Chapter 5 Part 1

The Working Cell

PowerPoint Lectures for

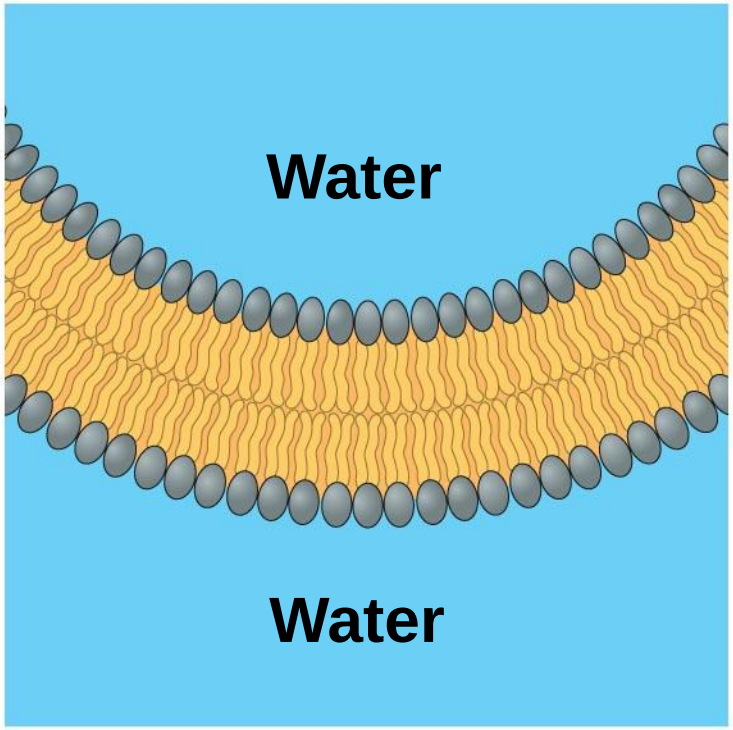
Biology: Concepts & Connections, Sixth Edition

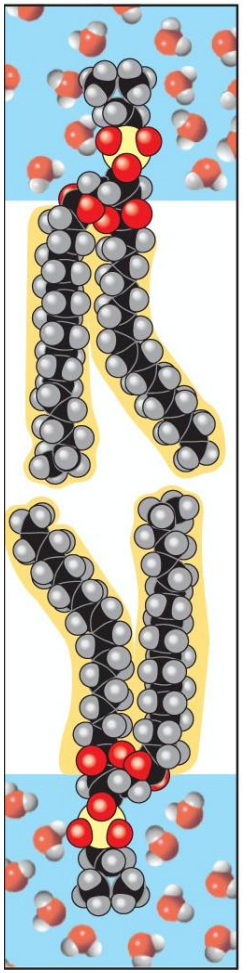
Campbell, Reece, Taylor, Simon, and Dickey

Lecture by Dr. Fernando Prince

Membranes form spontaneously due to fear. Fear of water!

