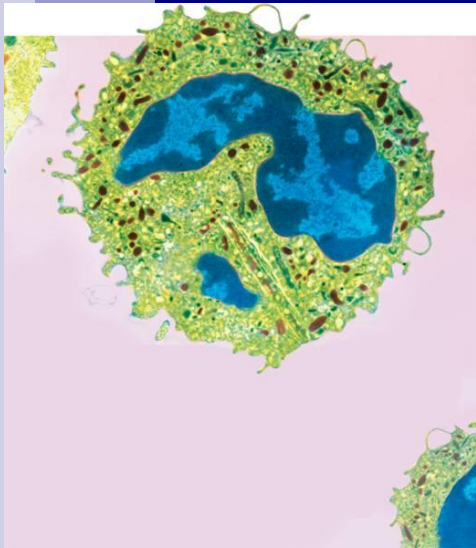


# Cell Transport Notes

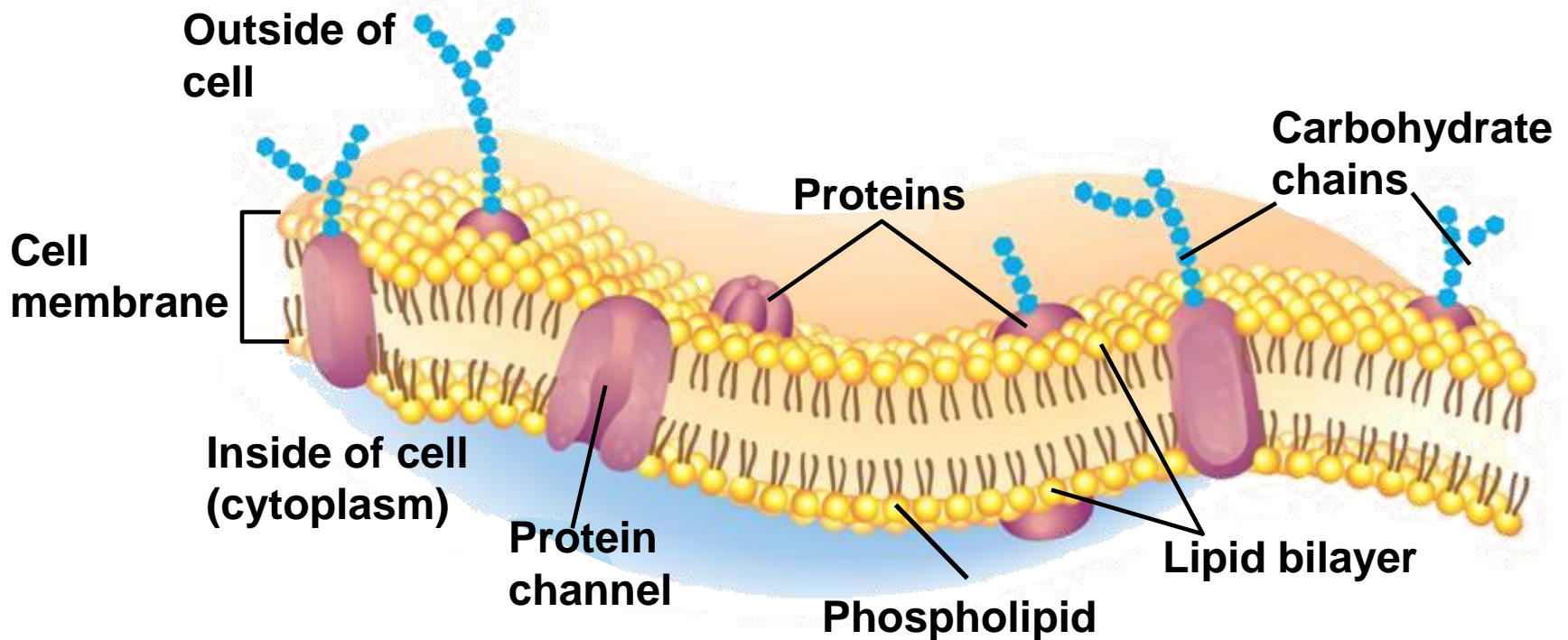


- Diffusion and Osmosis
- Active Transport

# Cell Membrane

- All cells are surrounded by a thin, flexible barrier known as the **cell membrane**.
  - The Cell Membrane has two major functions.
    - forms a boundary between inside and outside of the cell (provides protection and support)
    - regulates passage of materials into and out of the cell.

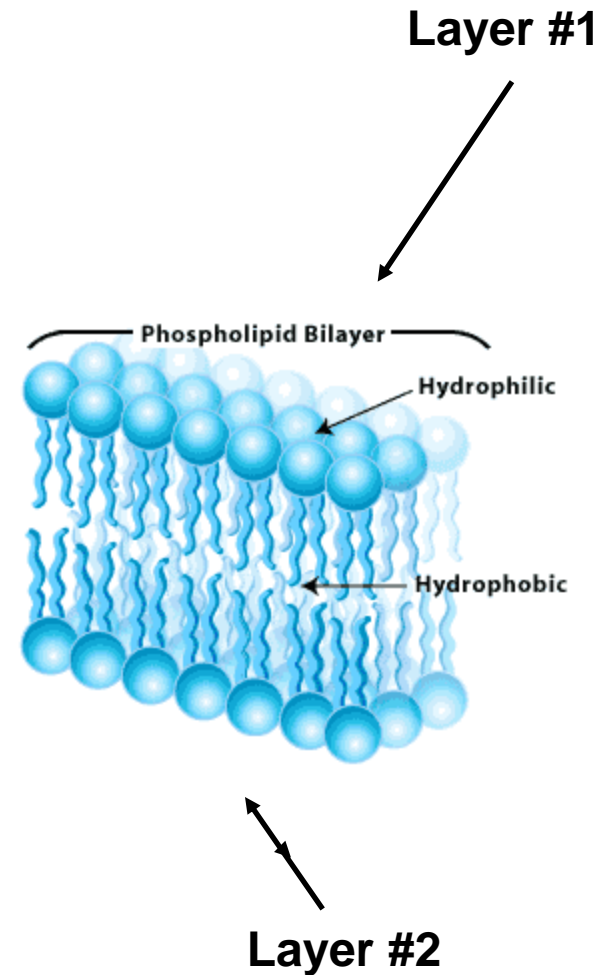
# Components of the Cell Membrane



- Now...lets take a closer look at cell membrane!

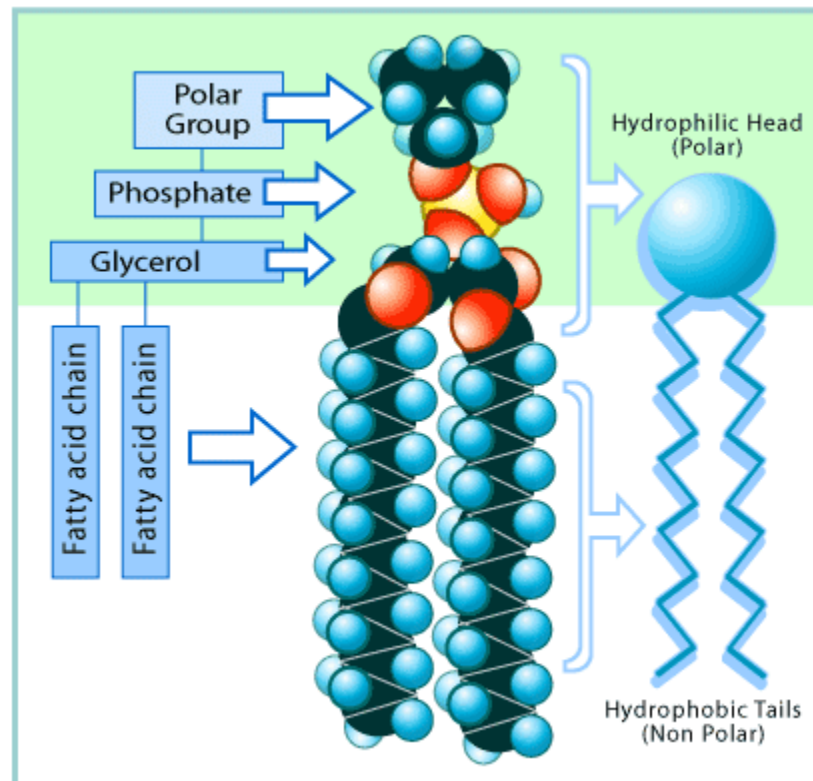
# Lipid Bilayers (2 layers of phospholipids)

- Phospholipids arrange themselves in lipid bilayers to make the cell membrane!
- The lipid bilayer gives the cell membranes a flexible structure that forms a barrier between the cell and its surroundings.



