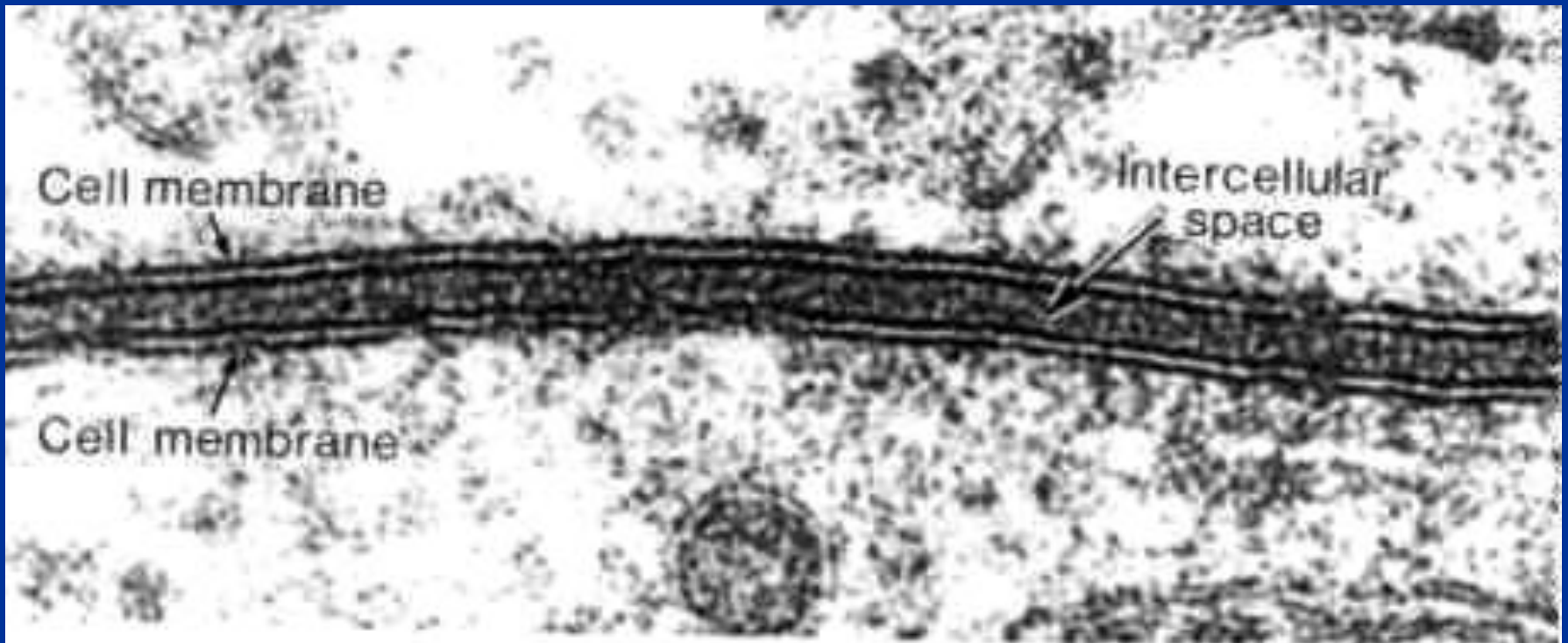


Cellular Transport

Ch. 5



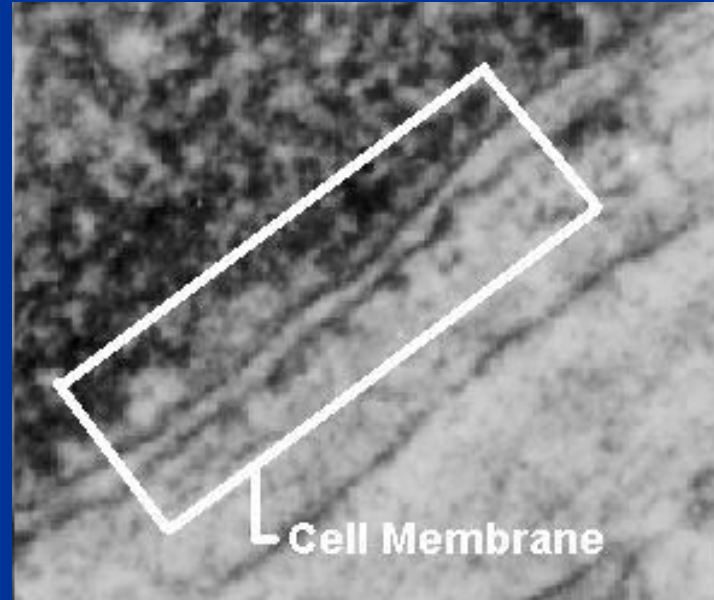
About Cell Membranes

1. All cells have a cell membrane

2. Functions:

a. Controls what enters and exits the cell to maintain an internal balance called homeostasis

b. Provides protection and support for the cell



TEM picture of a real cell membrane.

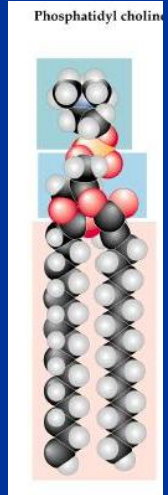
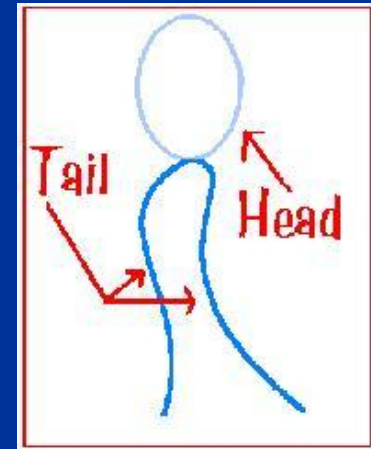
About Cell Membranes (continued)

