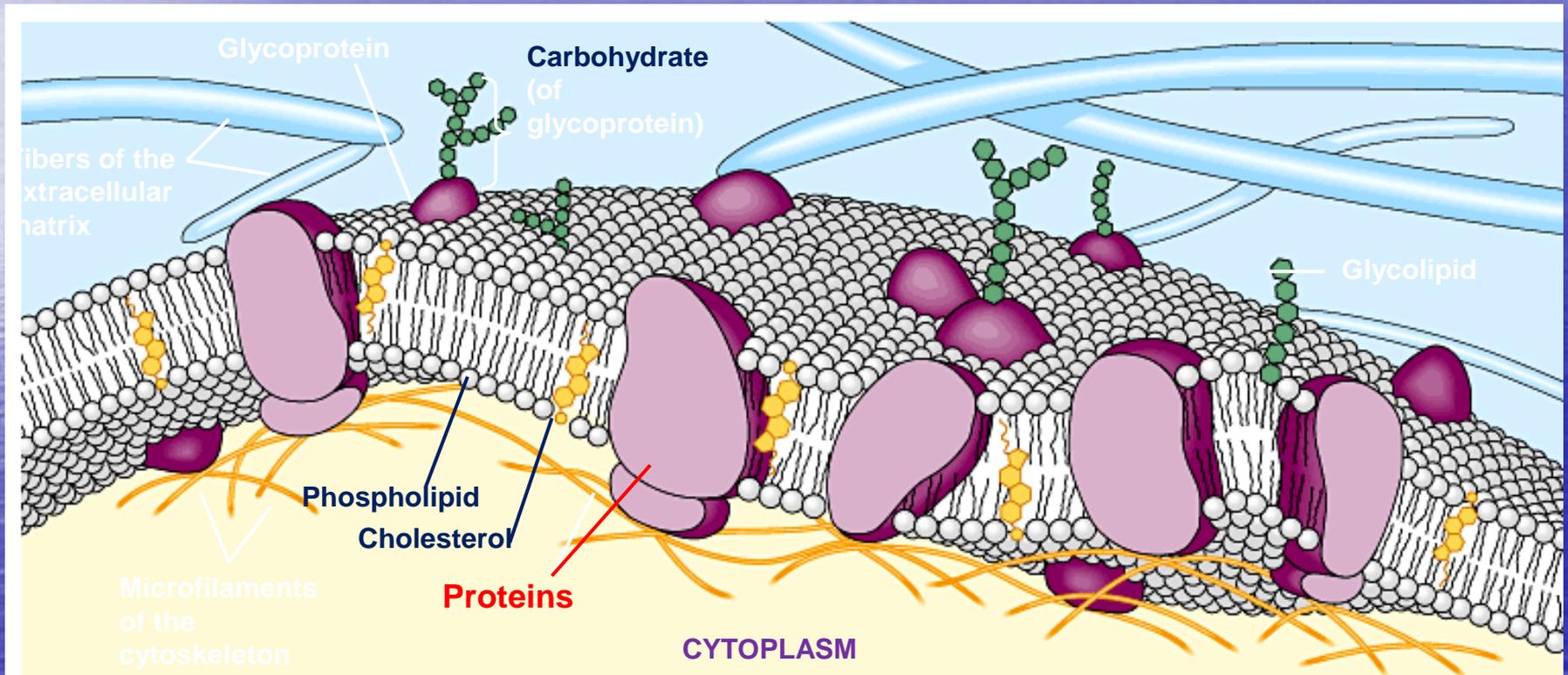
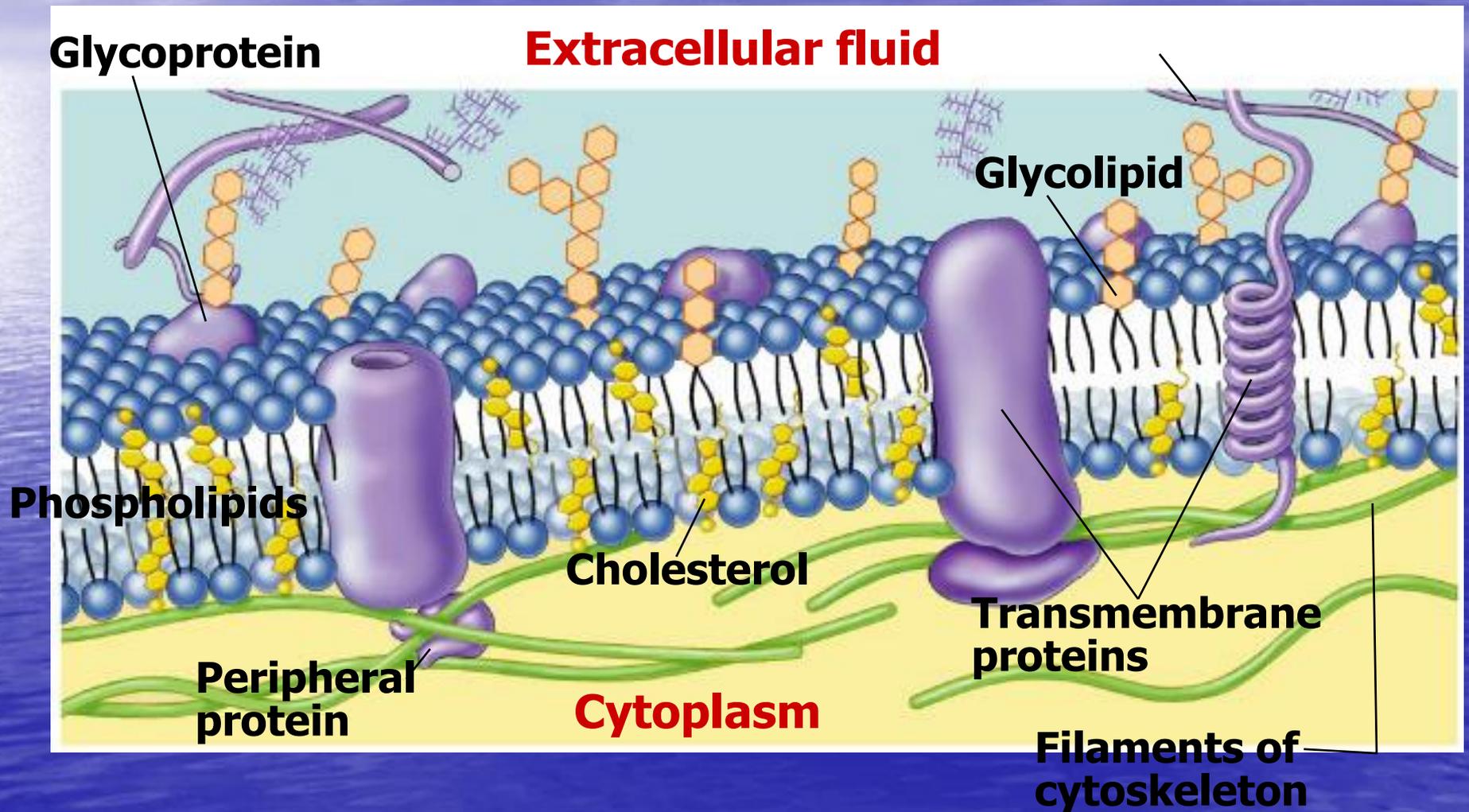
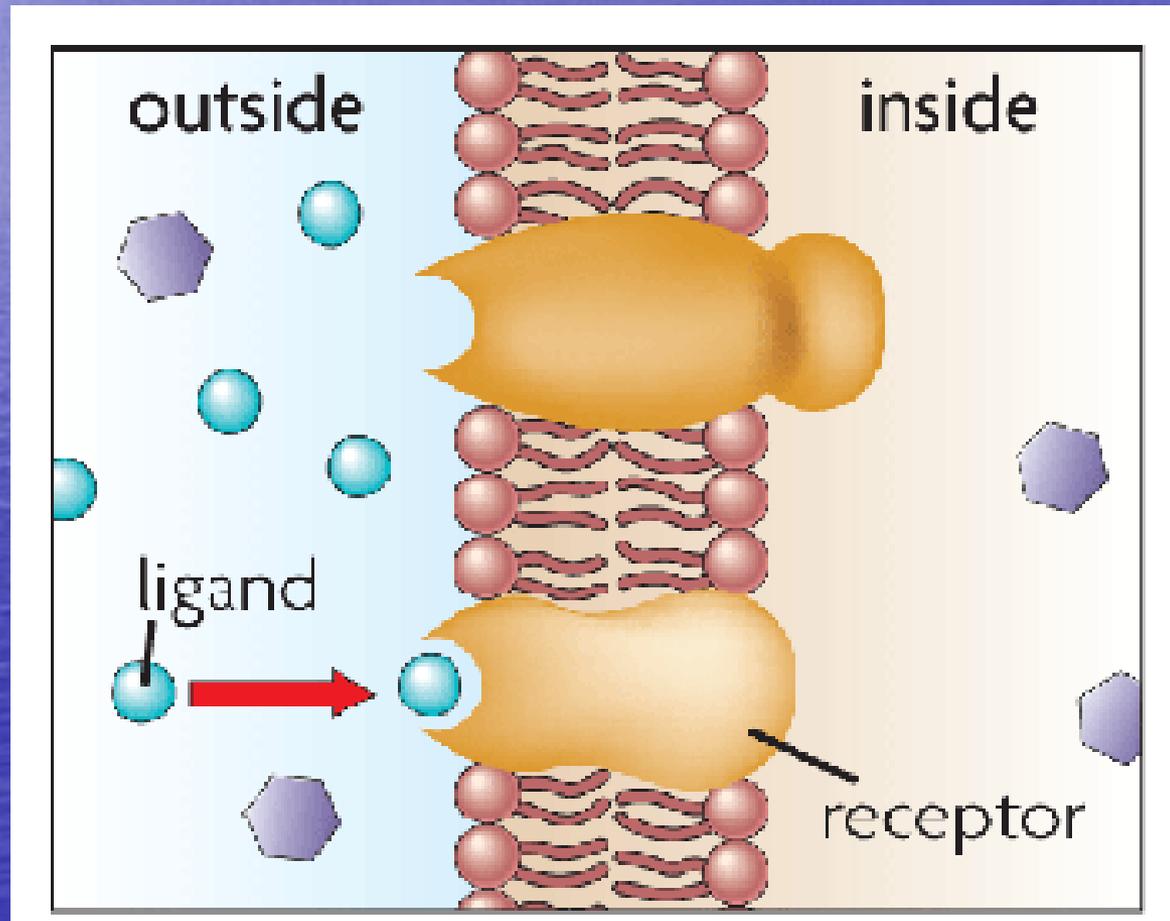