# Phospholipids

- Phospholipids are the major component of cell membranes



## Hydrophilic

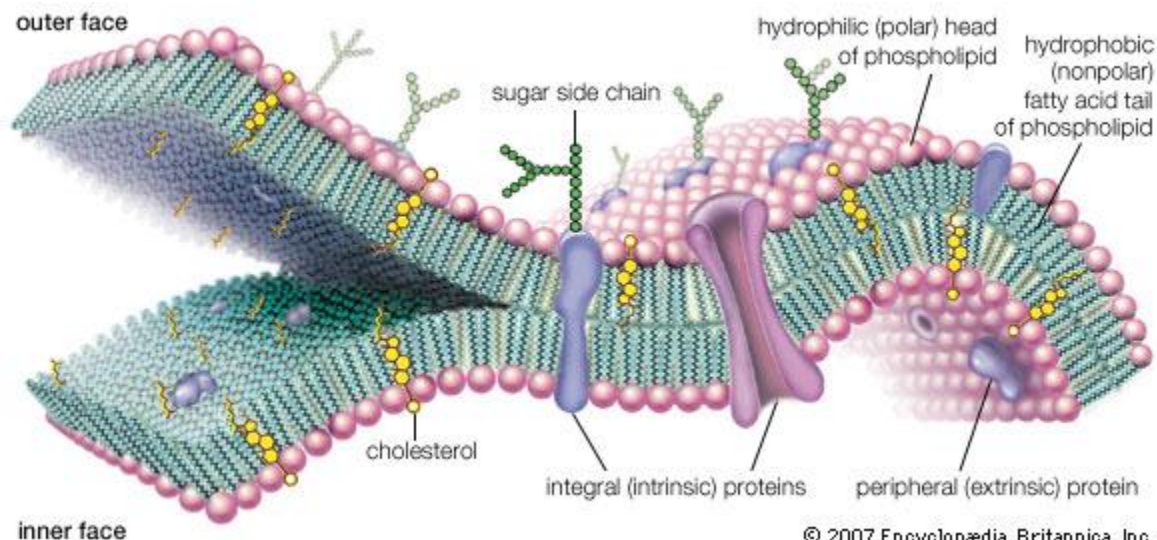
- likes water
- *polar*

## Hydrophobic

- dislikes water
- *non-polar*

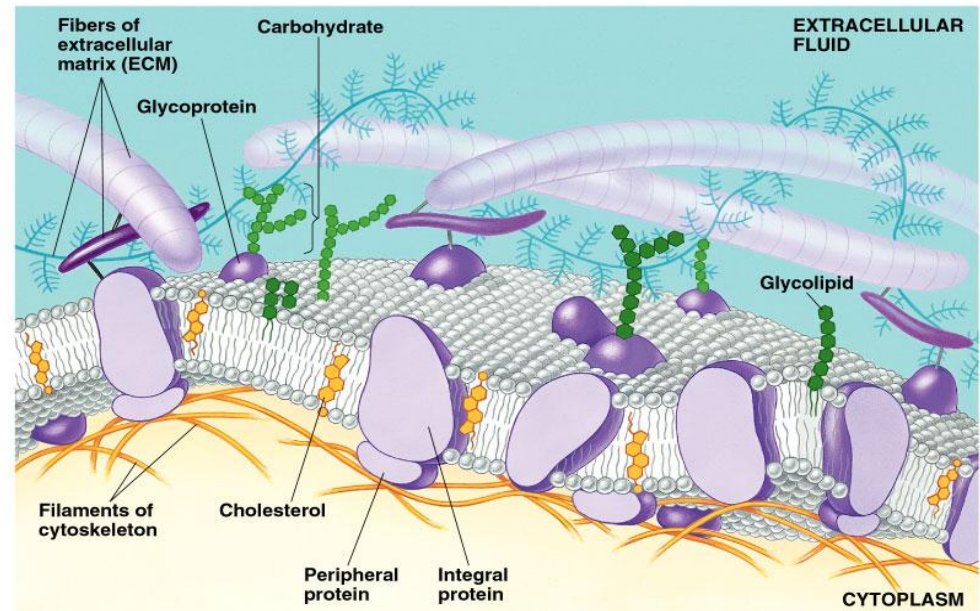
# Within the Layer

- Many different parts:
  - Sterols – Animal Cells that is the Cholesterol
  - Proteins
    - Markers
    - Receptors
    - Transporters
    - Enzymes
    - Anchoring

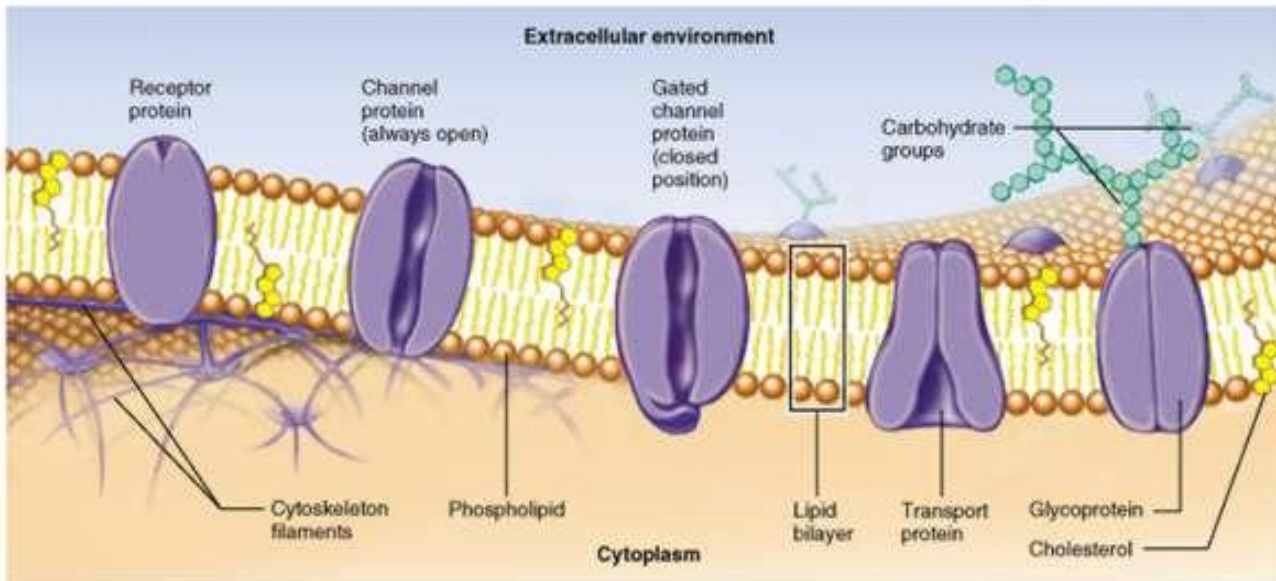


# Fluid Mosaic Model

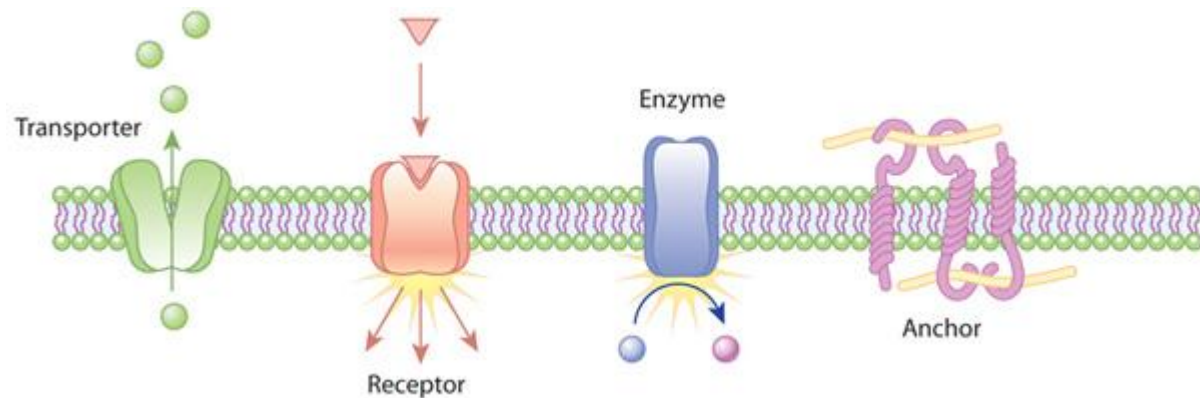
- Movement!
- Cholesterol/Sterols Purpose:
  - Keep the membrane firm and prevent freezing