3. Structure of cell membrane
Lipid Bilayer - 2 layers of phospholipids

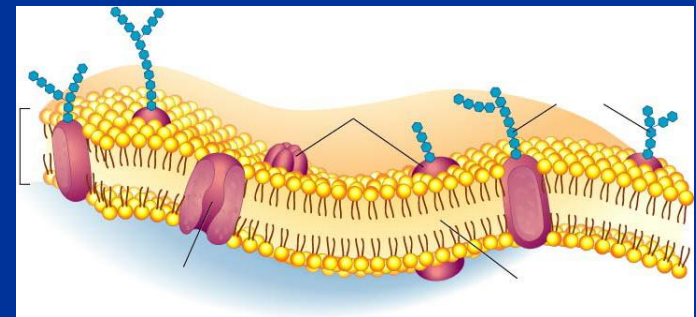
a. Phosphate head is ***polar***
(water loving)

b. Fatty acid tails ***non-polar***
(water fearing)

c. Proteins embedded in membrane

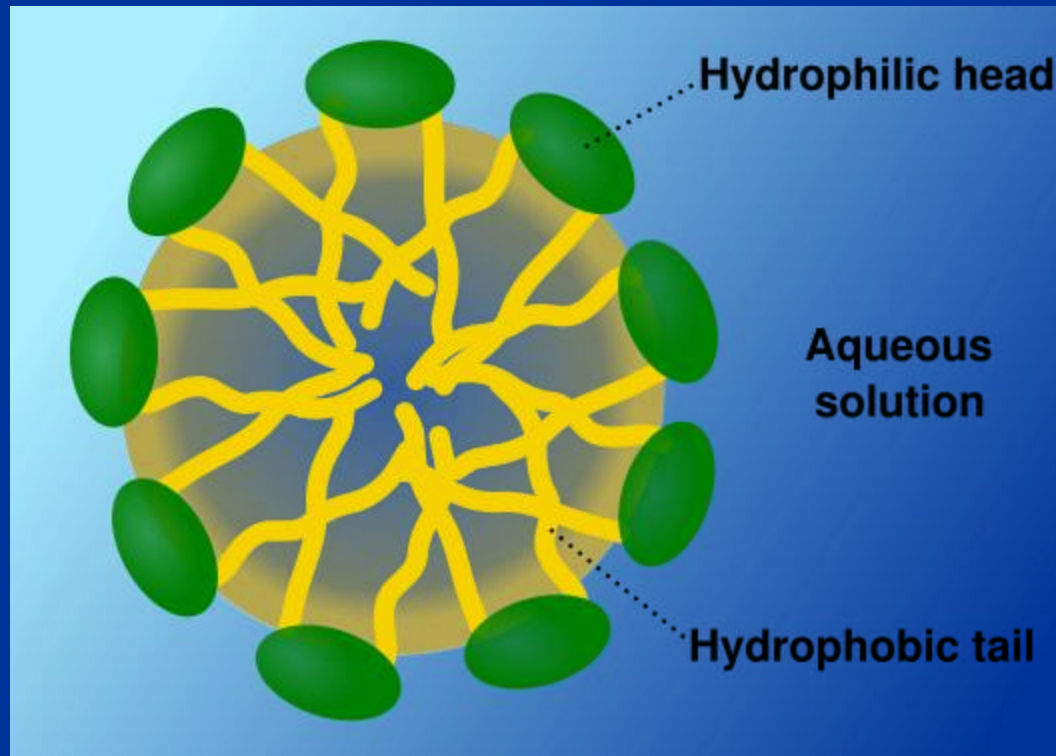


Phospholipid

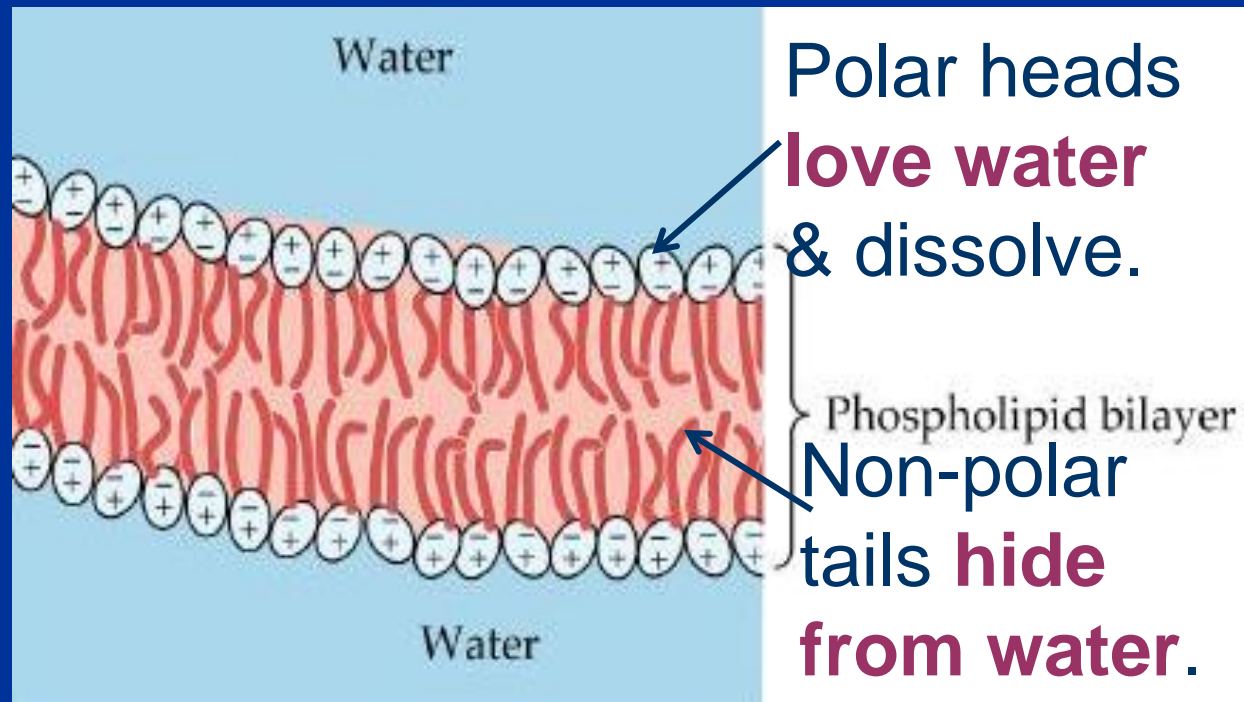
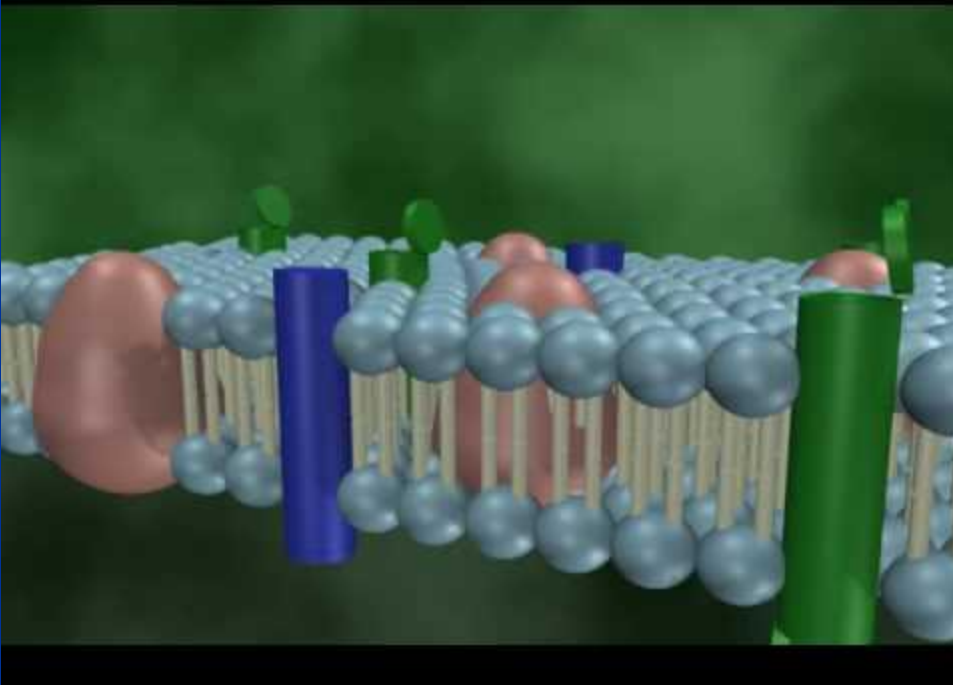