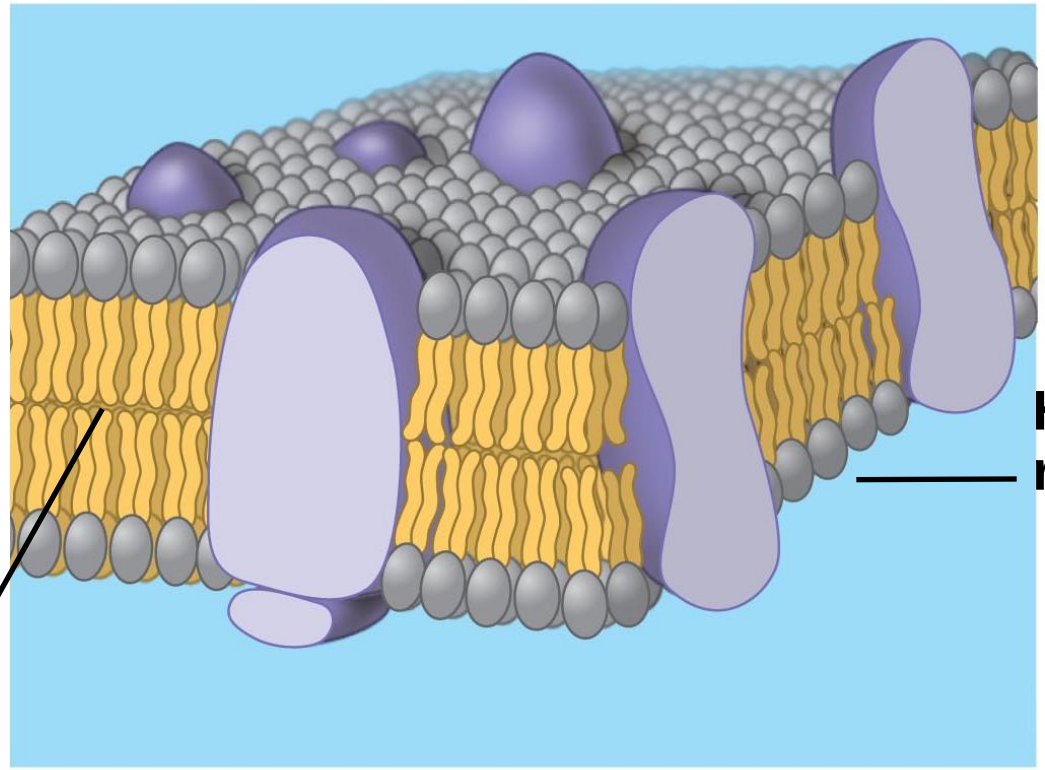
- The hydrophobic exclusion principle





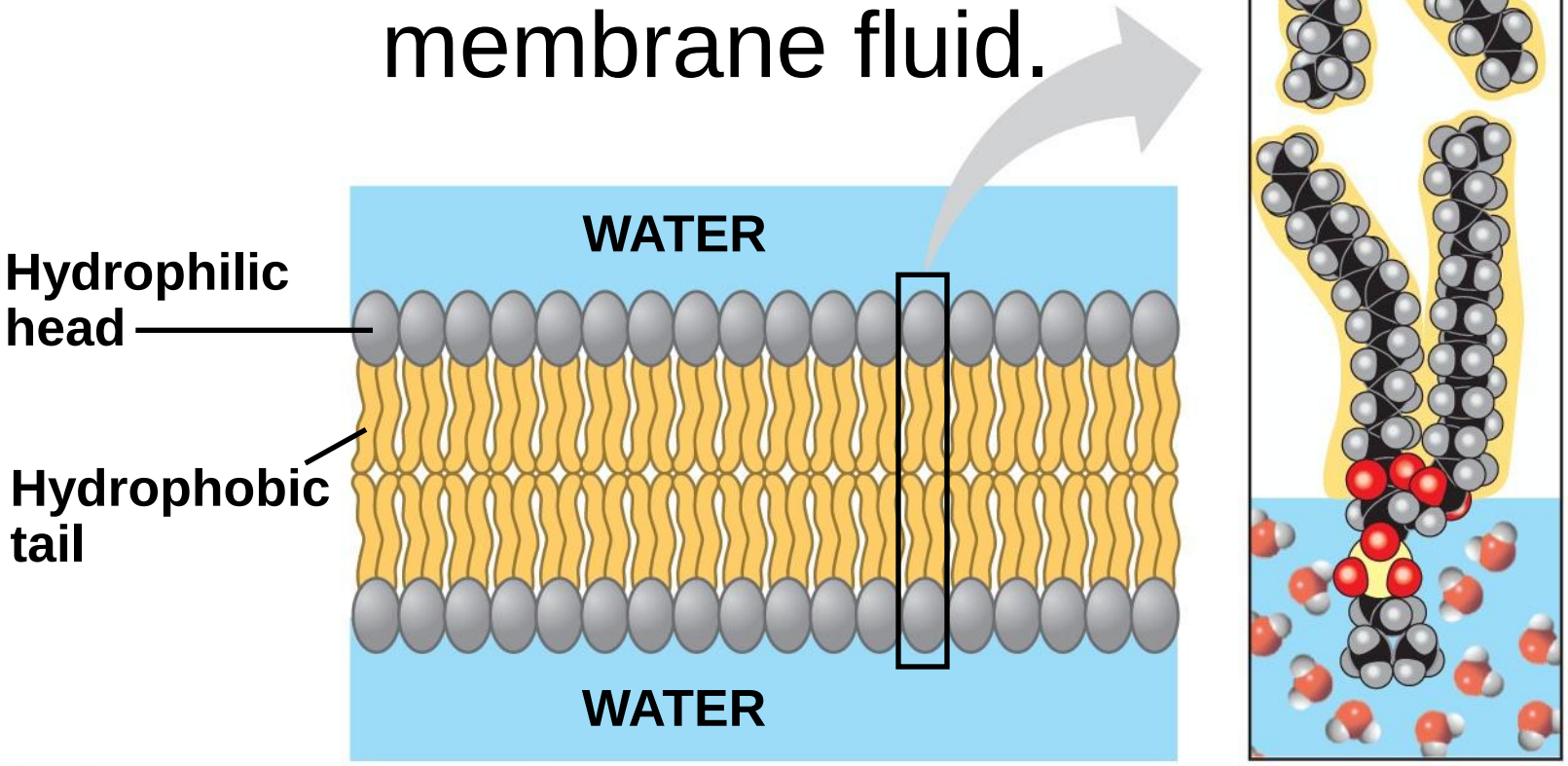
MEMBRANE STRUCTURE AND FUNCTION

- The membrane is a **fluid mosaic** because the