# Proteins



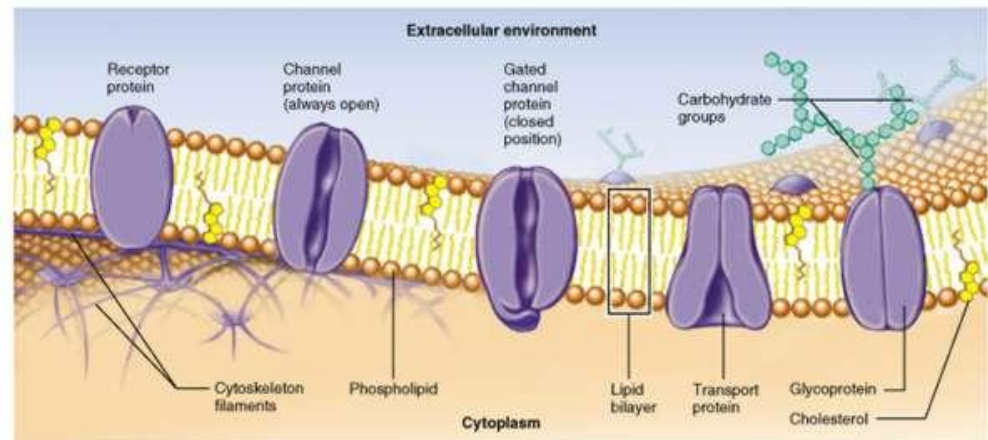
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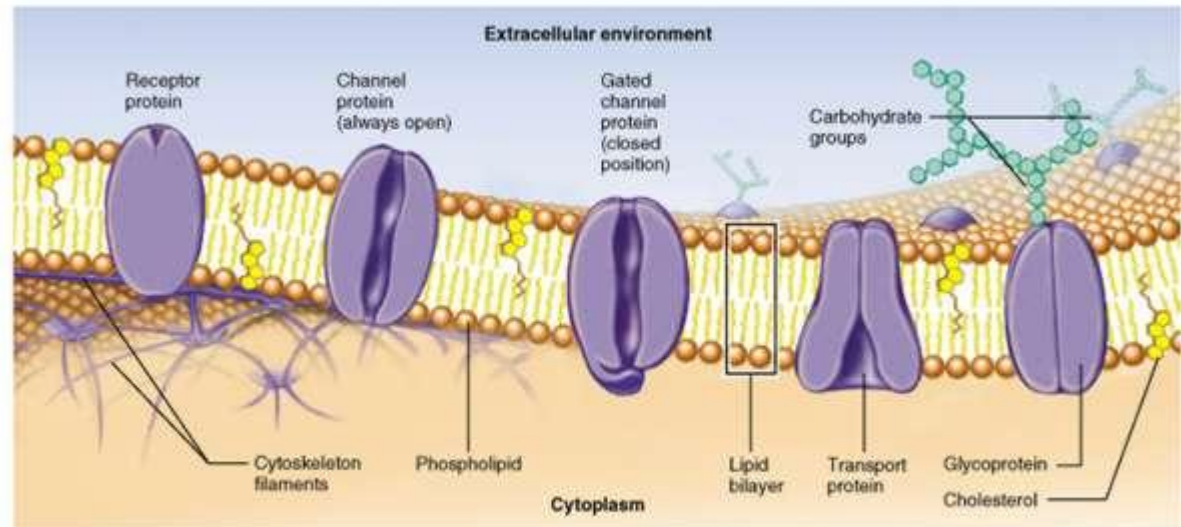
# Marker Proteins

- Purpose: Identifies the cell type
- How: Has a carbohydrate attached to the outside
- Can be called glycoprotein



# Receptor Proteins

- Purpose: Recognizes and binds to substances outside of the cell and sends a signal to the cell
  - Hormones





# Transport Proteins

- **Passive Diffusion:**

- **Channel Proteins**

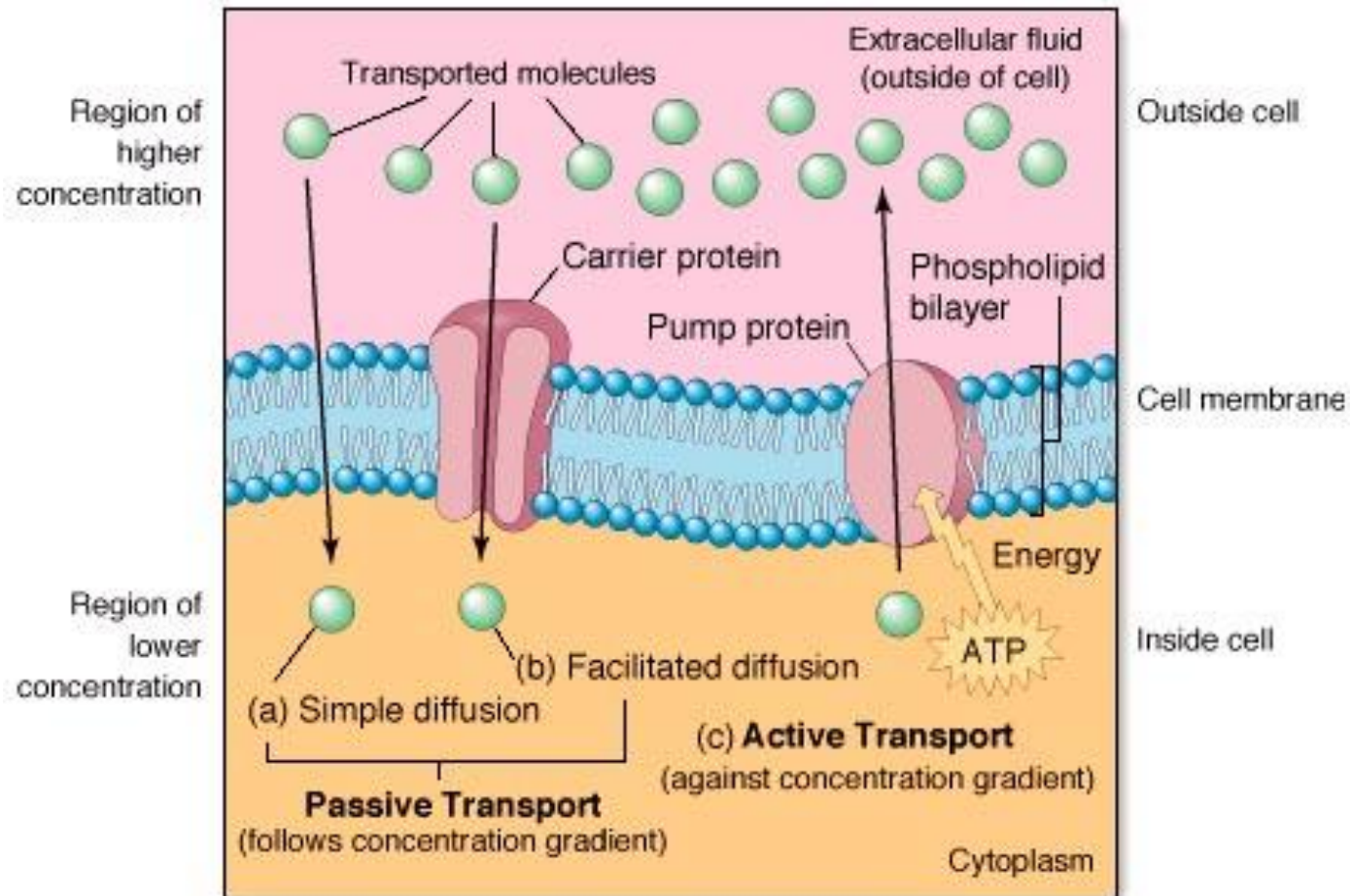
- **Purpose:** Create a hole to allow larger molecules to pass through the membrane