Lipid Bilayer

Phospholipids & Soap

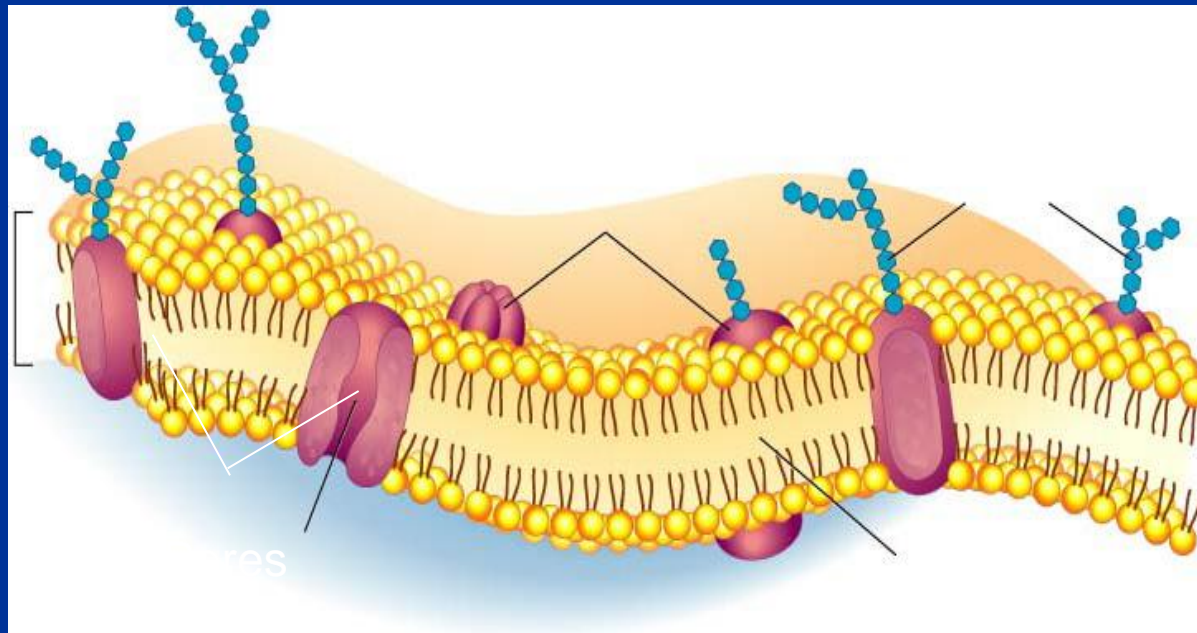


Fluid Mosaic Model of the cell membrane



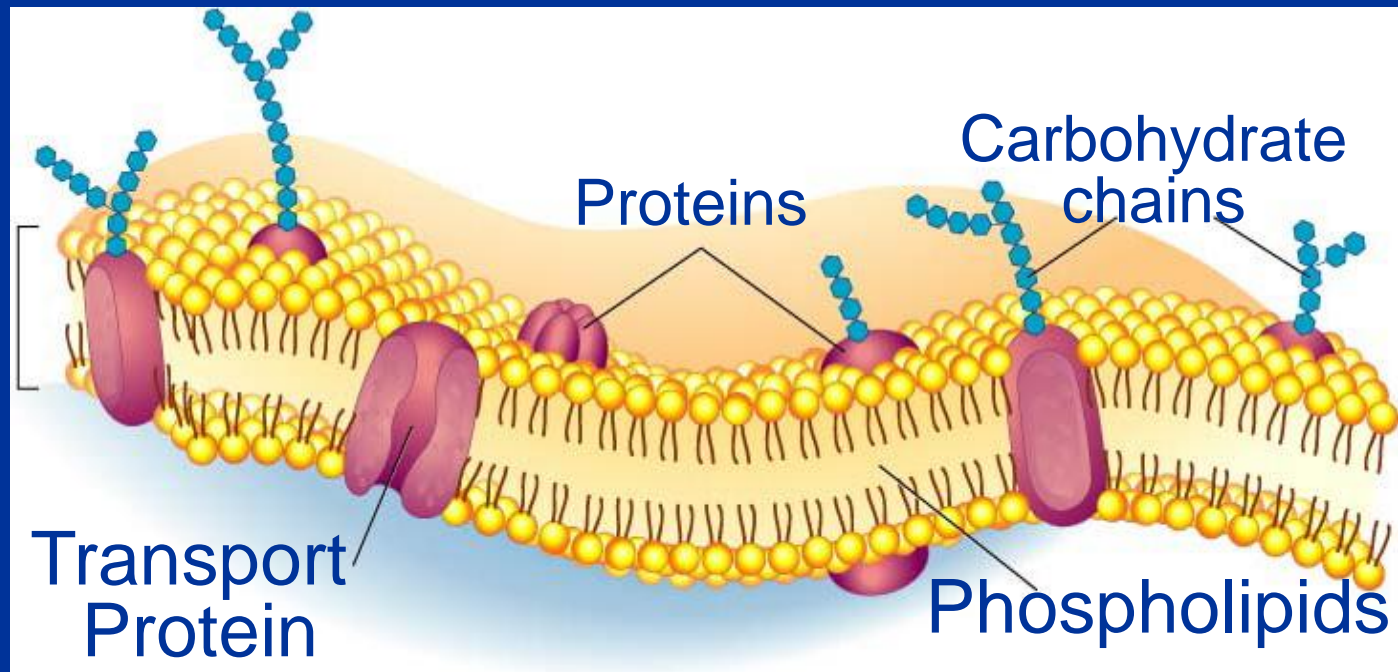
About Cell Membranes (continued)