Figure 5.12

The membrane is a flowing mixture of proteins and phospholipids

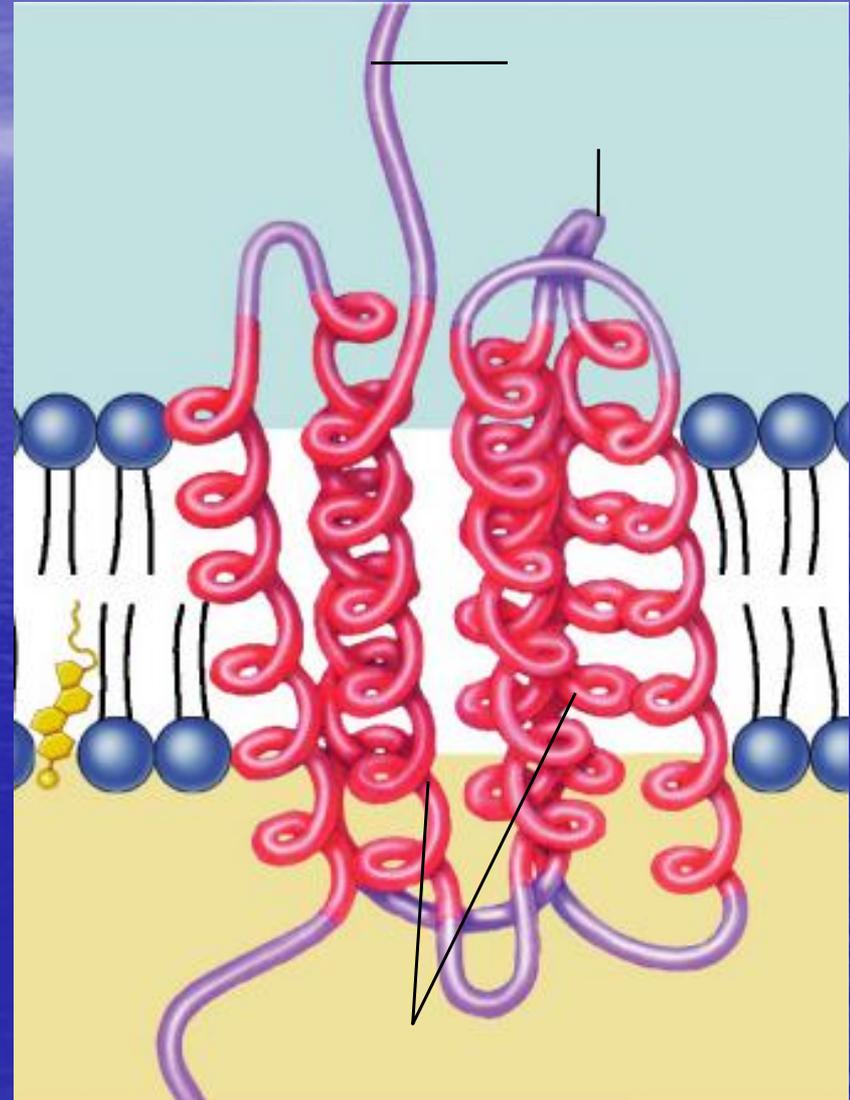


Check out how this **Receptor Protein** only “grabs” certain specific molecules outside the cell and helps them into the cell



Check out how this **Integrin** protein anchors the membrane to the inside cytoskeleton and the outside collagen fibers

Are the **RED** areas polar or nonpolar?