- **Active Transport:**

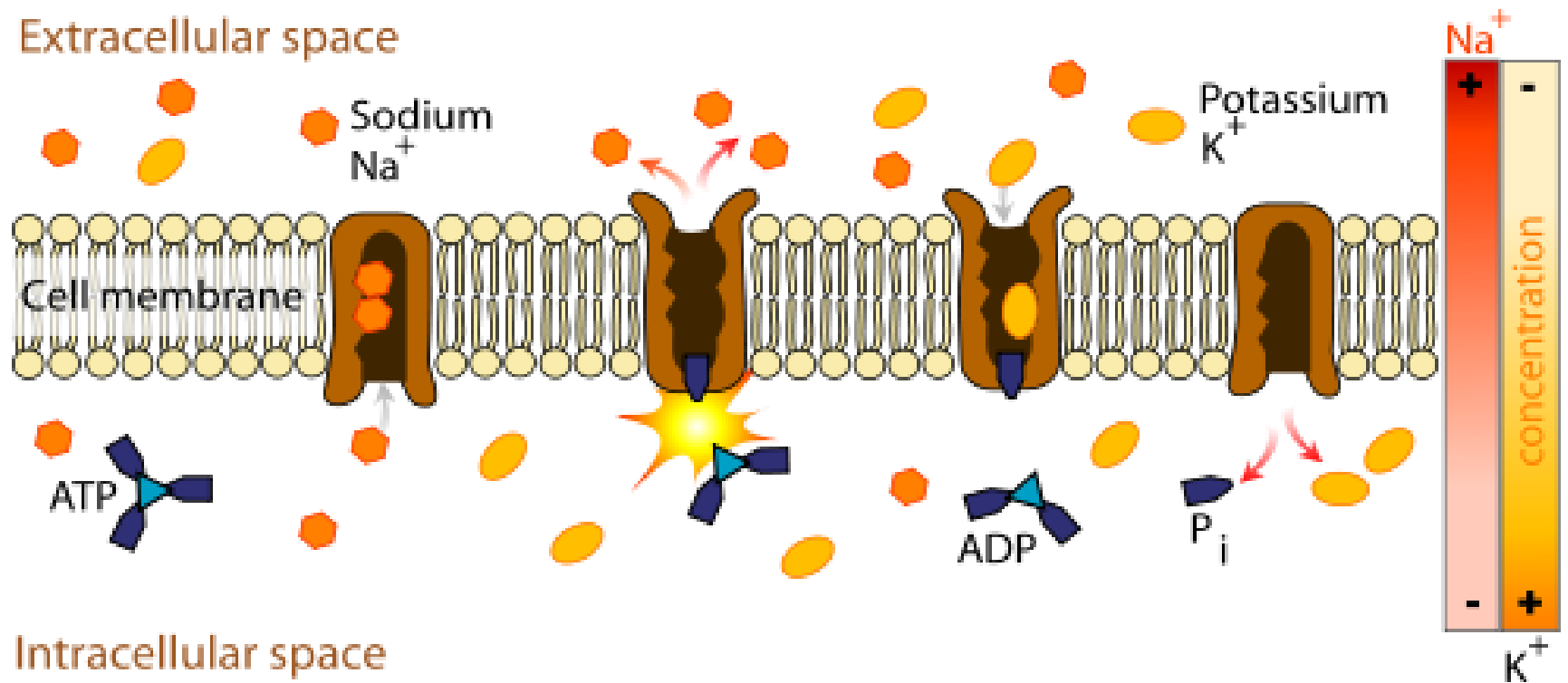
- **Protein Pumps**

- **Purpose:** Uses energy to move molecules against the concentration gradient

# Transport Proteins

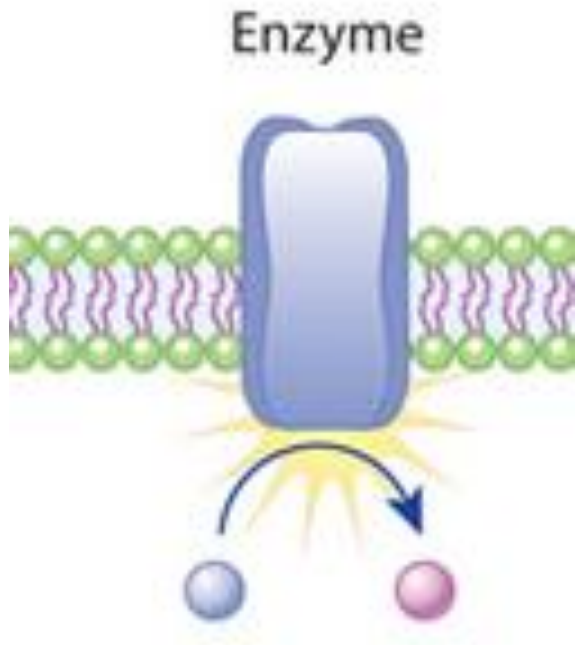


# Active Transport



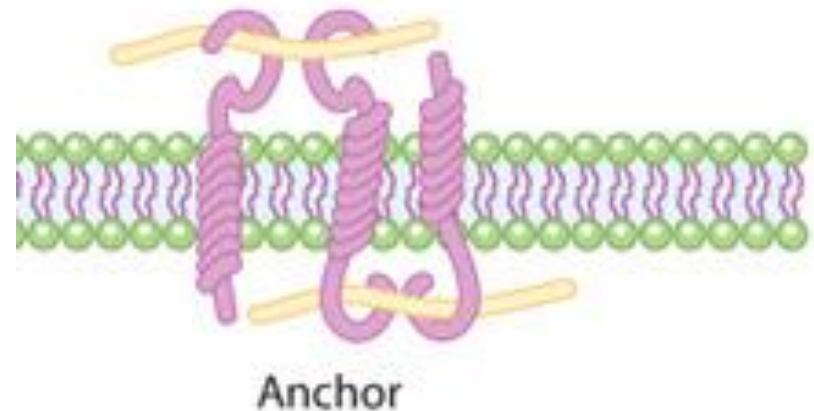
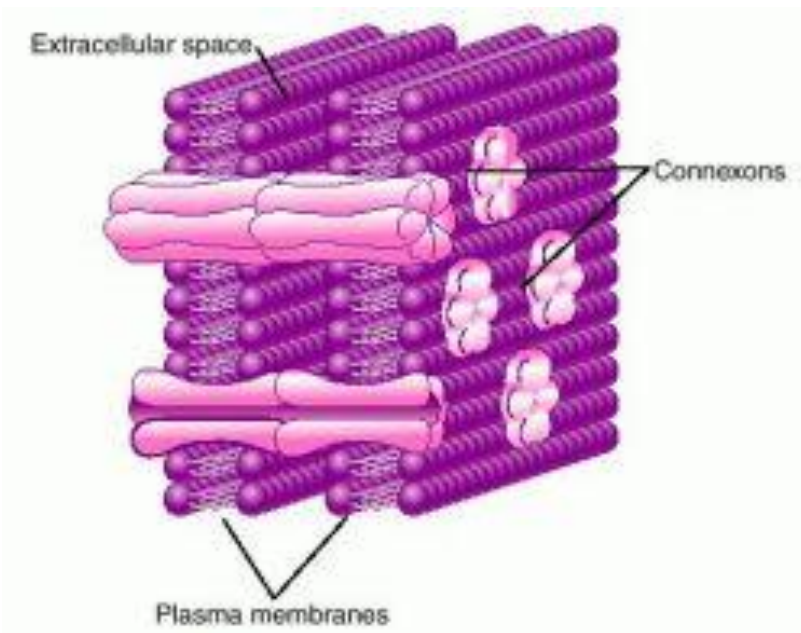
# Enzymes

- Purpose: Assists in chemical reactions inside of the cell



# Anchoring

- Purpose: Hold the cells together
  - Intercellular Junctions #ftw





# Main Function of the Cell Membrane

- Remember...one main function of the cell membrane is to regulate materials that enter and exist the cell.
- Do you think that the cell membrane lets all things in or out?
  - No... the cell membrane is considered **Selectively Permeable!**





# Cell Transport: Diffusion and Osmosis

# Cell Transport

## ■ Review Vocab

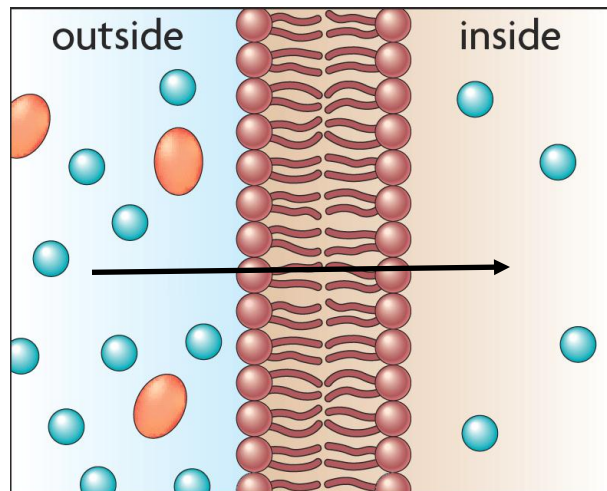
- Solute: Particle that is dissolved  
(Koolaid Sugar)
- Solvent: Liquid that does the dissolving (Water)

## ■ New VOCAB

- Permeable: Allows particles to pass through
- Impermeable: Does **NOT** allow particles to pass through
- Semipermeable: Allows **certain** particles to pass through \*\*\*\*\*

# ■ Selectively Permeable:

- Allows some molecules to cross the membrane, while others cannot.



**In the picture, which molecules are let across the membrane? Which are not?**

**•Let across - Blue Molecules**

**•Not allowed across - Orange Molecules**

# Why must the membrane be selective?

- To maintain HOMEOSTASIS:
  - Organisms ability to maintain stability and adjust to environmental changes
- To let in only necessary molecules such as:
  - water molecules
  - food particles
  - ions
- To remove wastes such as:
  - Worn-out organelles
  - CO<sub>2</sub>
  - excess water
  - Undigested food

# DEMO! Dialysis Tubing

Set Up: What do you think will happen?

What happened? Why?