components, a mixture of phospholipids and proteins are in constant motion.



Membranes are a fluid mosaic

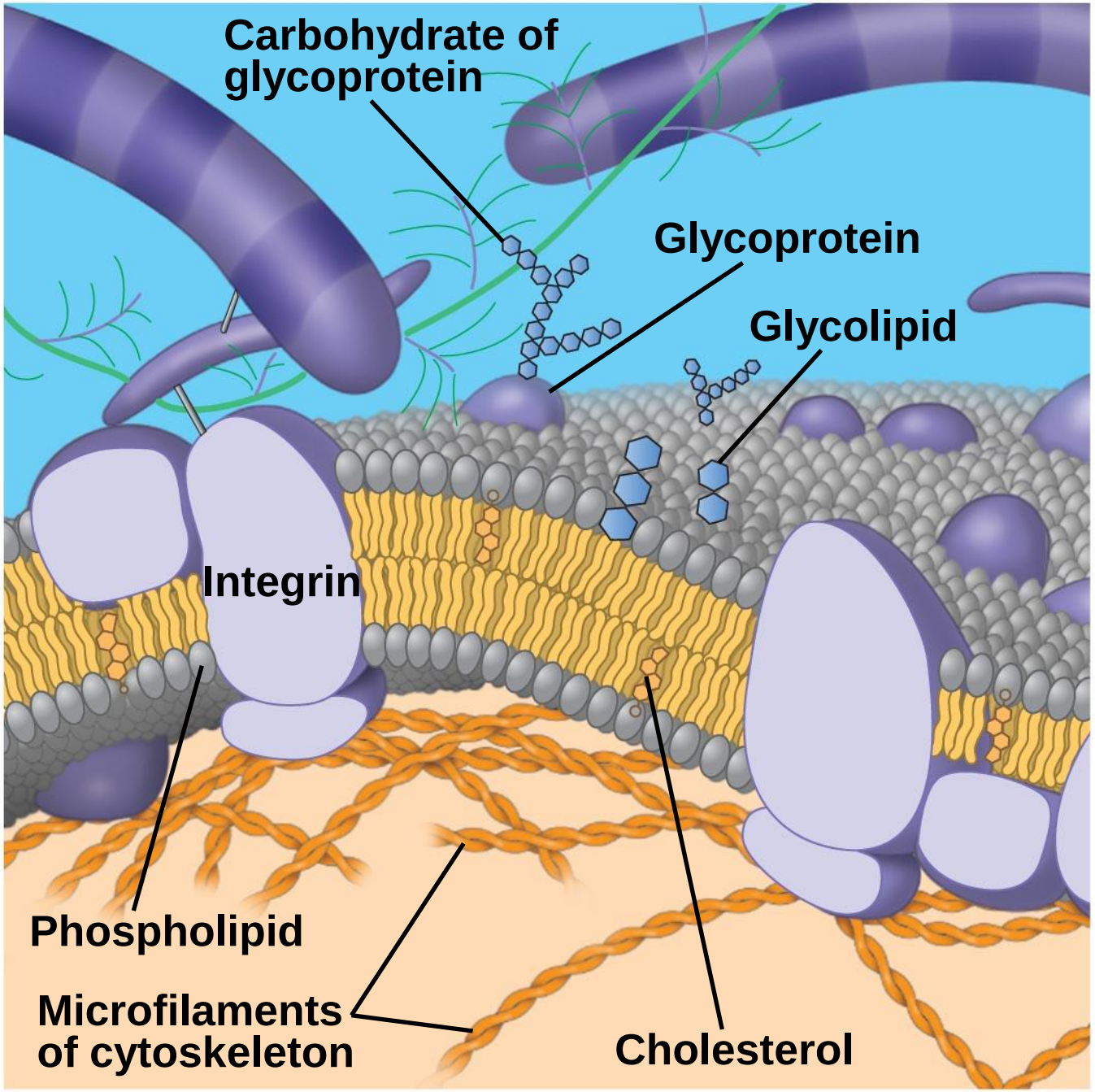
The kinks in the fatty acid chains and keeps the membrane fluid.