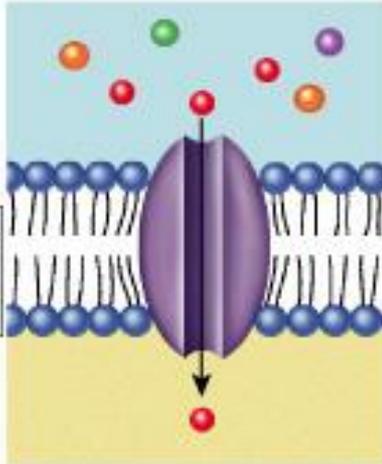


Many Functions of Membrane Proteins

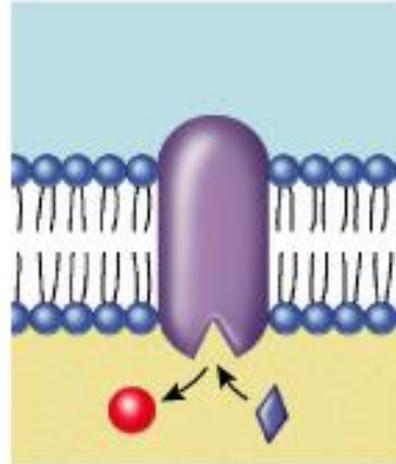
Outside

Plasma membrane

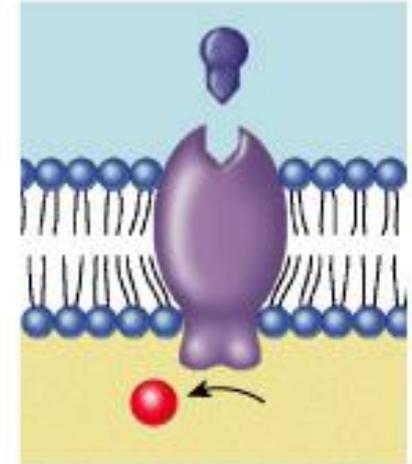
Inside



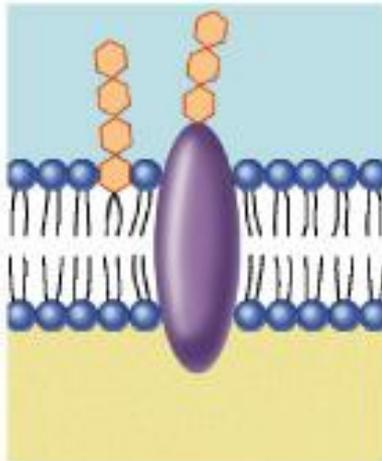
Transporter



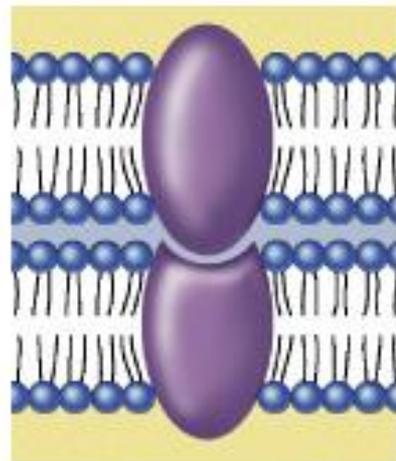
Enzyme activity



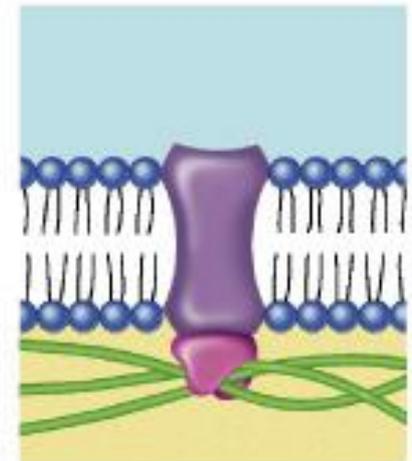
Cell surface receptor



Cell surface identity marker



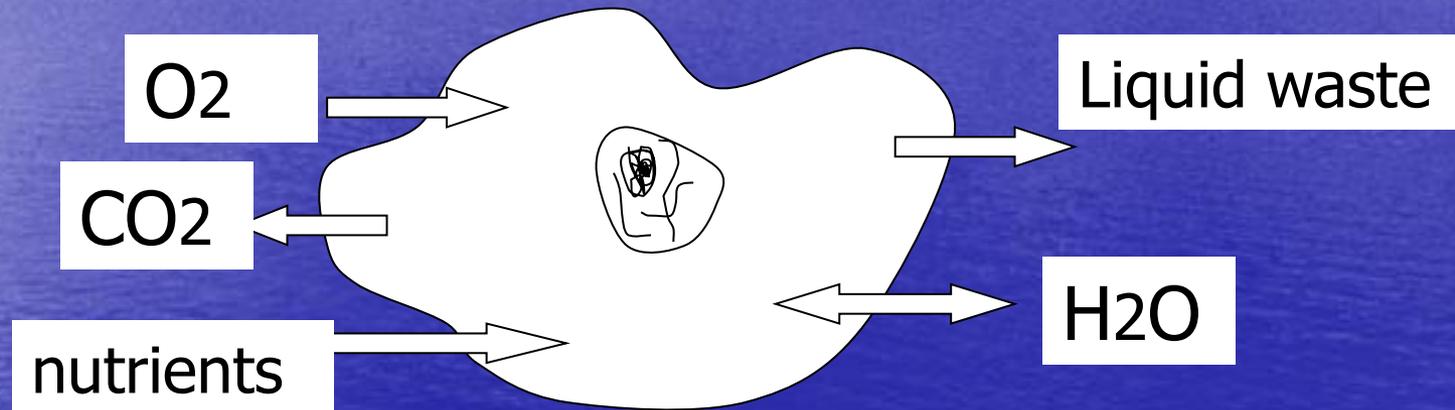
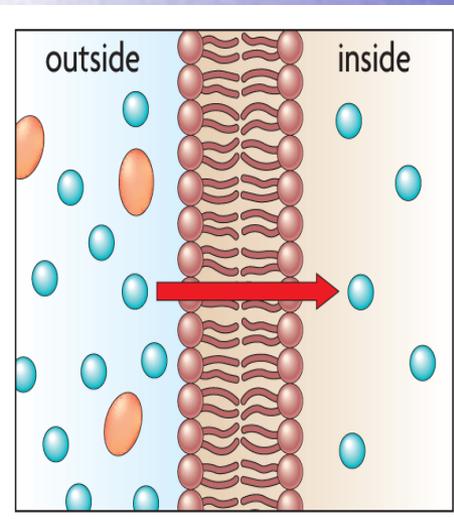
Cell adhesion



Attachment to the cytoskeleton

Topic 2: Membrane Characteristics

A) Selectively Permeable → only allows certain molecules to pass across as needed to keep the cell in homeostasis.

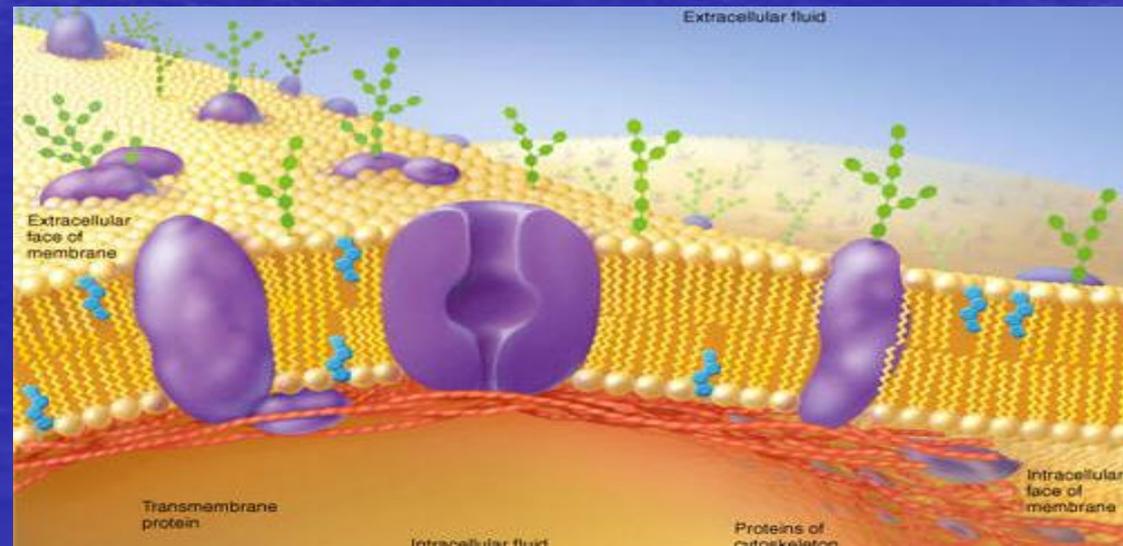
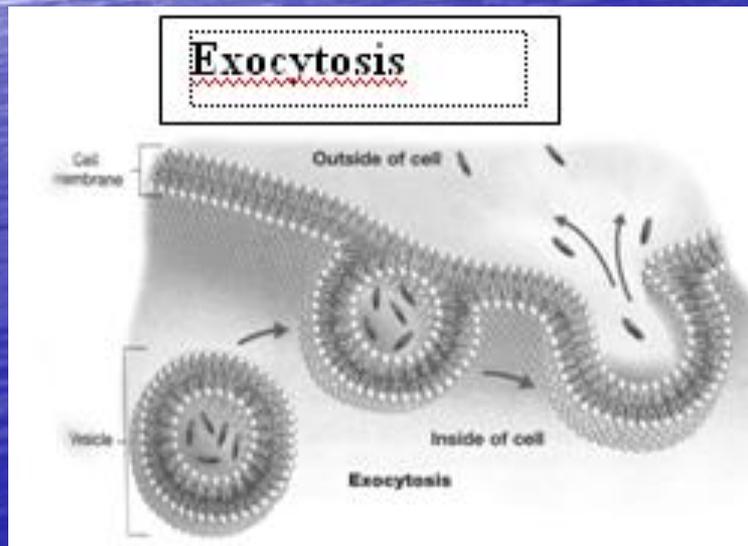


B) Stretchy → many cells must change shape and snap back to function

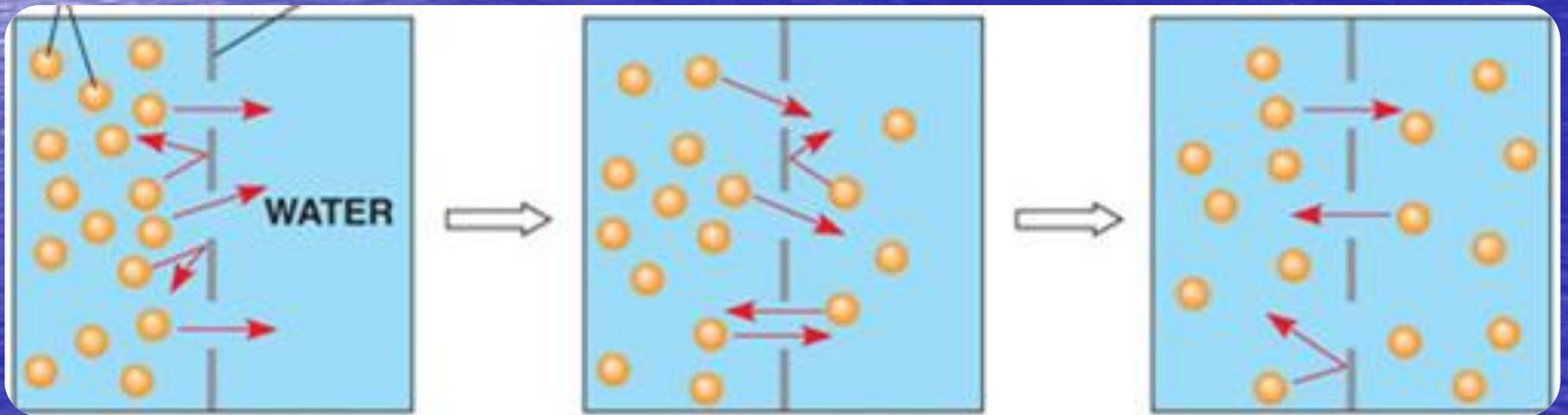
C) Self-sealing → as materials enter and exit the cell, vesicle membranes must break off or join the cell membrane without letting the cytoplasm leak out

D) Fluid Mosaic → describes the membrane

- Fluid: the membrane molecules are constantly flowing and trading places
- Mosaic: the surface of the membrane has a pattern of bumpy proteins that stick up



Can you tell what the **water** is doing as time passes?