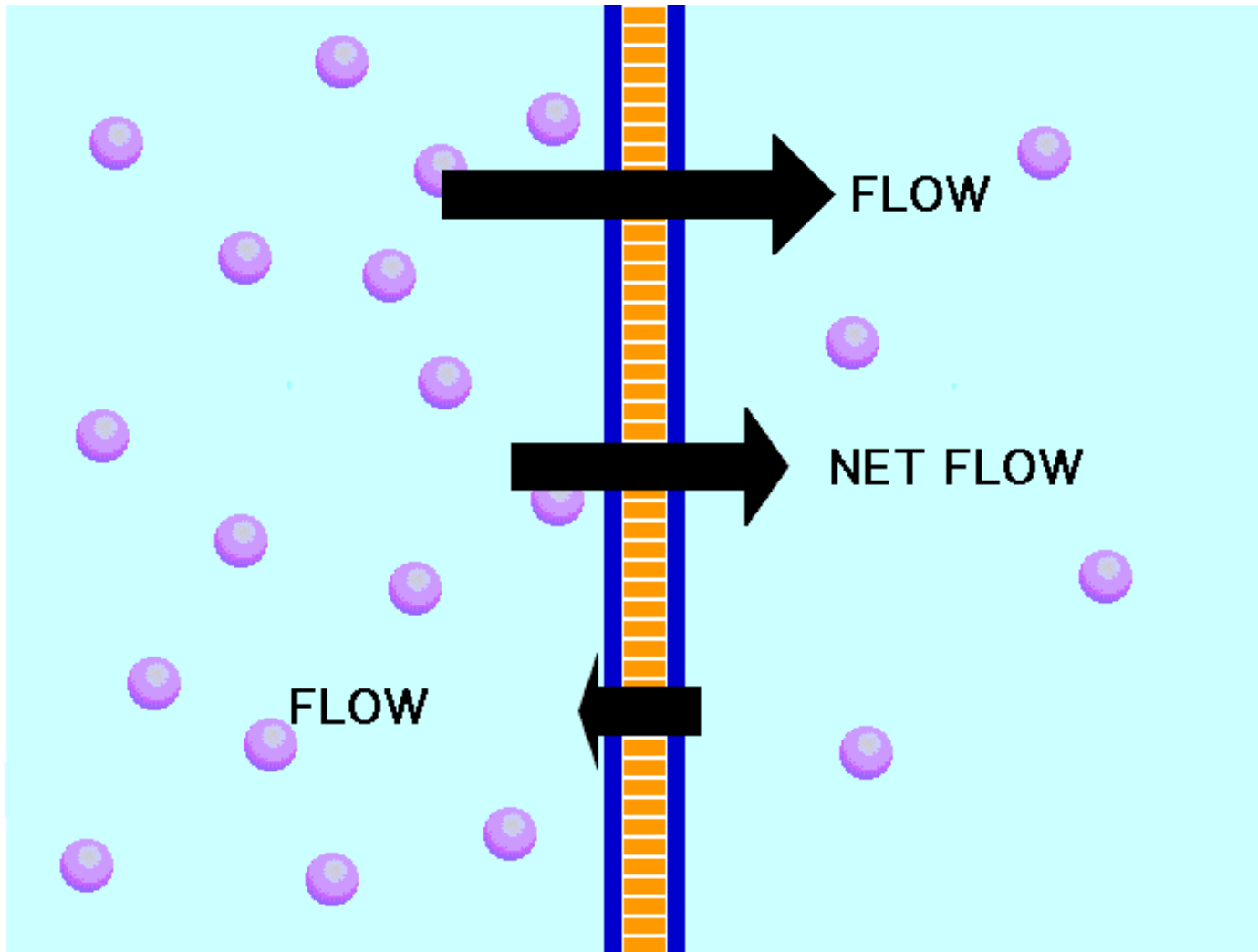
Draw it and Describe this in your own words!

# What is Diffusion?

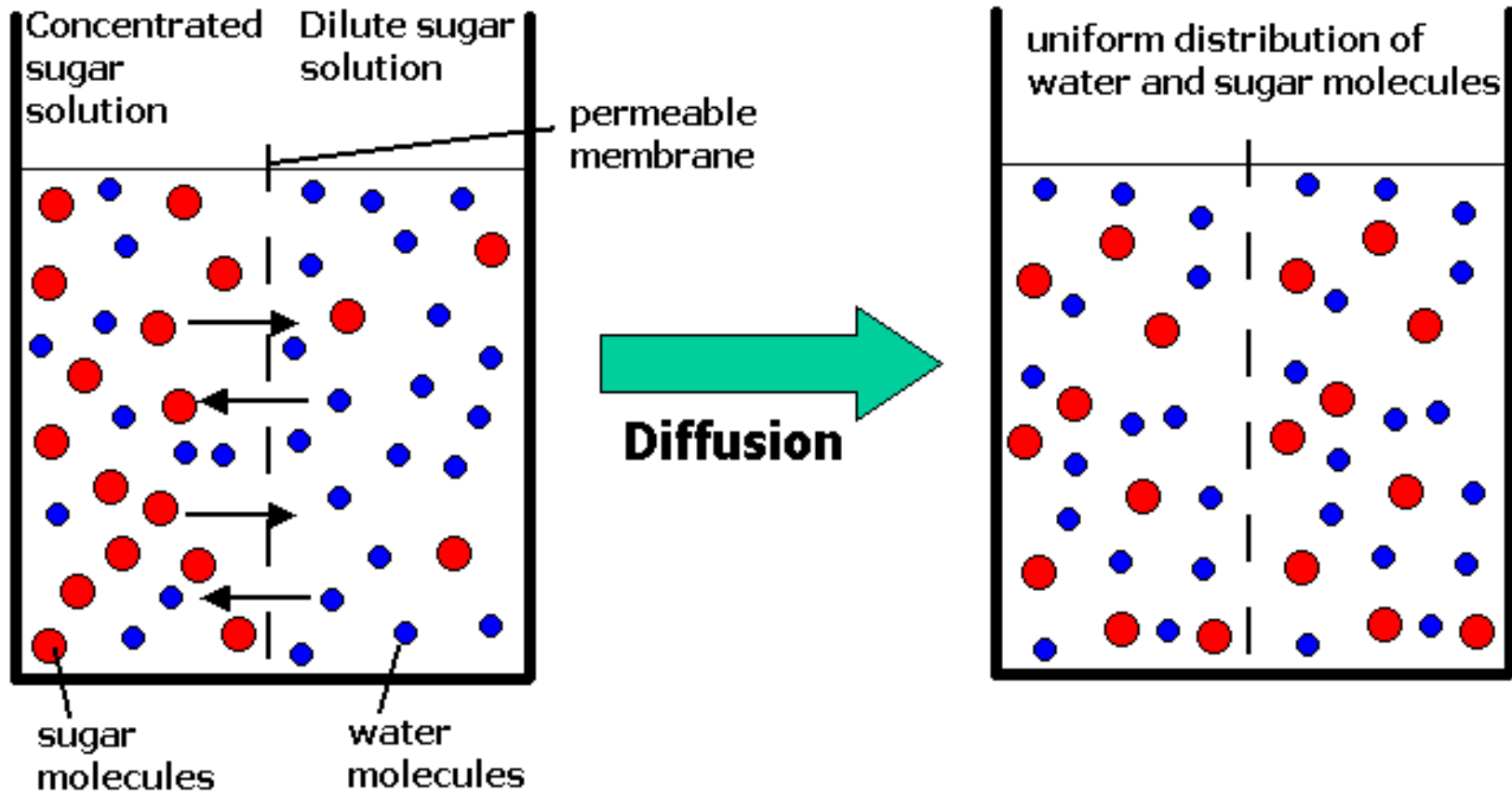
- Diffusion:

- Movement of particles from higher concentration to lower concentration.
- When the concentration of the particles is the same throughout a system, the system has reached **equilibrium**.
- Diffusion does **not** require the cell to use energy!