Cellular ID

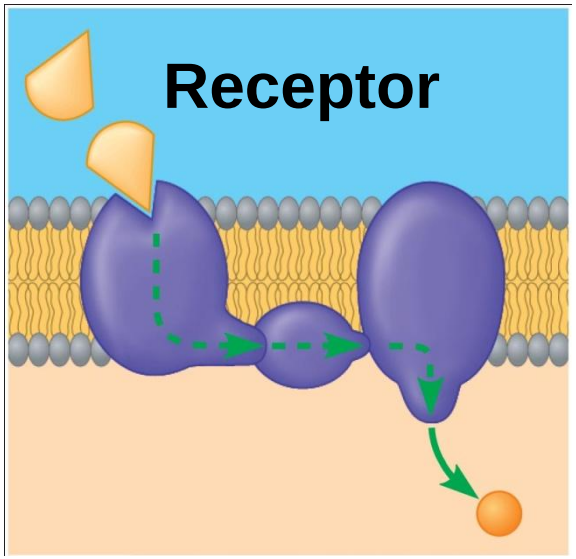
Cellular Membrane

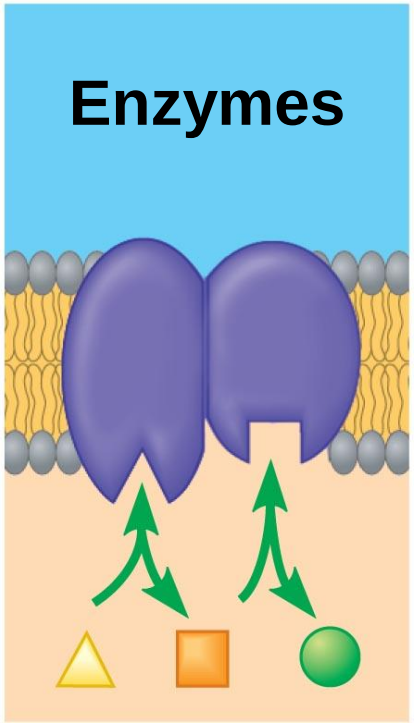
Cellular skeleton



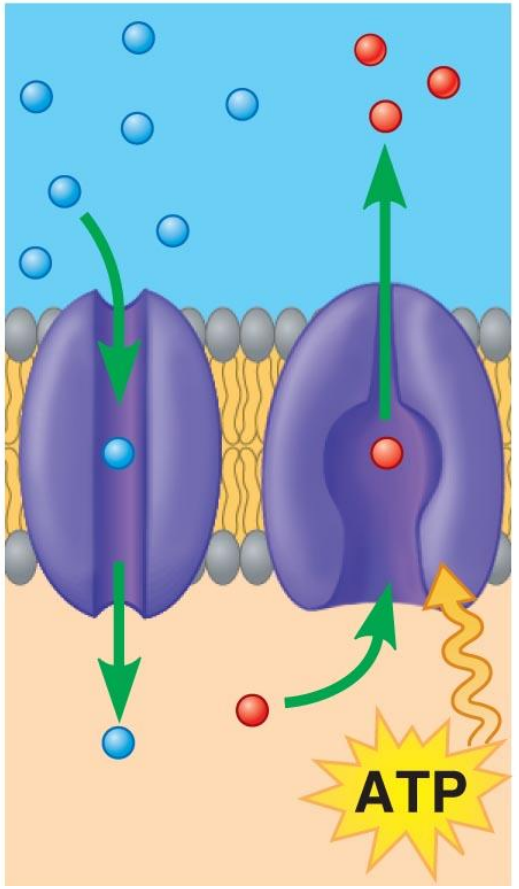
This border is very selective!