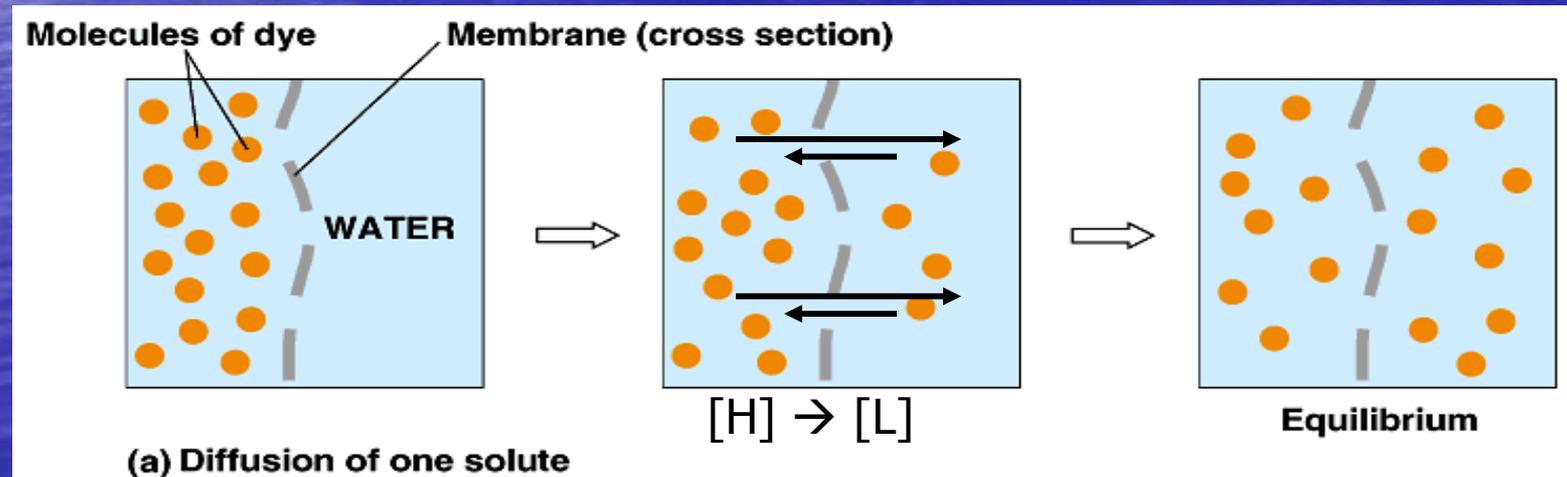


Topic 3: Membrane FUNCTION



A) **Diffusion** – the movement of gas or liquid molecules from [H] → [L] across a membrane.

- This process continues until an equilibrium is achieved → [Inside cell] = [Outside cell]
- Lipids diffuse easily across the membrane (like dissolves like)
- Small particles with NO charges like O₂, CO₂, and H₂O diffuse easily across the membrane



B) **Osmosis** – the diffusion of WATER across a selectively permeable membrane

– Osmosis follows 2 RULES:

- 1) H₂O moves from [H] → [L]
- 2) “Salt sucks” → H₂O is attracted toward the [H] solutes

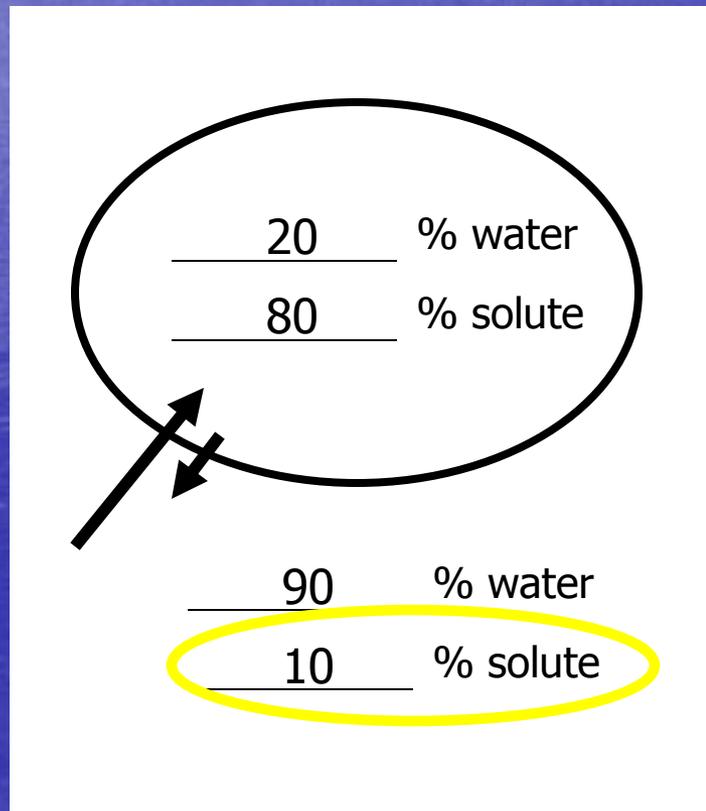
– water flow across a cell membrane depends on the [solutes] of the surrounding liquid

– there are 3 “tonic” choices:

1) HYP tonic solution= LESS solutes outside than inside the cell → more water will flow IN

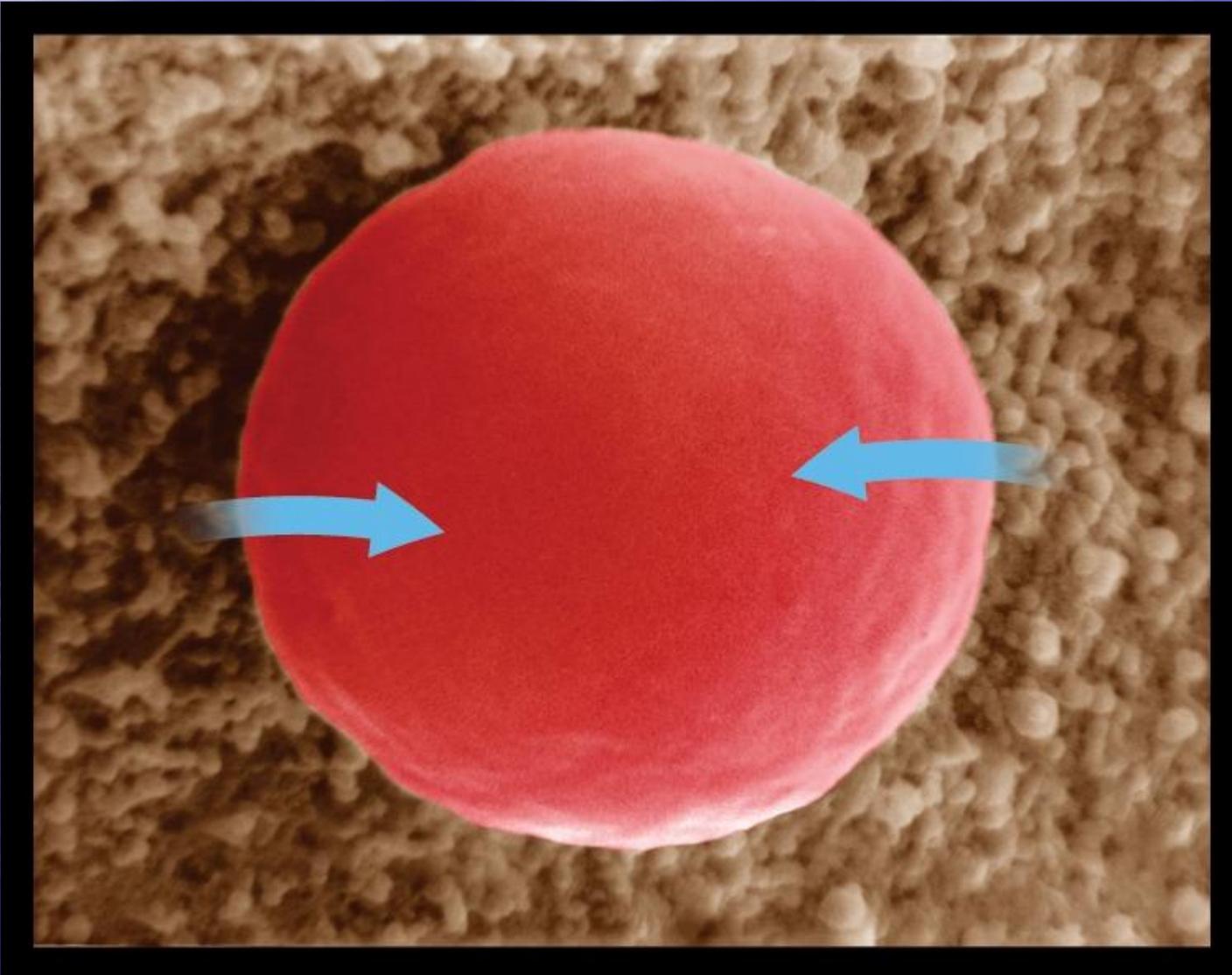
"Salt Sucks"

*Water moves to where there is the highest concentration of solute!



In a HYPOTonic solution, water moves IN to the cell.