# DIFFUSION

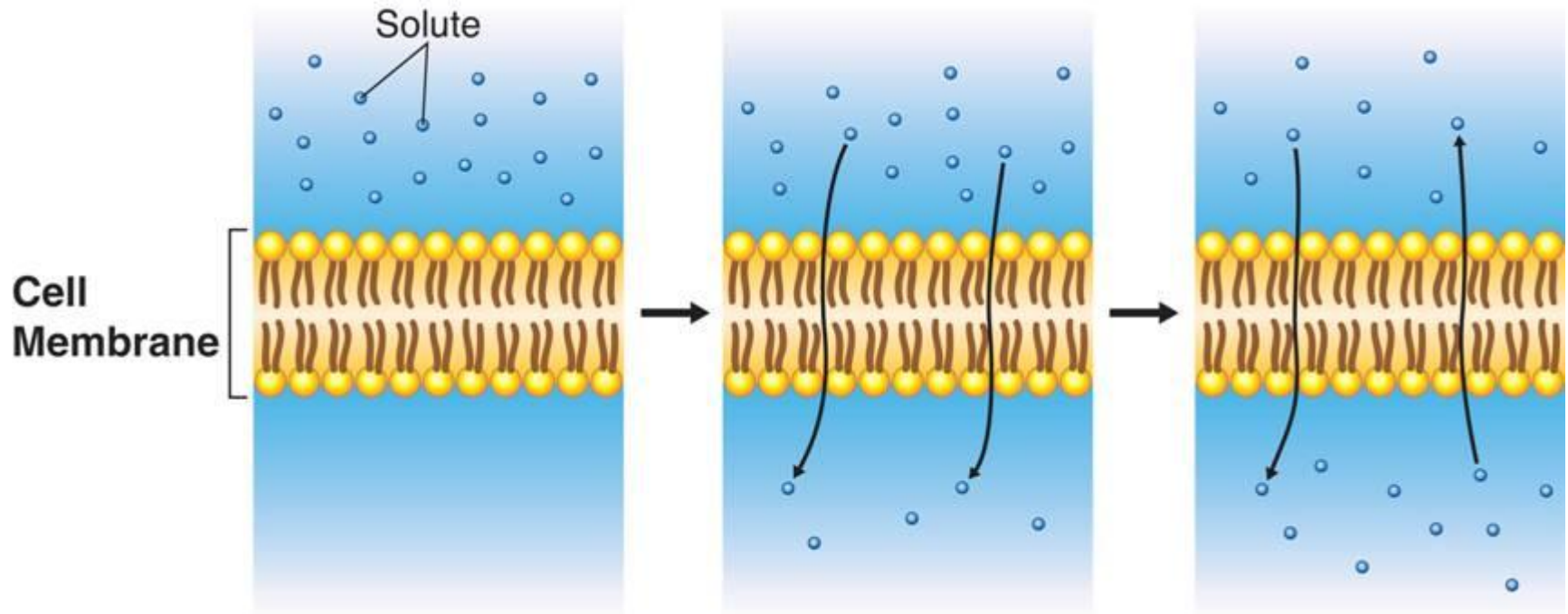


# DIFFUSION





# Diffusion Through Cell Boundaries





# Factors that affect Diffusion

## ■ Heat:

- The hotter the solution, the quicker it will diffuse

## ■ Size of Particles

- Particles that are too large may not be able to diffuse because they can't get through the semi permeable membrane

## ■ Concentration of Particles

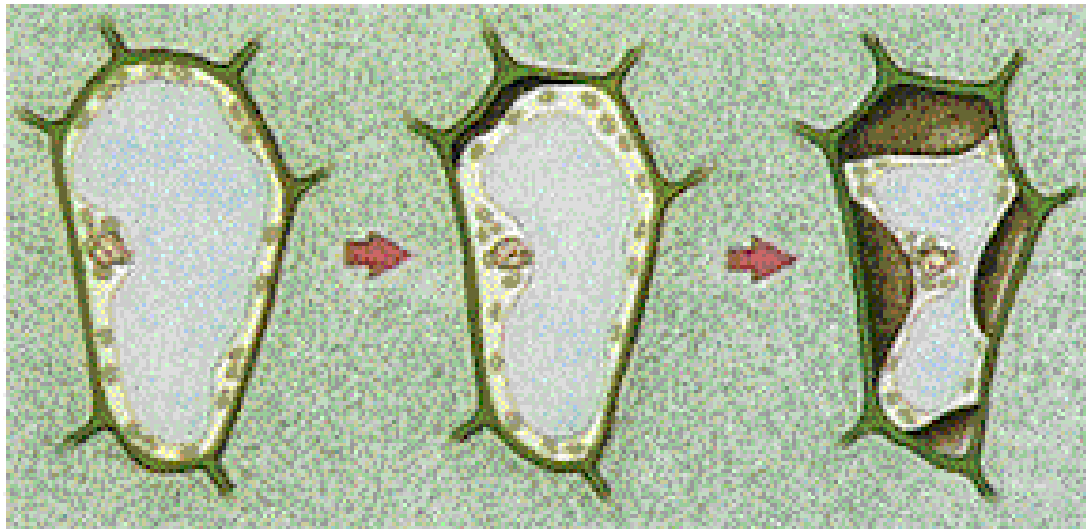
- The larger the difference, the faster the diffusion will happen

# Osmosis...a special type of Diffusion!

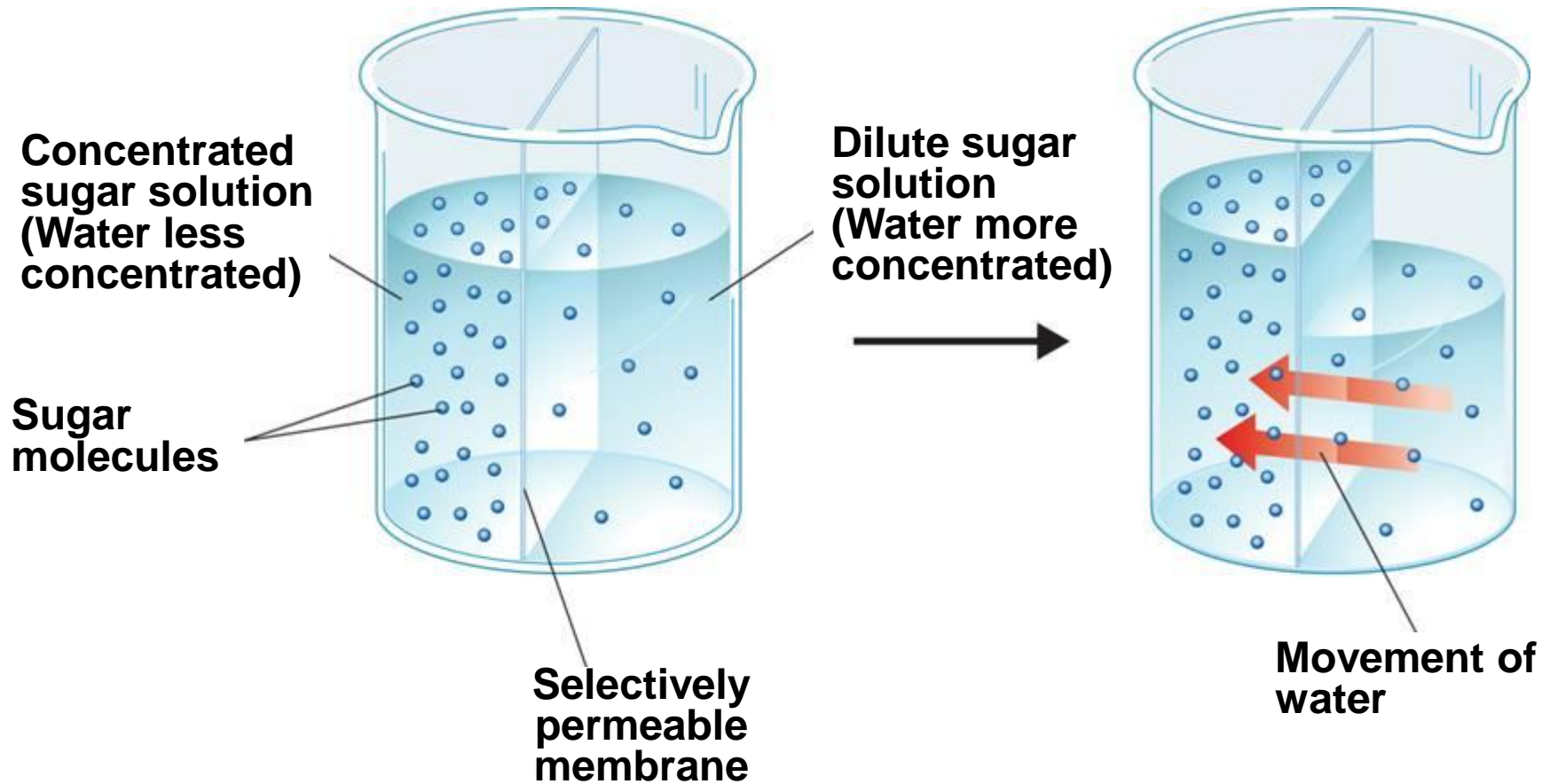
- Osmosis:
  - Osmosis is the diffusion of **water** through a selectively permeable membrane.
- In a cell, water always tries to reach an equal concentration on both sides of the membrane!