Membrane Proteins





Channels



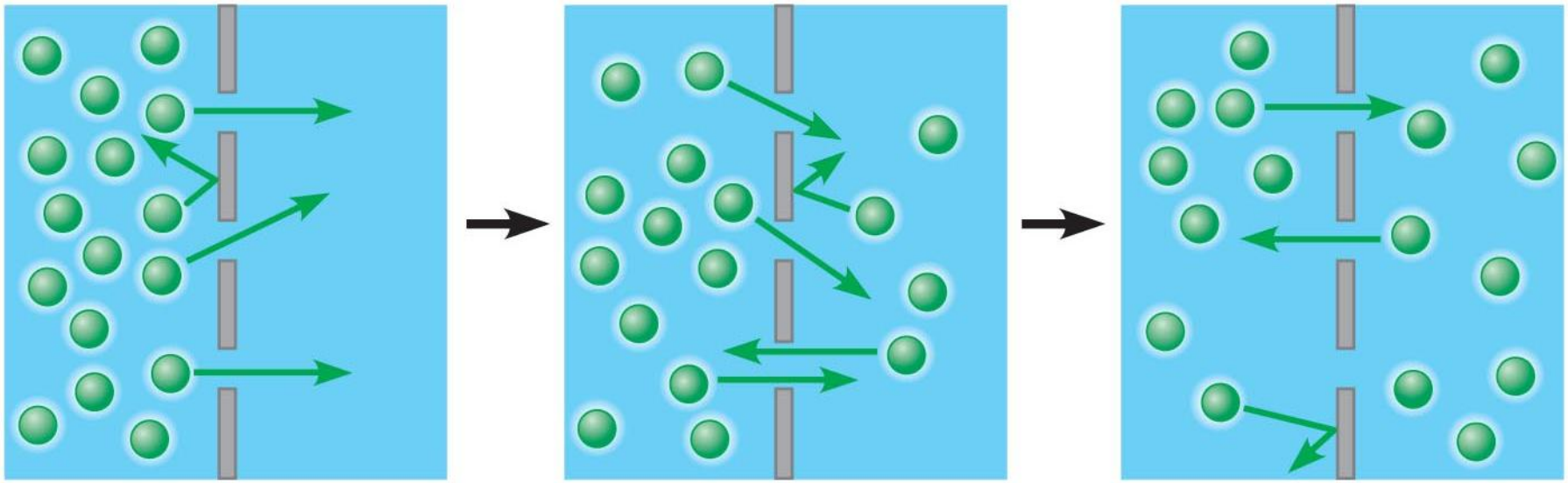
Pumps

5.3 Movement of substances across membranes

- Substances move across membranes by ether passive or active processes.
- Passive processes use kinetic energy (energy of motion) to push substances down their concentration or electrical gradients (differences).
- Active processes use cellular energy in the form of ATP to move substances against the gradient (up hill).
- "No one ever coasts to the top of the hill."