- 4. Cell membranes have pores (holes) in it
 - a. Selectively permeable:** Allows some molecules in and keeps other molecules out
 - b. The structure helps it be selective!**



Structure of the Cell Membrane

Outside of cell



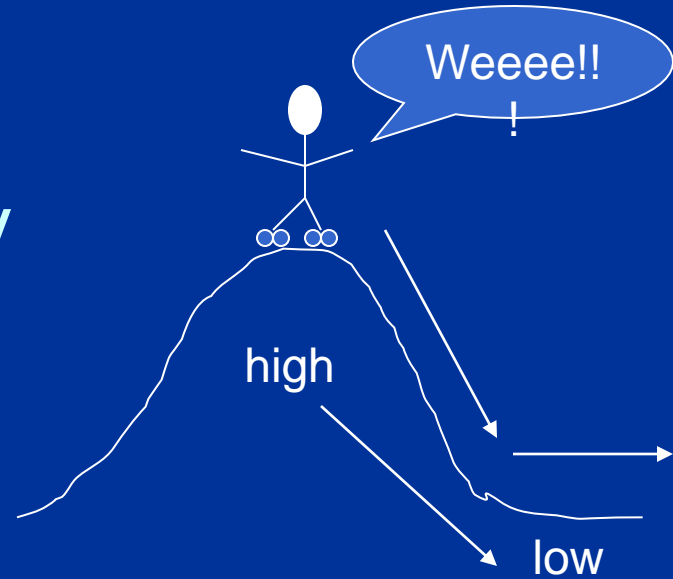
Inside of cell
(cytoplasm)

Types of Cellular Transport

- **Passive Transport**

cell doesn't use energy

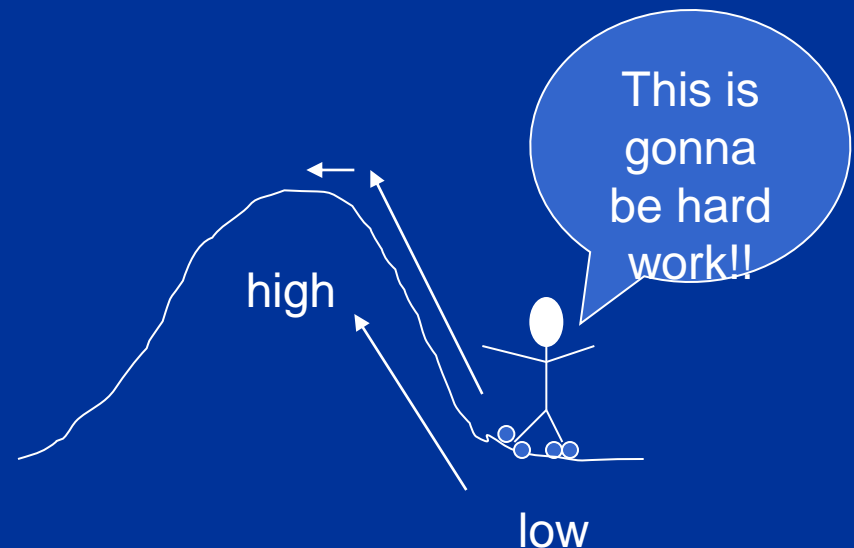
1. Diffusion
2. Facilitated Diffusion
3. Osmosis



- **Active Transport**

cell does use energy

1. Protein Pumps
2. Endocytosis
3. Exocytosis



Passive Transport

- cell **uses no energy**
- molecules move randomly
- Molecules spread out **from an area of high concentration to an area of low concentration.**
- (High → Low)
- **Three types:**

3 Types of Passive Transport

1. **Diffusion**
2. **Facilitative Diffusion** – diffusion with the help of transport proteins
3. **Osmosis** – diffusion of water

Passive Transport:

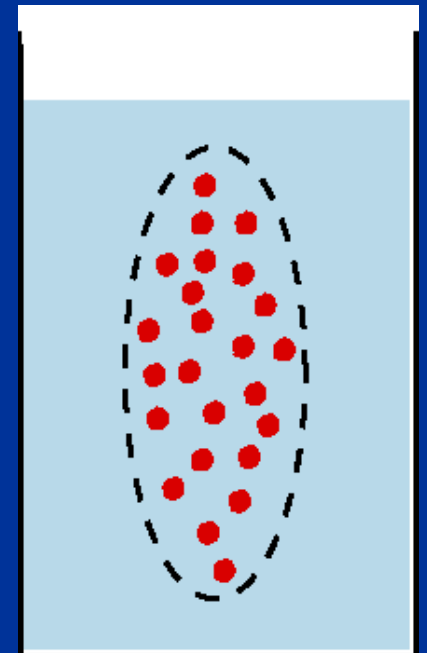
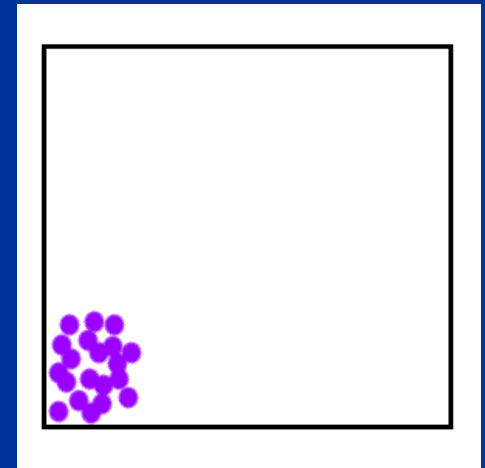
1. Diffusion

1. **Diffusion:** random movement of particles **from an area of high concentration to an area of low concentration.**

(High to Low)

- Diffusion continues until all molecules are evenly spaced (**equilibrium** is reached)-Note: molecules will still move around but stay spread out.