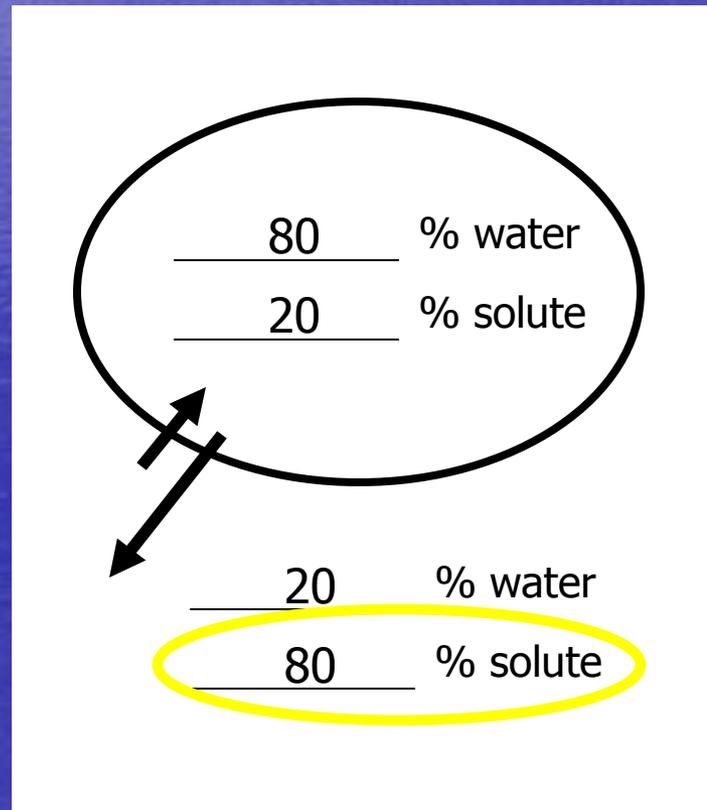
A RBC in a **Hypotonic** solution:



2) HYPER tonic solution = MORE solutes outside than inside the cell → more water will flow OUT

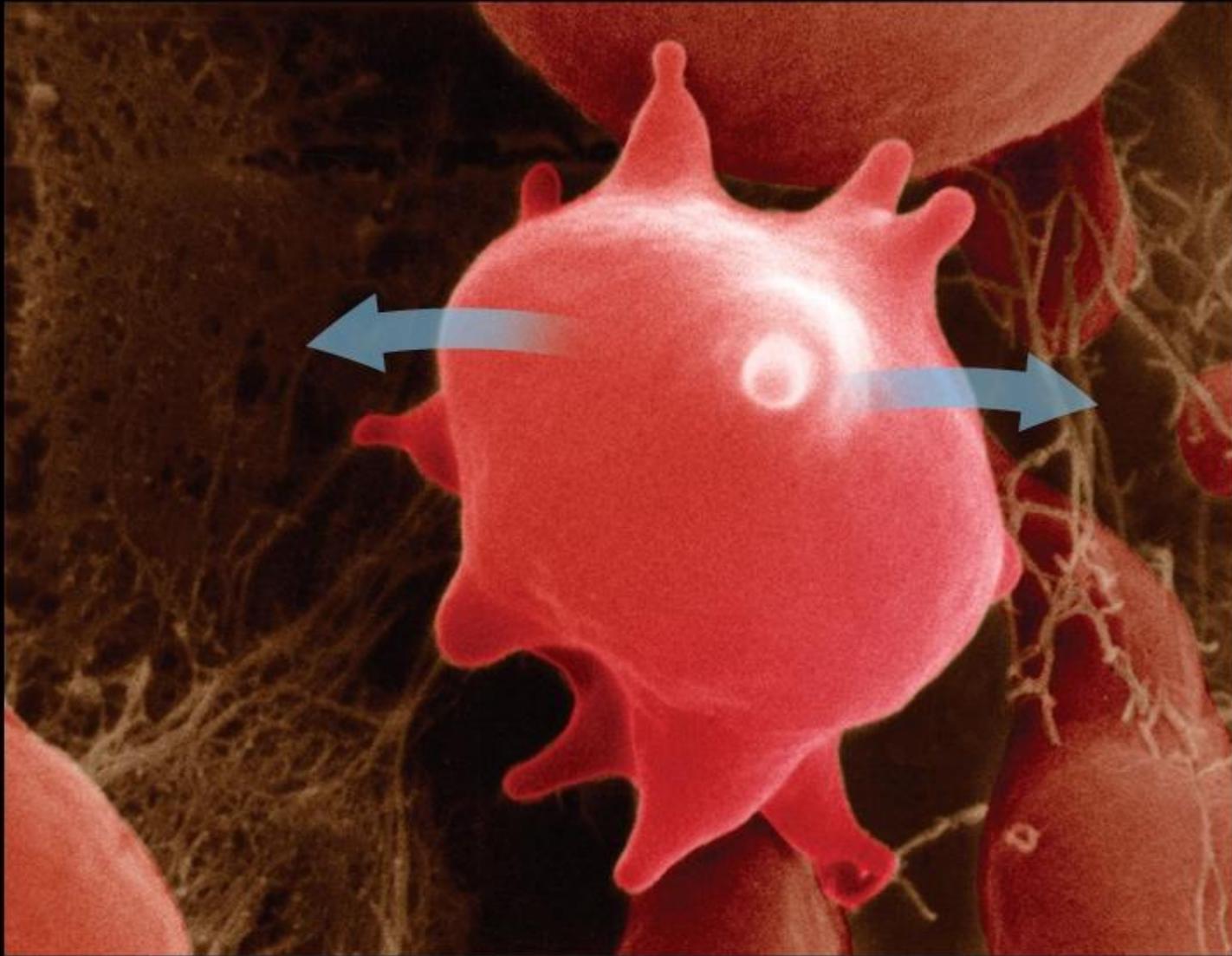
"Salt Sucks"

*Water moves to where there is the highest concentration of solute!



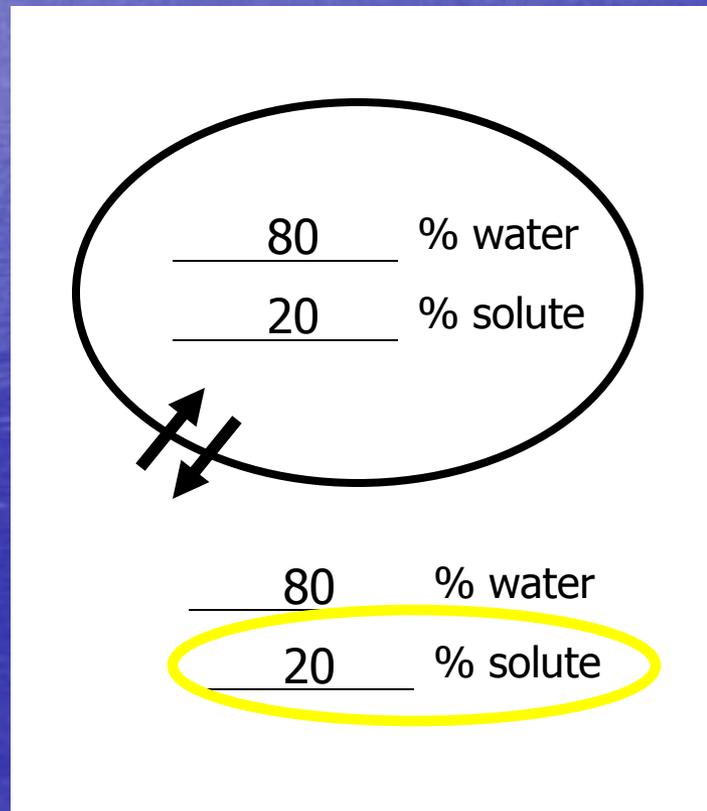
In a HYPERTonic solution, water moves OUT of the cell.

A RBC in a **Hypertonic** solution:



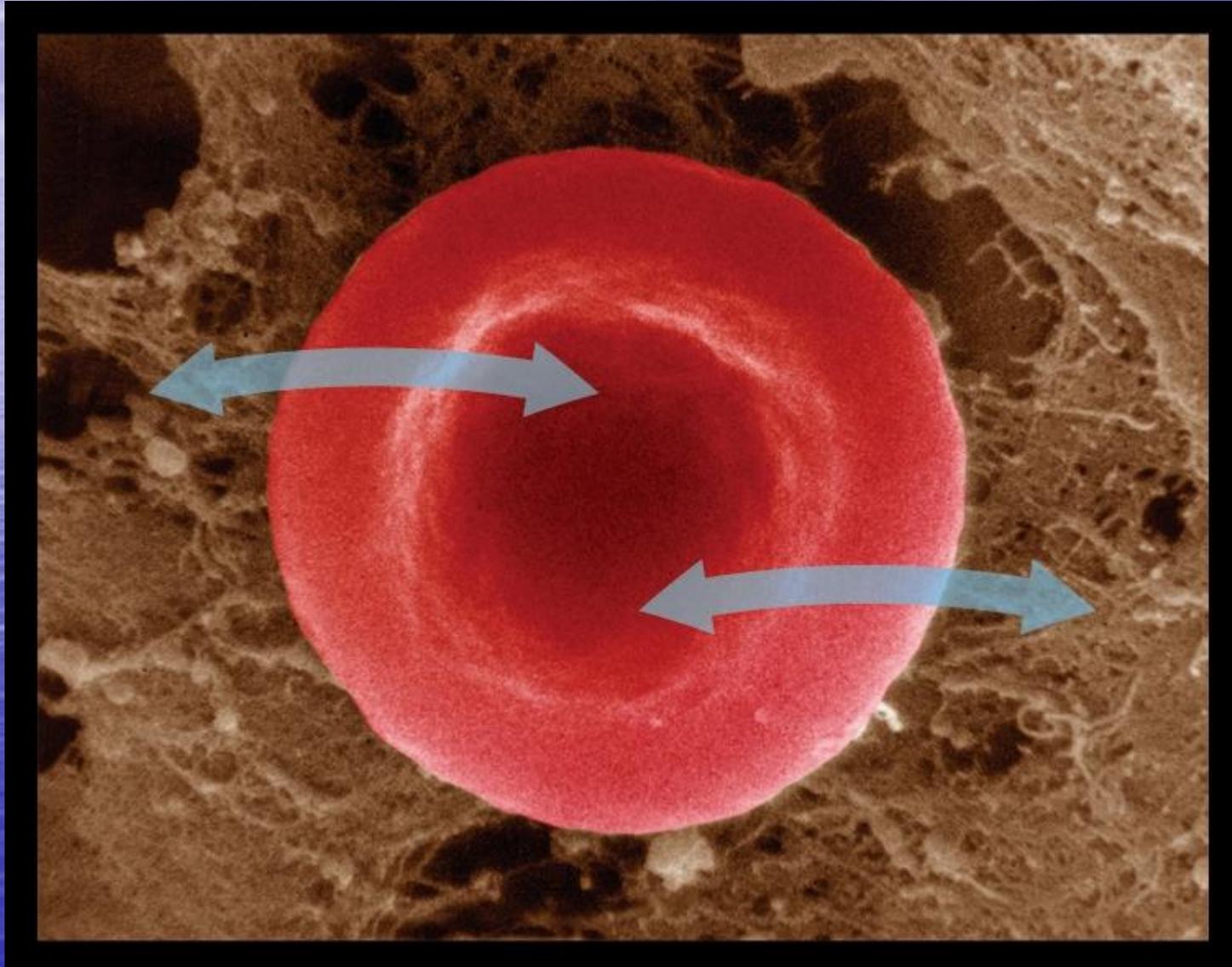
3) ISO tonic Solutions = SAME

[solute] outside and inside → water flow across the membrane is EQUAL



There is no NET flow of liquid.