5.3 Movement of substances across membranes
Passive Transport

- **Diffusion** is the movement of substances from an area of higher concentration to an area of lower concentration or down their **concentration gradient.**

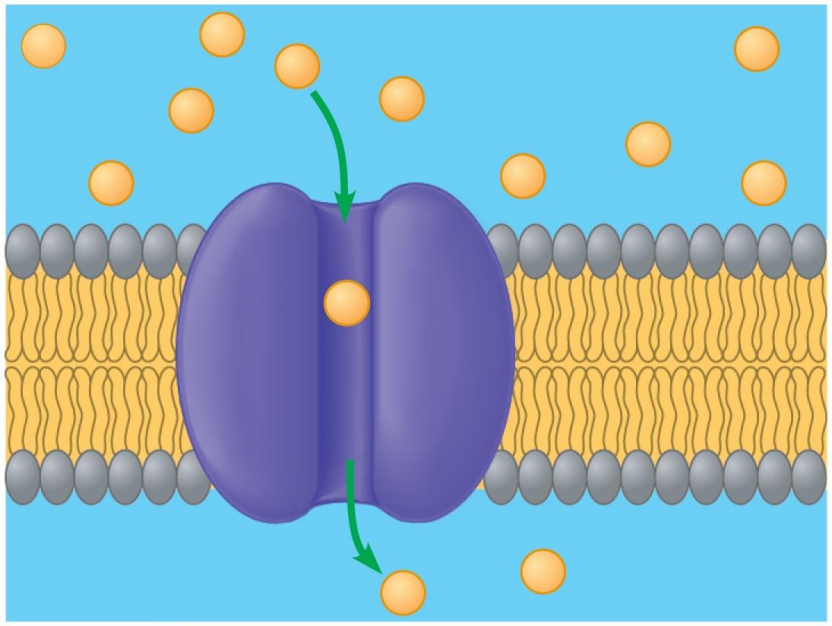


5.3 Movement of substances across membranes
Passive Transport

- Substances that are not lipid soluble must use membrane proteins to assist their diffusion across the cell membrane.

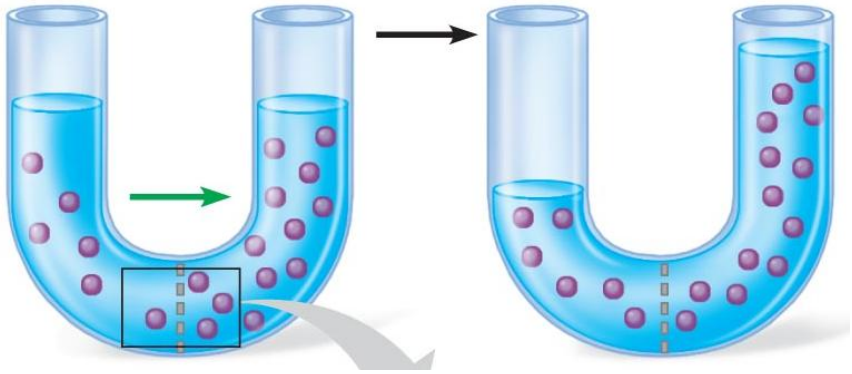
- The membrane proteins can function as channels or as transporters.

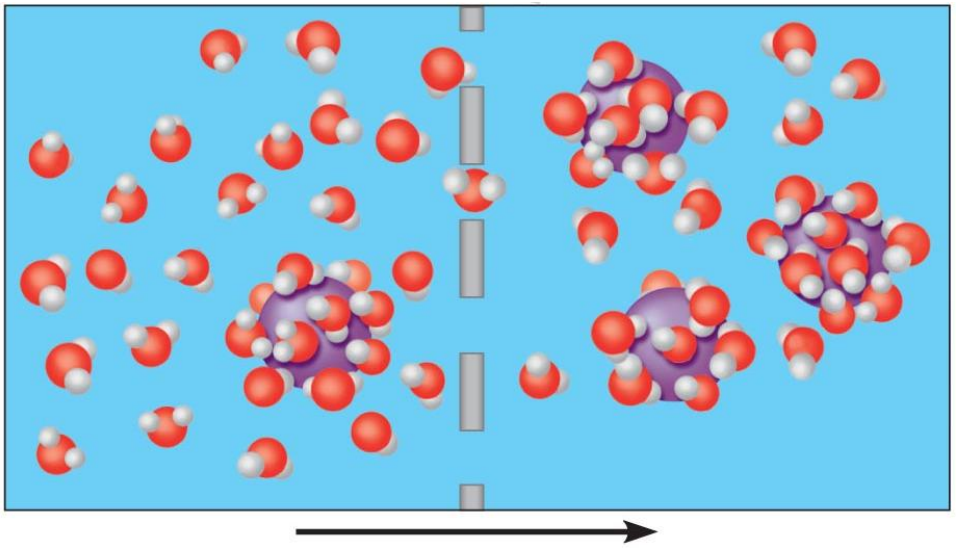
These proteins assist or facilitated the diffusion. This is still a passive transport and does not require ATP energy