# What happens if there is too little water?

- The cytoplasm shrinks!
  - PLASMOLYSIS



# Osmosis





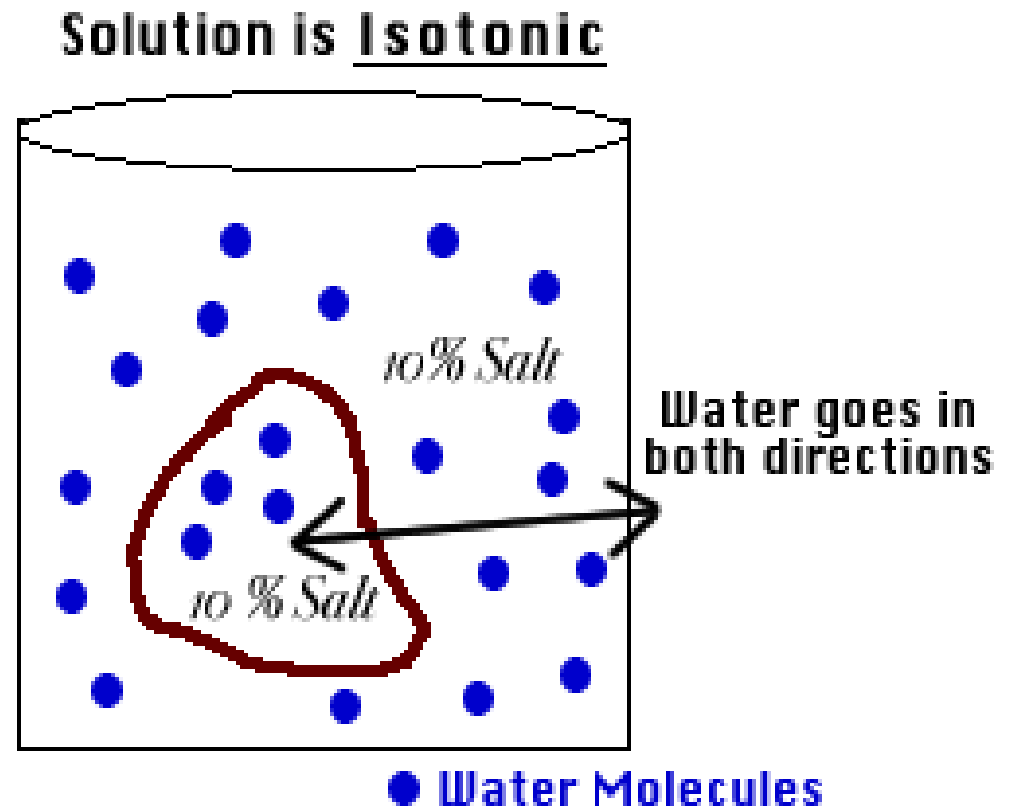
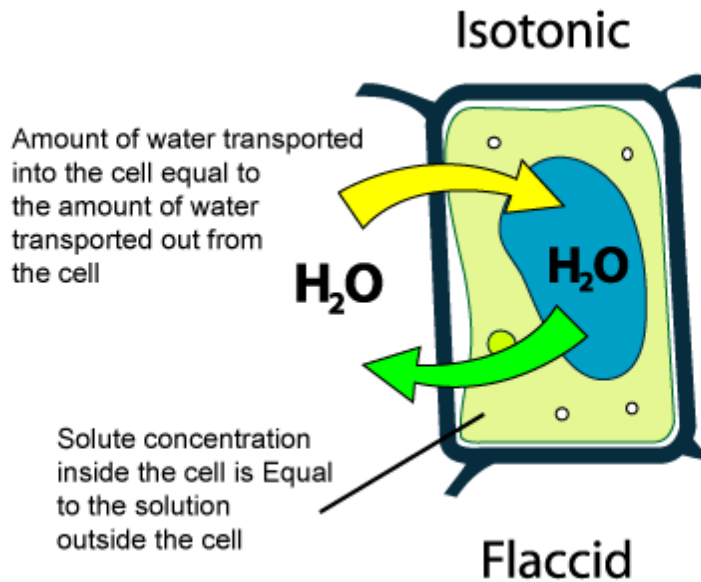
# Three Types of Solutions

- **A cell can be in three types of solutions:**
  - **Isotonic** (same strength")
  - **Hypertonic** ("above strength")
  - **Hypotonic** ("below strength")
  
  - Let's examine each a little closer!

# Isotonic Solutions

- Concentration of dissolved substances in solution is the same as concentration of dissolved substances inside the cell. (same strength).
- Water inside the cell is equal to water in solution.
- Cells in isotonic solution do not experience osmosis and retain their normal shape.
- EX:
  - Immunizations are isotonic solutions so they do not damage the cells by gain or loss of water.

# Isotonic





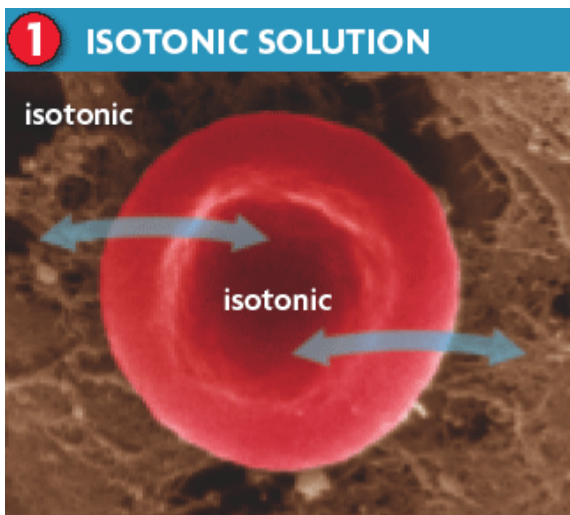
# Hypertonic Solutions (Hyper kids)

- Concentration of dissolved substances in solution is higher than concentration of dissolved substances inside cell.
- There is more water inside cell than outside.
- Cells in hypertonic solutions experience osmosis in which water moves through membrane to **outside** of cell.
- Ex:
  - In plant cells, membrane and cytoplasm shrink away from cell wall and plant wilts.
  - In animal cells, the pressure decreases and the cells shrivel.

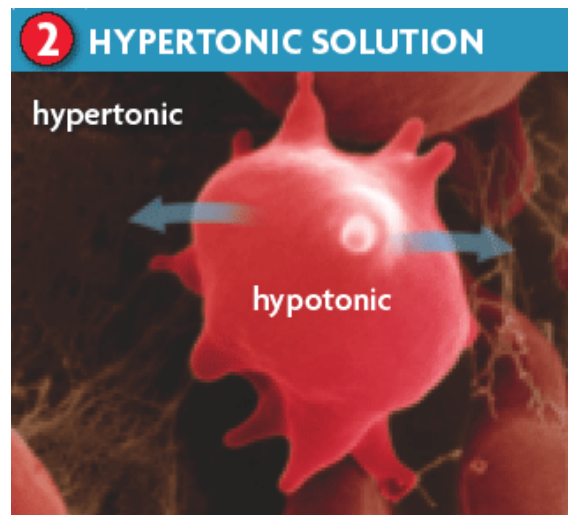
# Hypotonic Solutions (Hippo)

- Concentration of dissolved substances in solution is lower than concentration of dissolved substances inside the cell.
- There is more water outside the cell than inside.
- Cells in hypotonic solutions experience osmosis in which water moves through membrane **into** cell.
- EX:
  - In animal cells, the pressure inside cell increases causing the cells to swell and sometimes burst!
  - In plant cells, the rigid cell wall prevents bursting, but the cells become more firm.

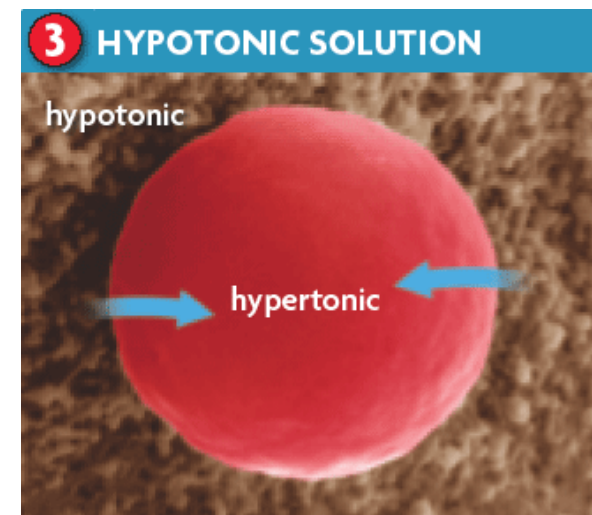
- There are three types of solutions.
  - isotonic
  - hypertonic
  - Hypotonic



A solution is isotonic to a cell if it has the same concentration of solutes as the cell. Equal amounts of water enter and exit the cell, so its size stays constant.



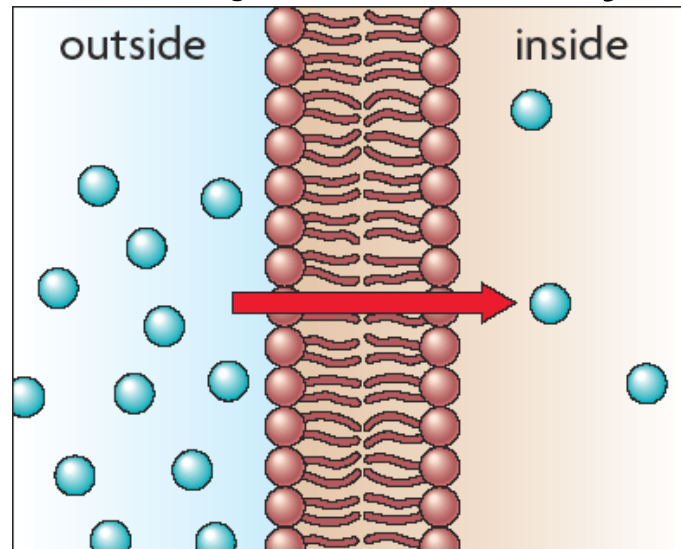
A hypertonic solution has more solutes than a cell. Overall, more water exits a cell in hypertonic solution, causing the cell to shrivel or even die.