A RBC in a **I**sotonic solution:

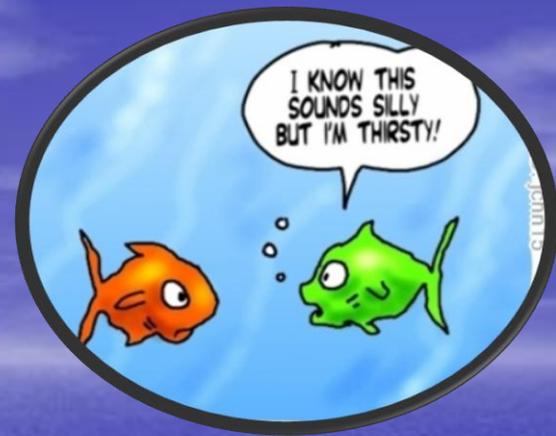


Fun Question!

Why could drinking too much sea water be dangerous?



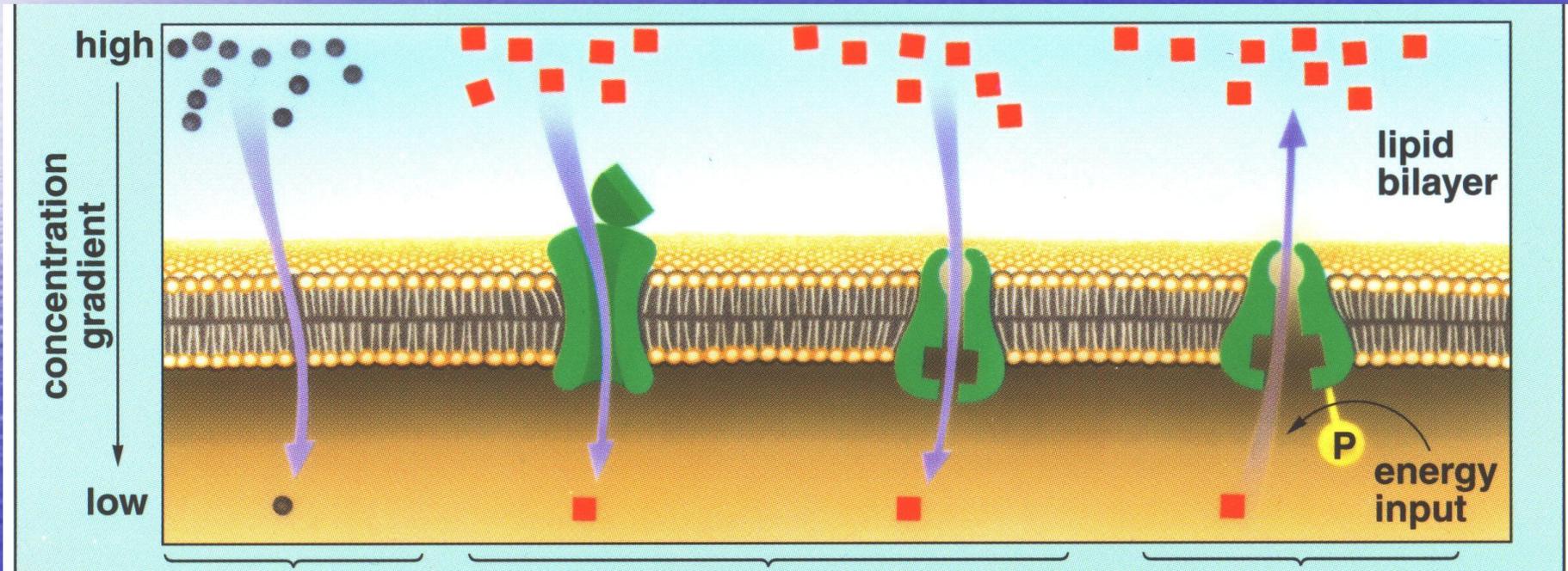
And the answer is...



**Based on the basic principles of diffusion
and
osmosis!**

As the salt water solution enters your body, the cells near the solution release water in order to reach equilibrium with the surrounding fluid. The cells then shrink and may die out. This is a condition called dehydration!

C) **Facilitated Diffusion** = Large particles and small particles with charges need the **HELP** of transport proteins to get across a membrane.



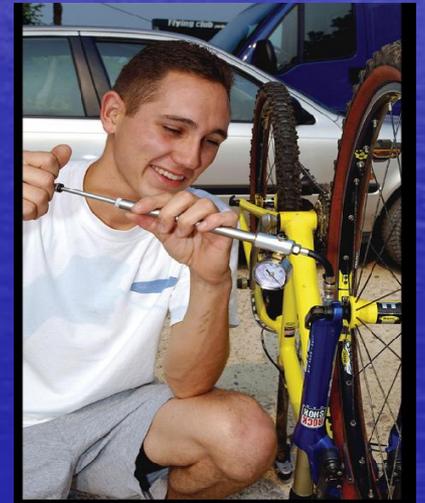
D) **Passive Transport** = anytime particles move across a membrane from [H] → [L]

(i.e., WITH the concentration gradient = **NO ATP energy needed**)

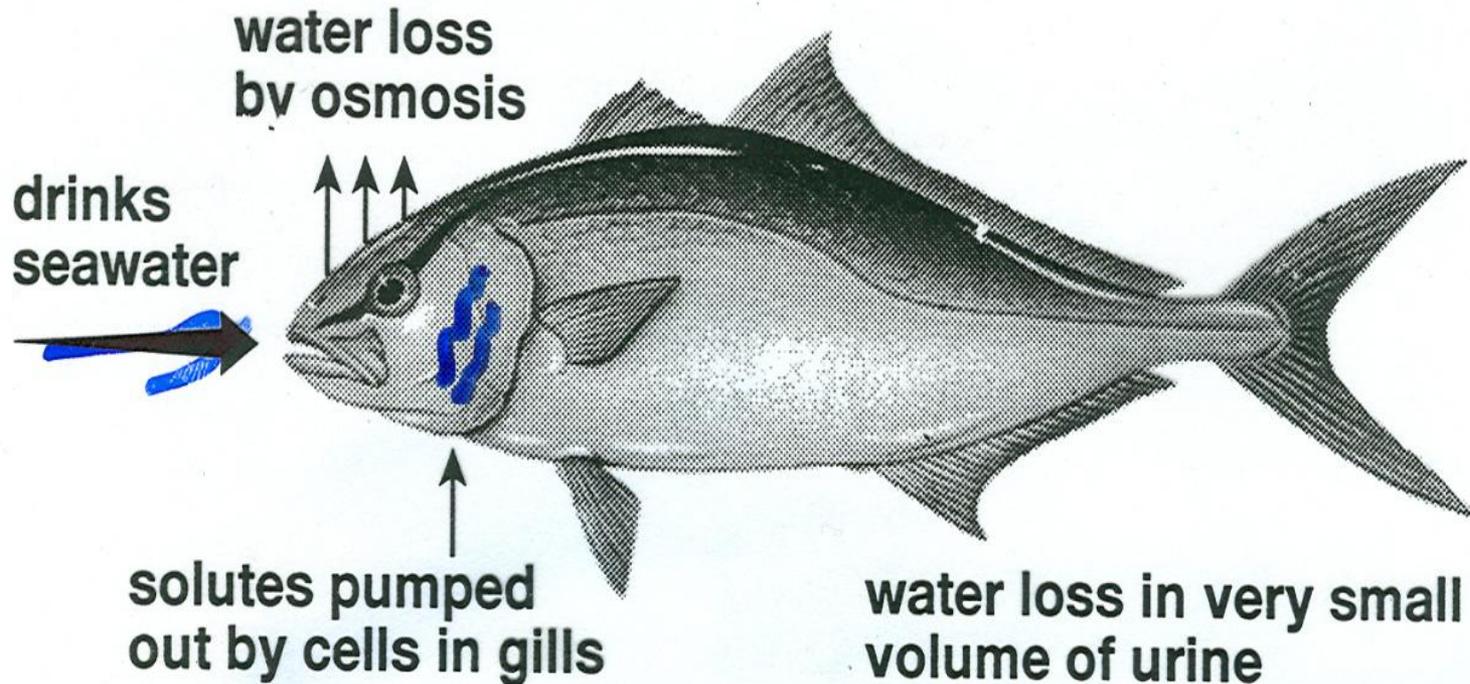
E) **Active Transport** = anytime a particle is “PUMPED” across a membrane from [L] → [H]