5.4 Osmosis is the diffusion of water across a selectively permeable membrane (SPM)

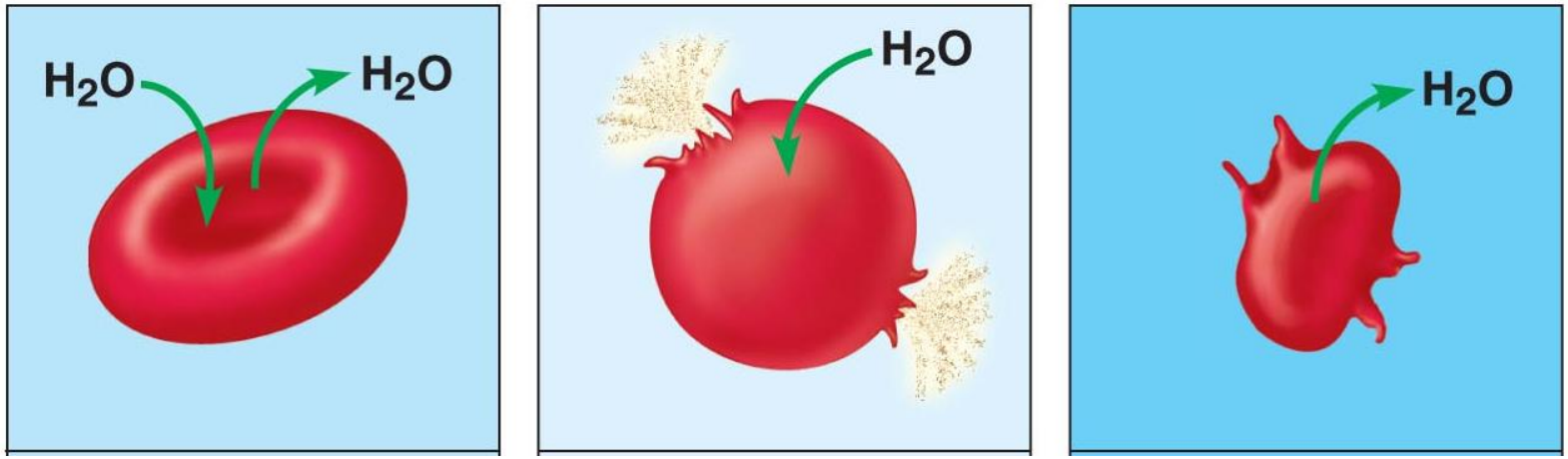
- Water is a substance and so will move from an area of higher concentration to an area of lower concentration (diffuse) like all other substances.
- When water diffuses across a SPM it is called **osmosis.**
- **Concentration Gradient Not Volume!**