Simple Diffusion Animation



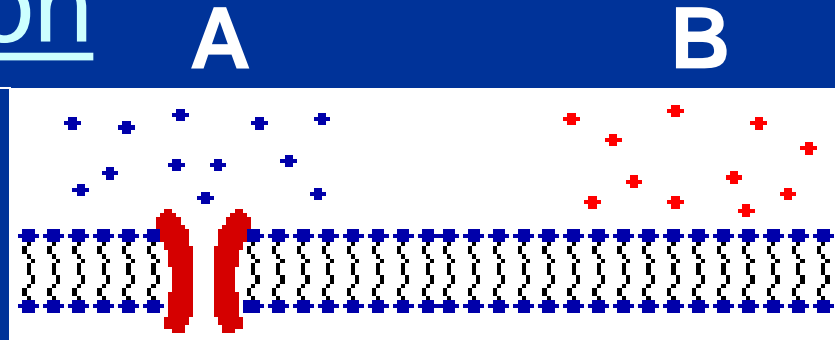
Passive Transport:

2. Facilitated Diffusion

2. **Facilitated diffusion:**

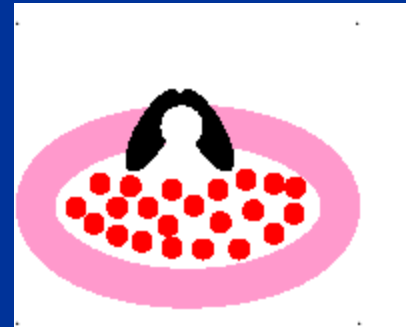
diffusion of specific particles **through transport proteins** found in the membrane

- Transport Proteins are specific – they “select” only certain molecules to cross the membrane
- Transports larger or charged molecules



**Facilitated
diffusion
(Channel
Protein)**

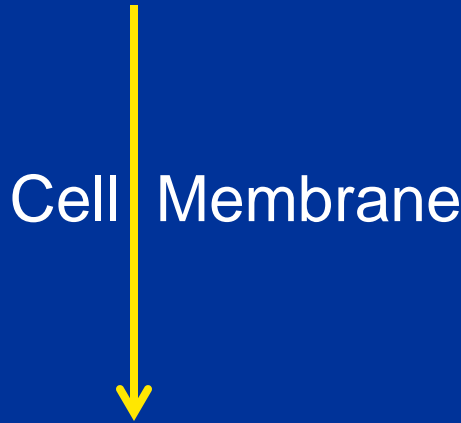
**Diffusion
(Lipid
Bilayer)**



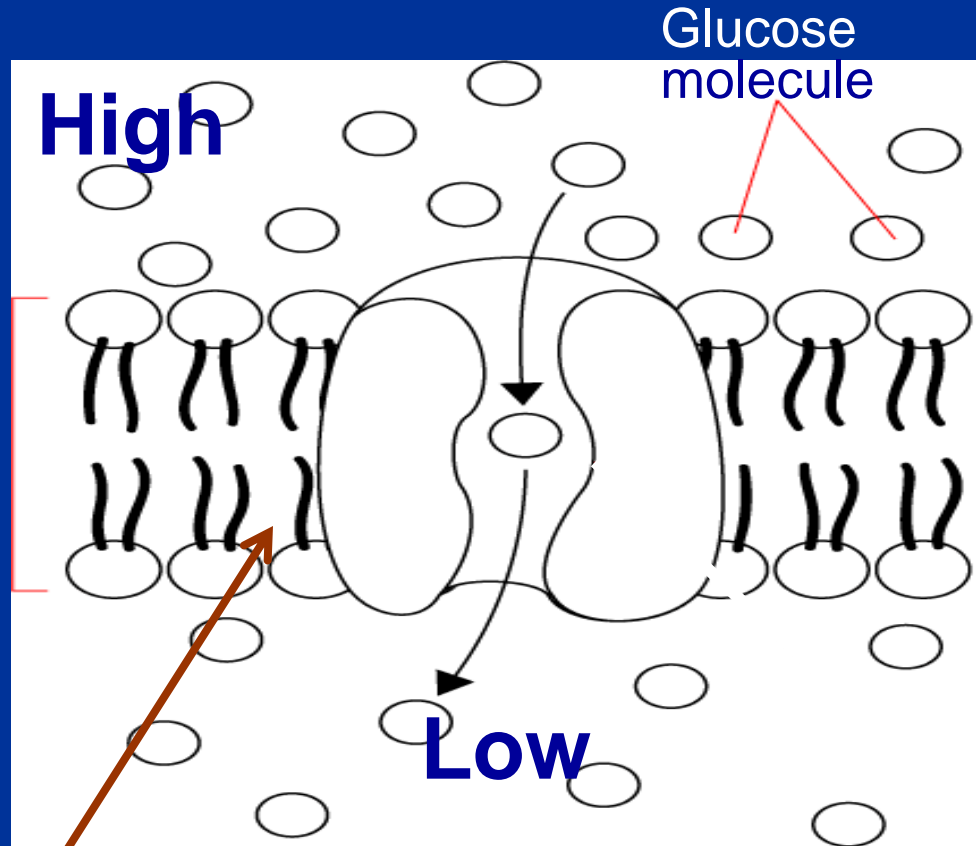
Carrier Protein

Passive Transport: 2. Facilitated Diffusion

Cellular Transport From a-
High Concentration



Low Concentration



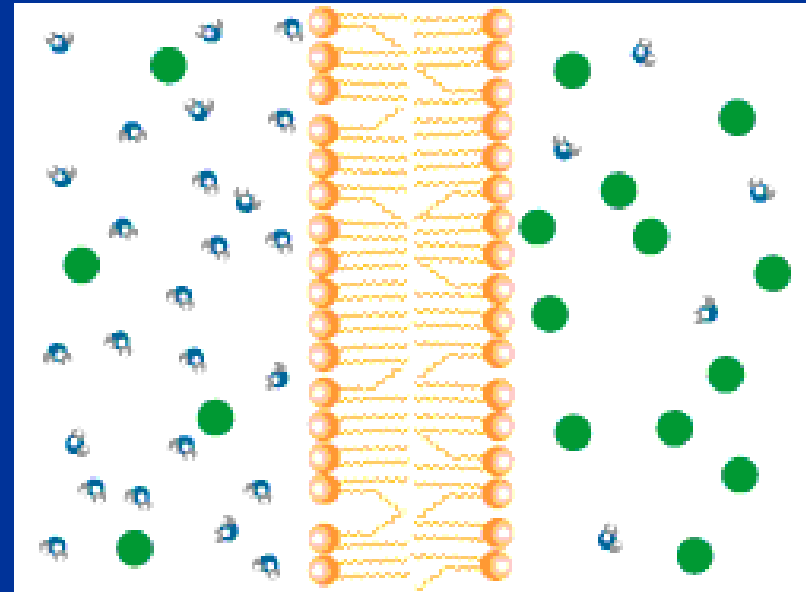
Through a →
Transport
Protein

Passive Transport:

3. Osmosis

- **3.Osmosis:** diffusion of *water* through a selectively permeable membrane
- Water moves from high to low concentrations

Osmosis
animation



- Water moves freely through pores.
- Solute (green) too large to move across.