(i.e., AGAINST the concentration gradient = **ATP energy needed**)

Ex. Salt-water fish gills pump OUT salt ions into salty water

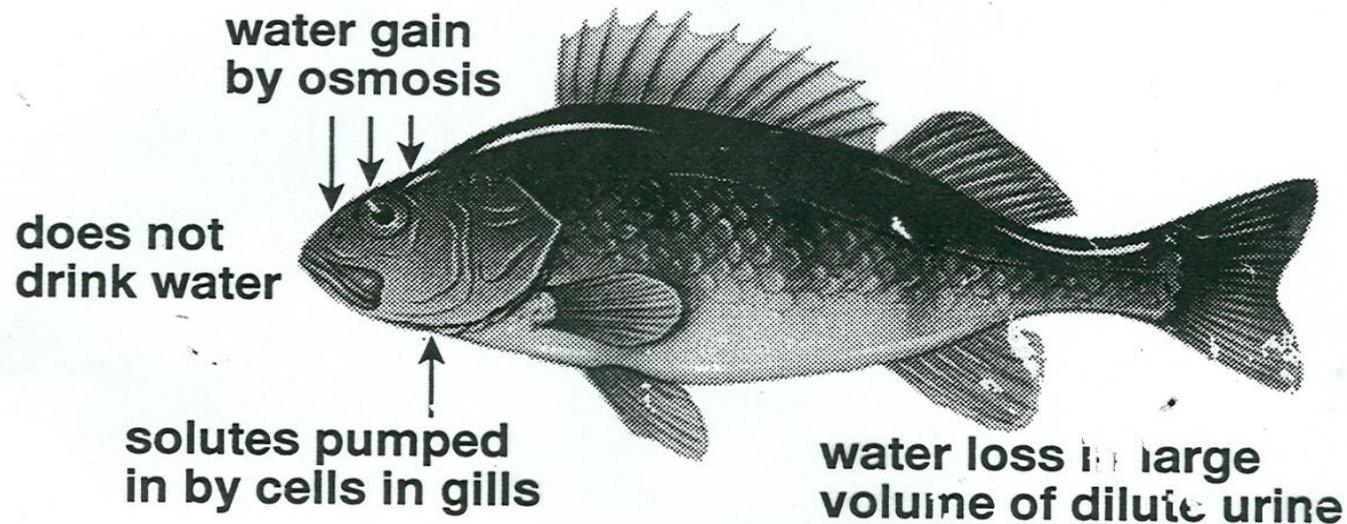


A Saltwater Fish & Osmosis



a Marine bony fish
(body fluids less salty than the surroundings).

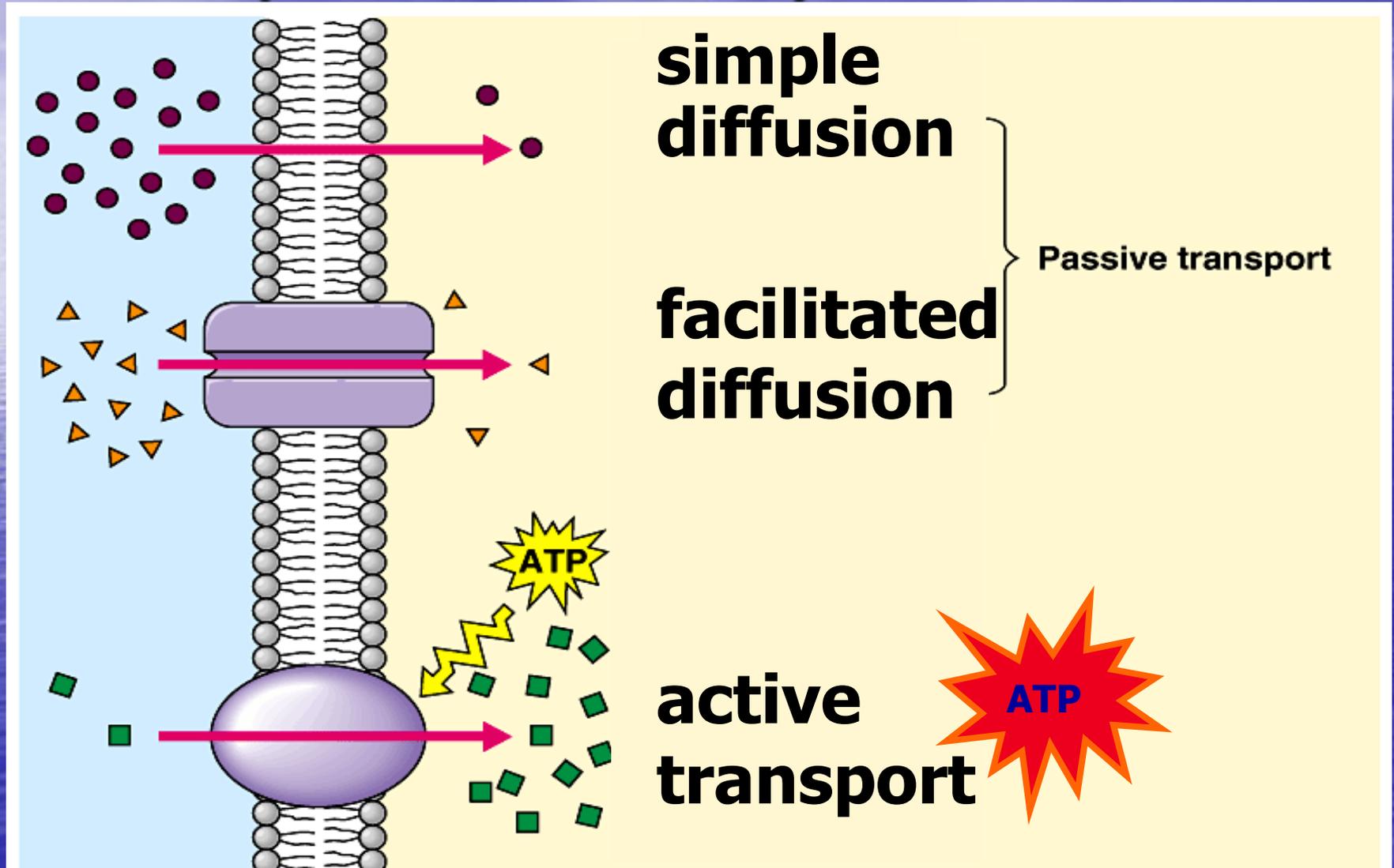
A Freshwater Fish & Osmosis



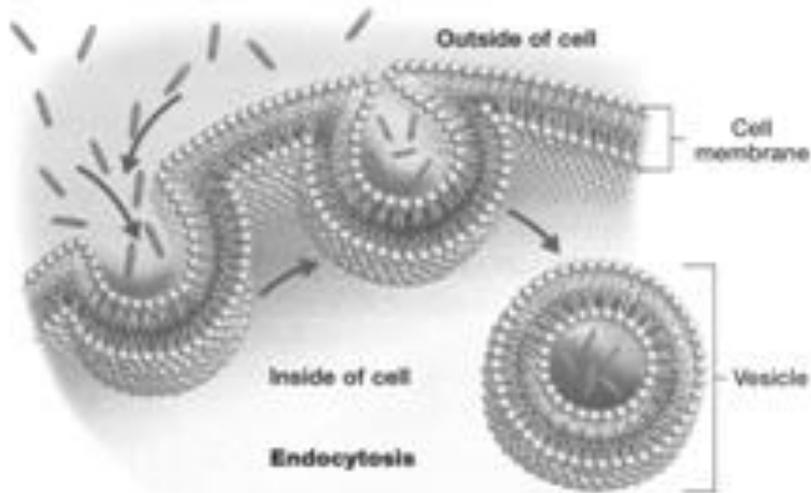
b Freshwater bony fish
(body fluids much saltier than the surroundings).

Fig. 29.8 Water-solute balance in fishes.