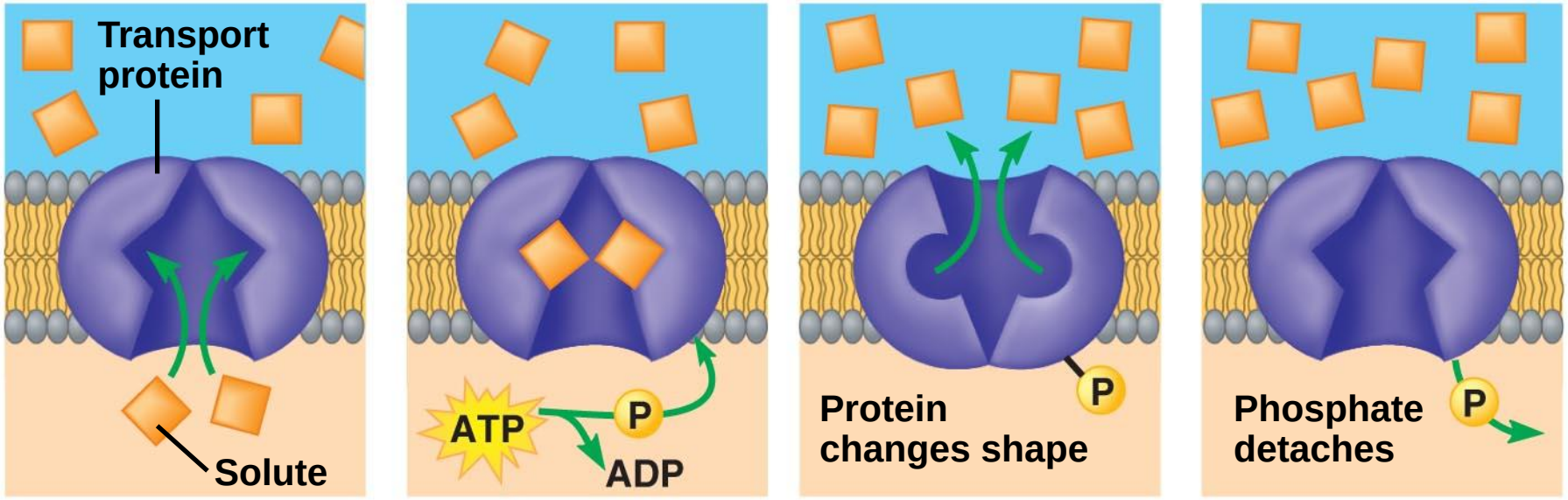


5.5 Tonicity is determined by the solute not the solvent

- Students must keep in mind that **Tonicity** is a comparative term
  - **Isotonic** indicates that the concentration of a solute is the same in both solutions
  - **Hypertonic** indicates that the concentration of solute is higher in one solution compared to another
  - **Hypotonic** indicates that the concentration of solute is lower in one solution compared to another

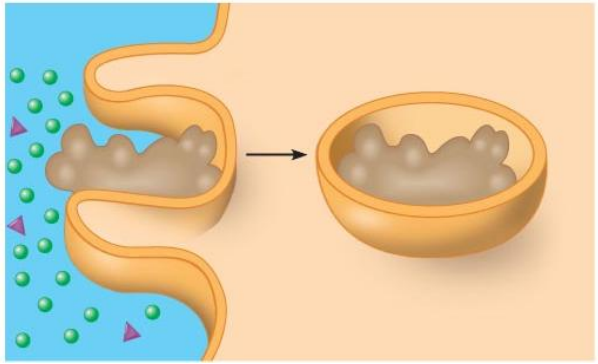


5.8 Cells use ATP to actively transport substances against their concentration gradients

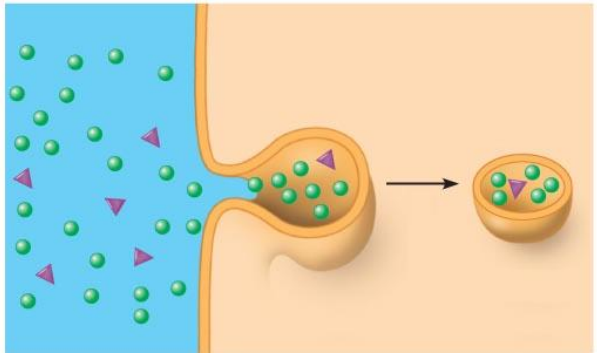


Vesicular Transport: Exocytosis and Endocytosis

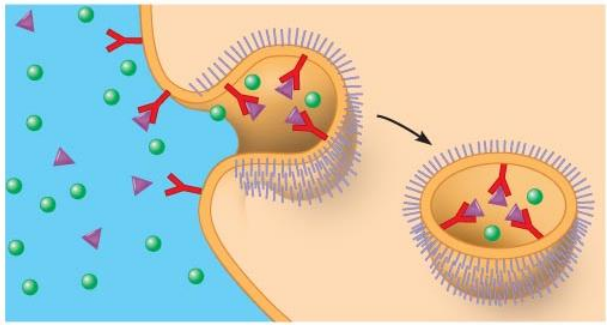
- A cell uses **Exocytosis** to export large substances out of the cell, such as proteins and neurotransmitters
- **Endocytosis** is used to import large substances into the cell.
- There are three types of endocytosis:



Phagocytosis – "cell eating"



Pinocytosis – "cell drinking"



Receptor-mediated endocytosis