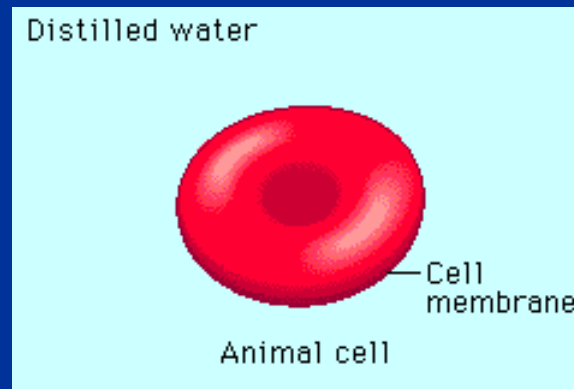
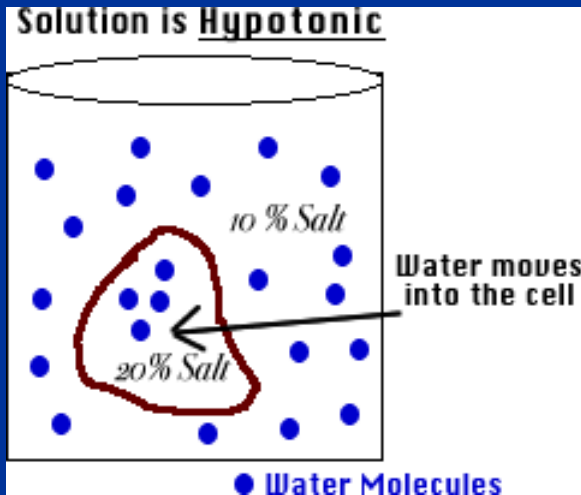
Effects of Osmosis on Life

- **Osmosis**- diffusion of water through a selectively permeable membrane
- **Water is so small and there is so much of it the cell can't control it's movement through the cell membrane.**

Hypotonic Solution

- [Osmosis](#)
Animations for isotonic, hypertonic, and hypotonic solutions

Hypotonic: The solution has a lower concentration of solutes and a higher concentration of water than inside the cell. (**Low solute; High water**)



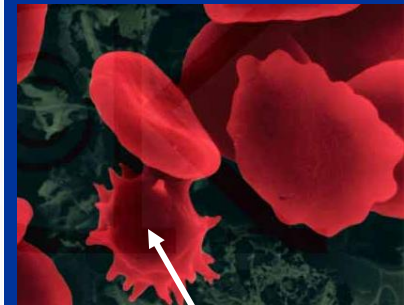
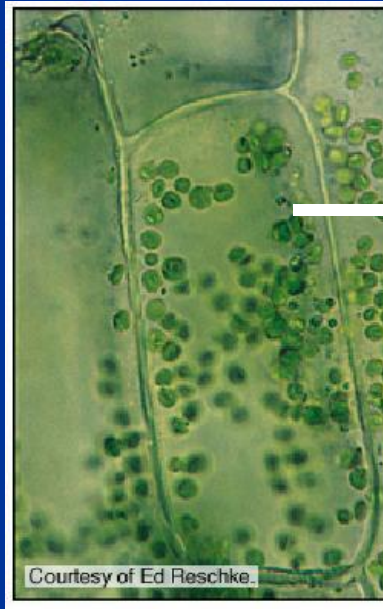
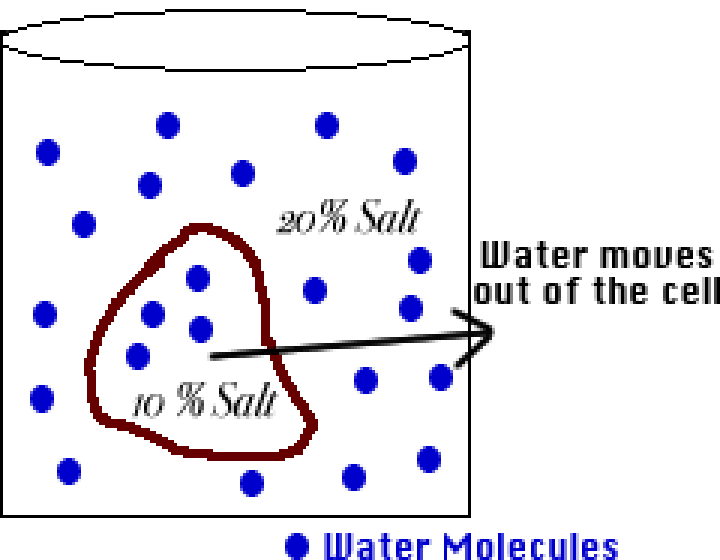
Result: Water moves from the solution to inside the cell): Cell Swells and bursts open (**cytolysis**)!

Hypertonic Solution

- Osmosis Animations for isotonic, hypertonic, and hypotonic solutions

Hypertonic: The solution has a higher concentration of solutes and a lower concentration of water than inside the cell. (**High solute; Low water**)

Solution is Hypertonic



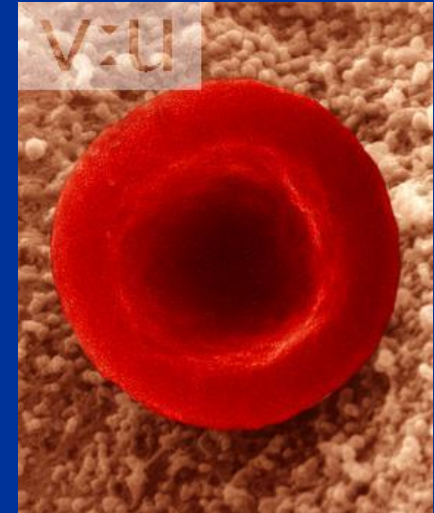
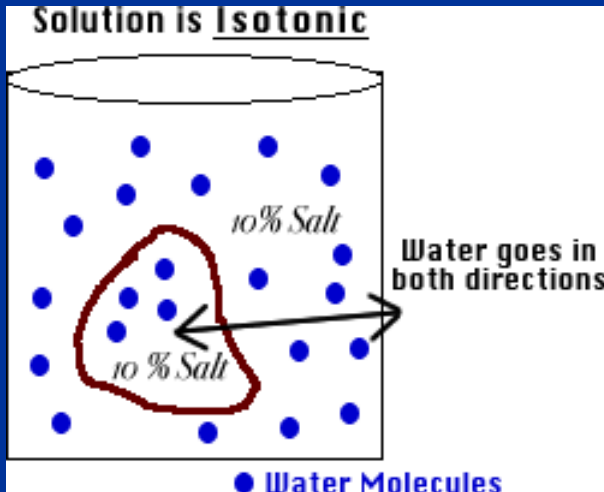
shrinks

Result: Water moves from inside the cell into the solution: Cell shrinks (*Plasmolysis*)!