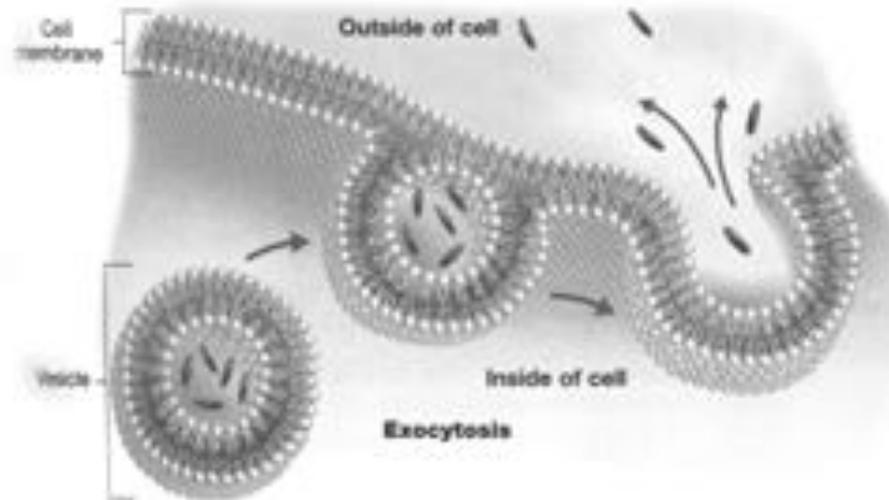
Transport summary



Endocytosis



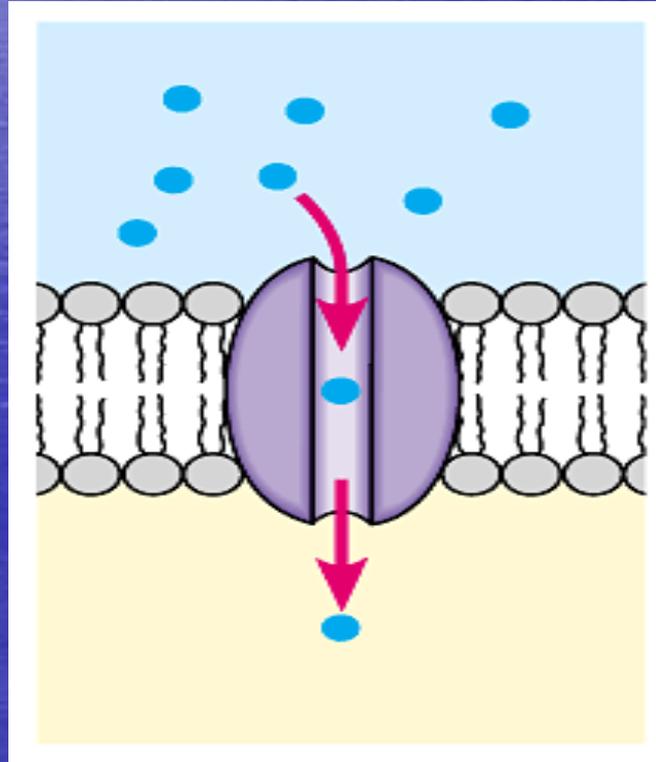
Exocytosis



- **Endocytosis** = vesicles bring large materials INTO the cell as the cell membrane surrounds the outside material in a pouch and then pinches off
- **Exocytosis** = vesicles ship materials to the membrane, release the contents OUT of the cell, and then fuse with the cell membrane

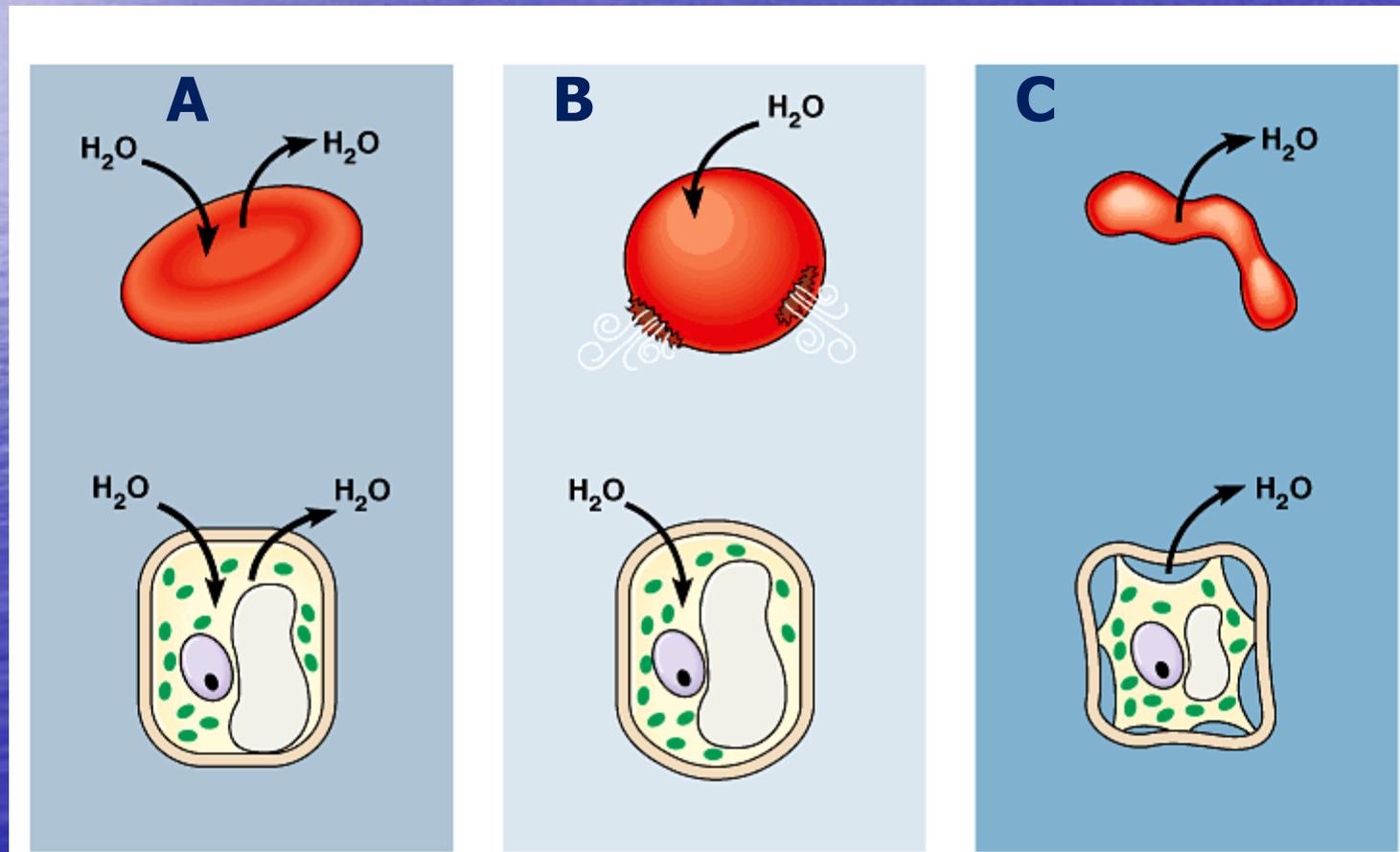
Concept Check Time:

- Regular diffusion or facilitated diffusion?
- Passive or Active Transport?
- What type of membrane protein?



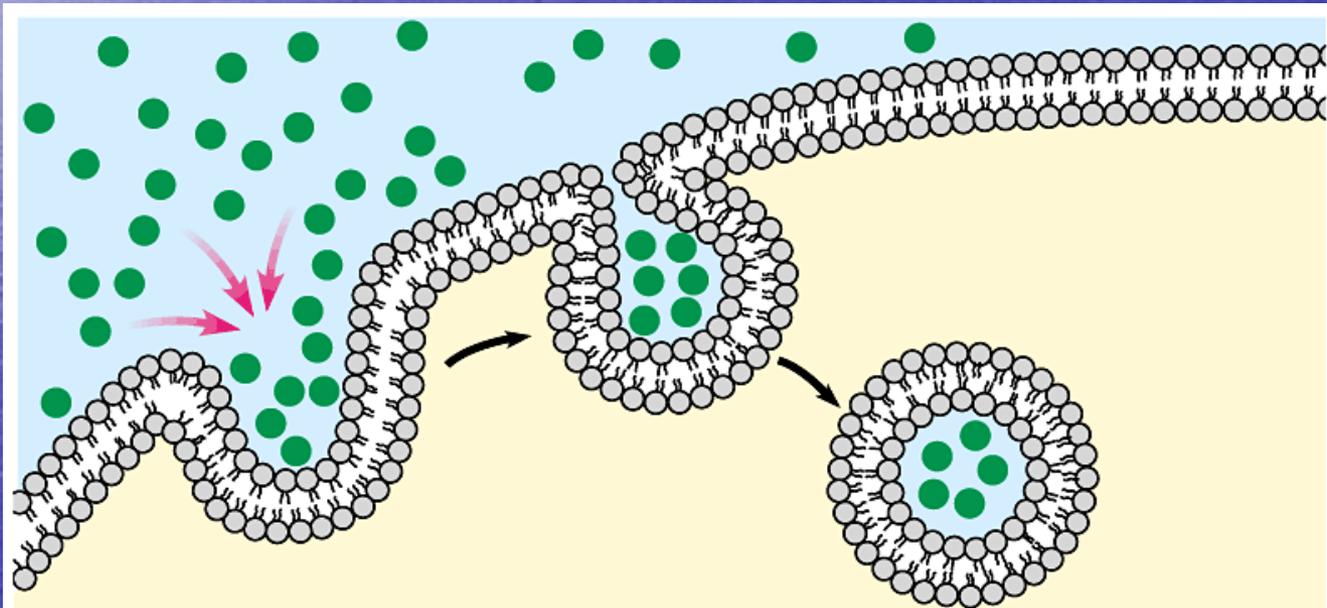
Concept Check Time:

- Which cell is in a Hypertonic solution?
- Which cell is in an Isotonic solution?



Concept Check Time:

- Endocytosis or Exocytosis?



Concept Check Time:

Shows Regular diffusion

Shows facilitated diffusion?

Shows Active Transport?

Shows Passive Transport?