- [Osmosis](#)
Animations for isotonic, hypertonic, and hypotonic solutions

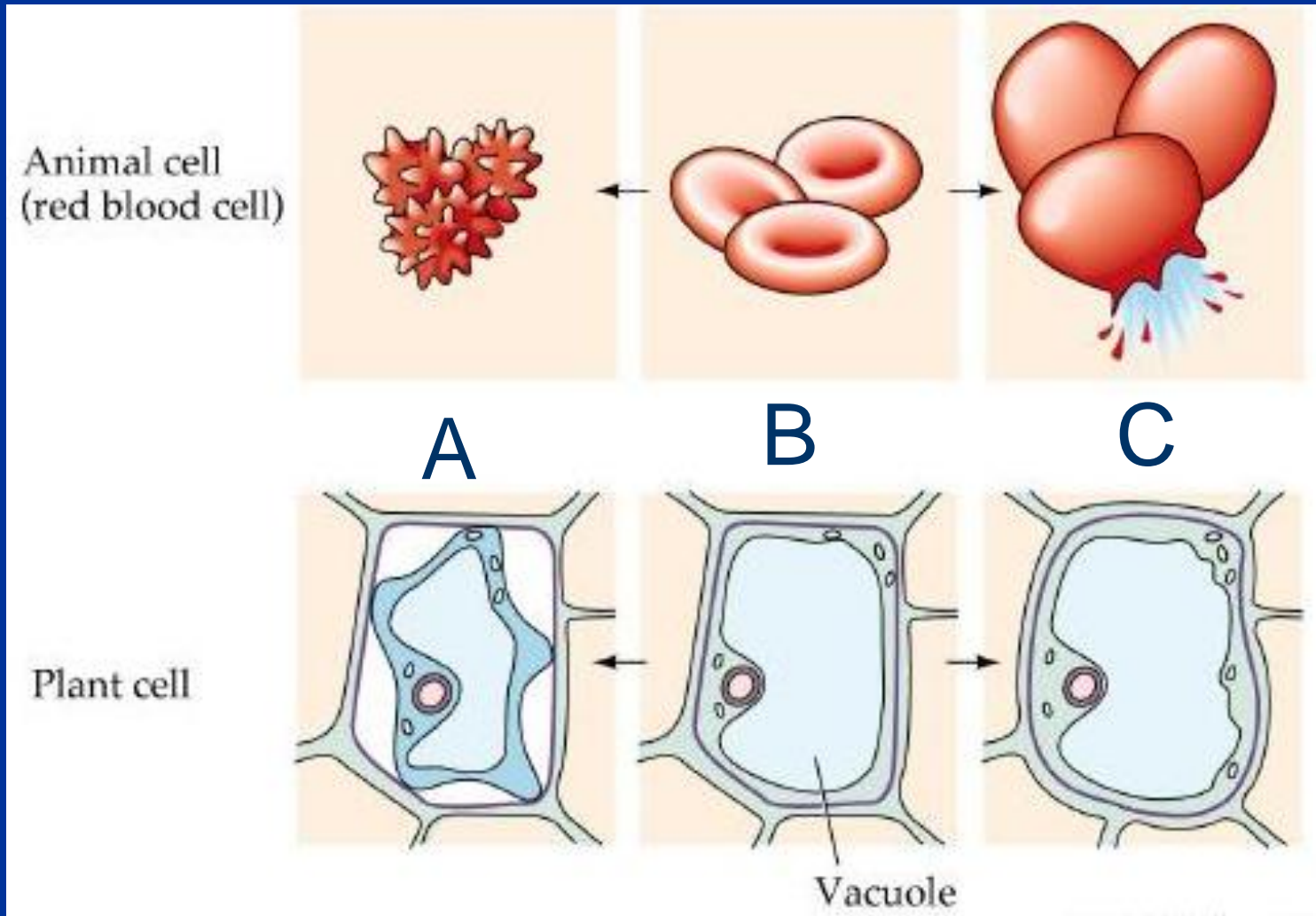
Isotonic Solution

Isotonic: The concentration of solutes in the solution is equal to the concentration of solutes inside the cell.



Result: Water moves equally in both directions and the cell remains same size! (Dynamic Equilibrium)

What type of solution are these cells in?



Hypertonic

Isotonic

Hypotonic

How Organisms Deal with Osmotic Pressure

- [Paramecium \(protist\) removing excess water video](#)

- **Bacteria and plants** have **cell walls** that prevent them from over-expanding. In plants the pressure exerted on the cell wall is called **turgor pressure**.
- A **protist** like paramecium has **contractile vacuoles** that collect water flowing in and pump it out to prevent them from over-expanding.
- **Salt water fish** pump salt out of their **specialized gills** so they do not dehydrate.
- **Animal cells** are bathed in **blood**. **Kidneys** keep the blood isotonic by remove excess salt and water.

Active Transport

- cell **uses energy**
- actively moves molecules to where they are needed
- Movement **from an area of low concentration to an area of high concentration**
- **(Low → High)**
- Three Types:

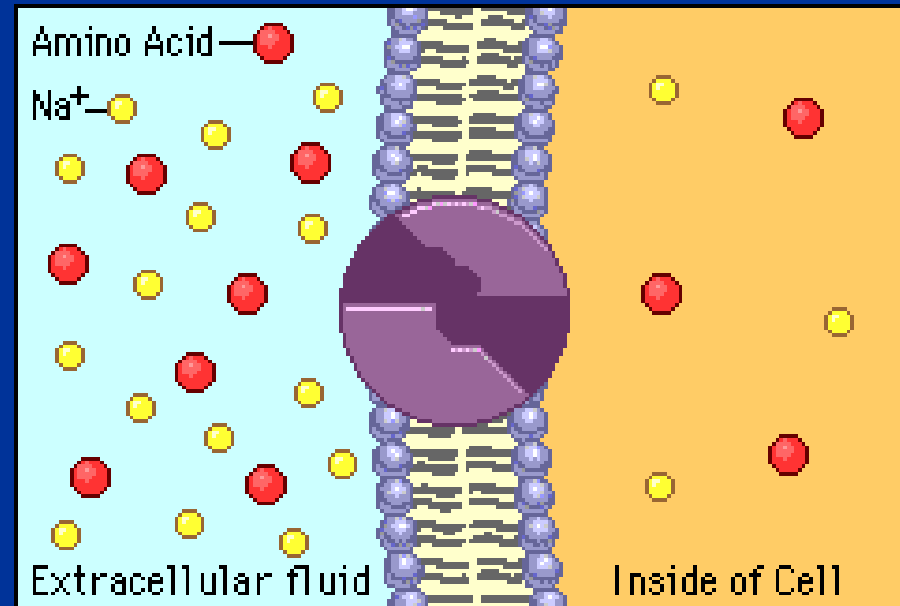
Types of Active Transport

Sodium
Potassium Pumps
(Active Transport
using proteins)

1. Protein Pumps -

transport proteins that require energy to do work

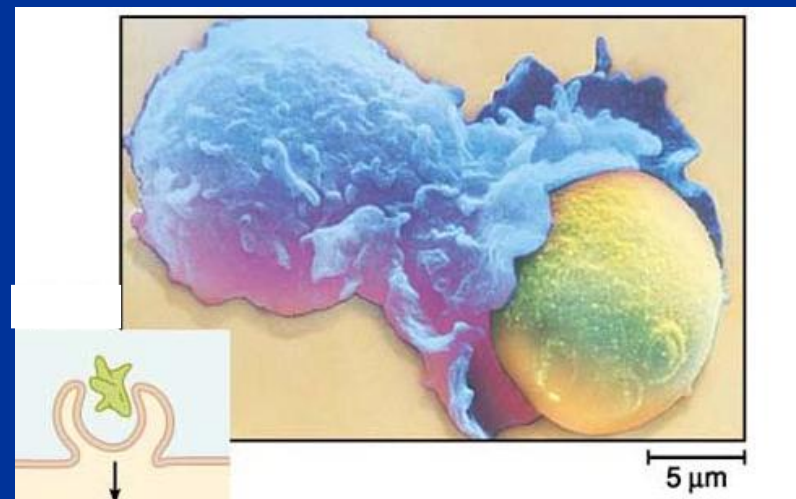
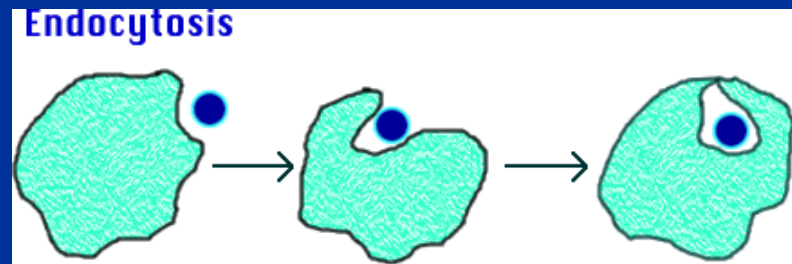
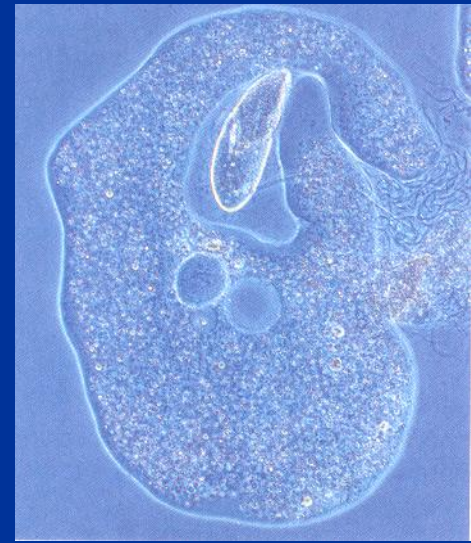
- **Example:** Sodium / Potassium Pumps are important in nerve responses.



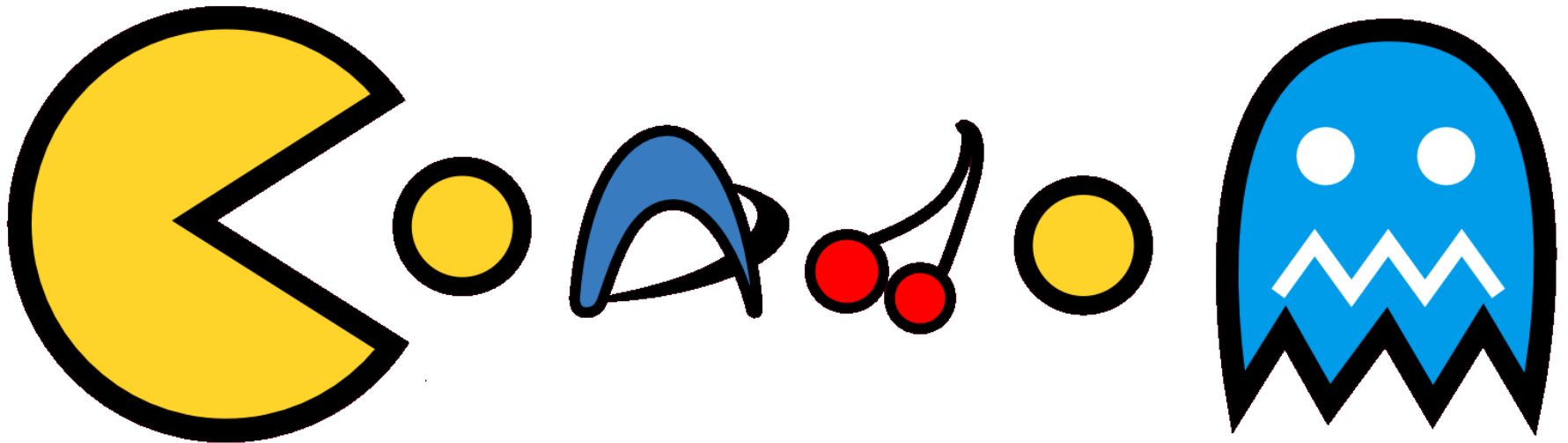
Protein changes shape to move molecules: this requires energy!

Types of Active Transport

- **2. Endocytosis:** taking bulky material into a cell
 - Uses energy
 - Cell membrane in-folds around food particle
 - “*cell eating*”
 - forms food vacuole & digests food
 - This is how white blood cells eat bacteria!



Endocytosis & Pac - Man

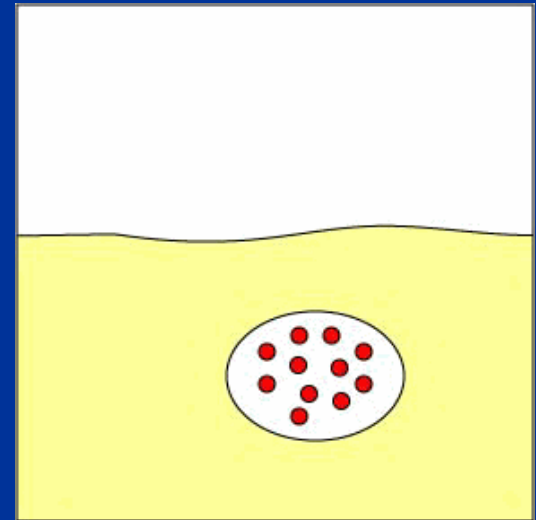


Types of Active Transport

3. **Exocytosis:** Forces material out of cell in bulk

- membrane surrounding the material fuses with cell membrane
- Cell changes shape – requires energy
- EX: Hormones or wastes released from cell

[Endocytosis & Exocytosis animations](#)



Exocytosis &.....



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