A hypotonic solution has fewer solutes than a cell. Overall, more water enters a cell in hypotonic solution, causing the cell to expand or even burst.

# Passive Transport: Mosey on through...

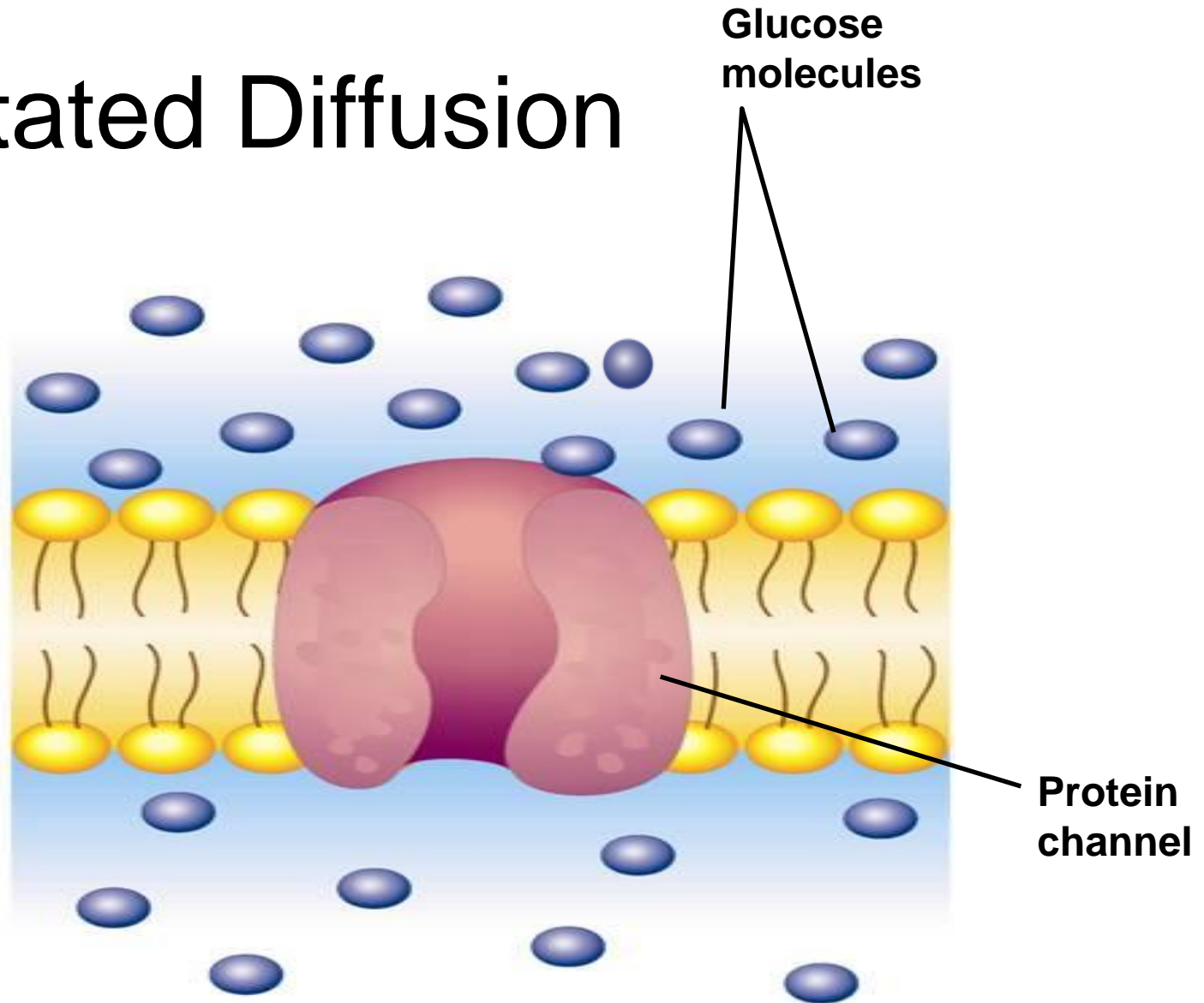
- Molecules pass through the cell membrane requiring **no energy** input from the cell.
- The molecules just mosey on through!



# Facilitated Diffusion

- The *passive transport* of specific molecules across cell membranes through protein channels is known as **facilitated diffusion**.
  - Essentially, the molecules are being helped across the membrane!
- If facilitated diffusion is considered Passive Transport, is there any energy used?
  - NO

# Facilitated Diffusion





# Facilitated Diffusion

- Although facilitated diffusion is fast and specific, it is still diffusion.
- Therefore, facilitated diffusion will only occur if there is a higher concentration of the particular molecules on one side of a cell membrane as compared to the other side.

# Active Transport

- Sometimes cells move materials in the opposite direction from which the materials would normally move—that is against a concentration difference. (from low to high concentrations)
- This process is known as **active transport**.



□ Active transport requires energy!



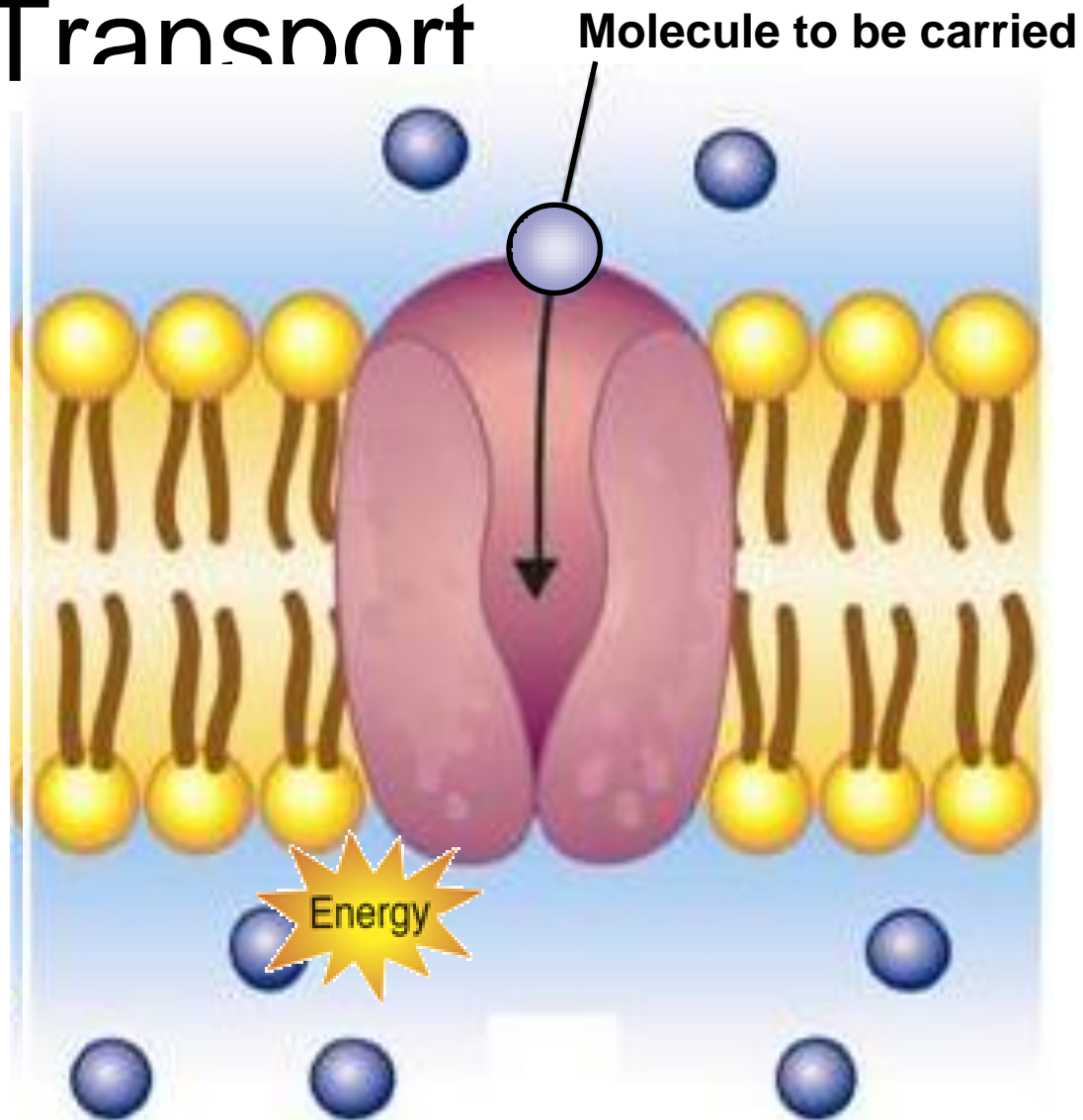


# Active Transport

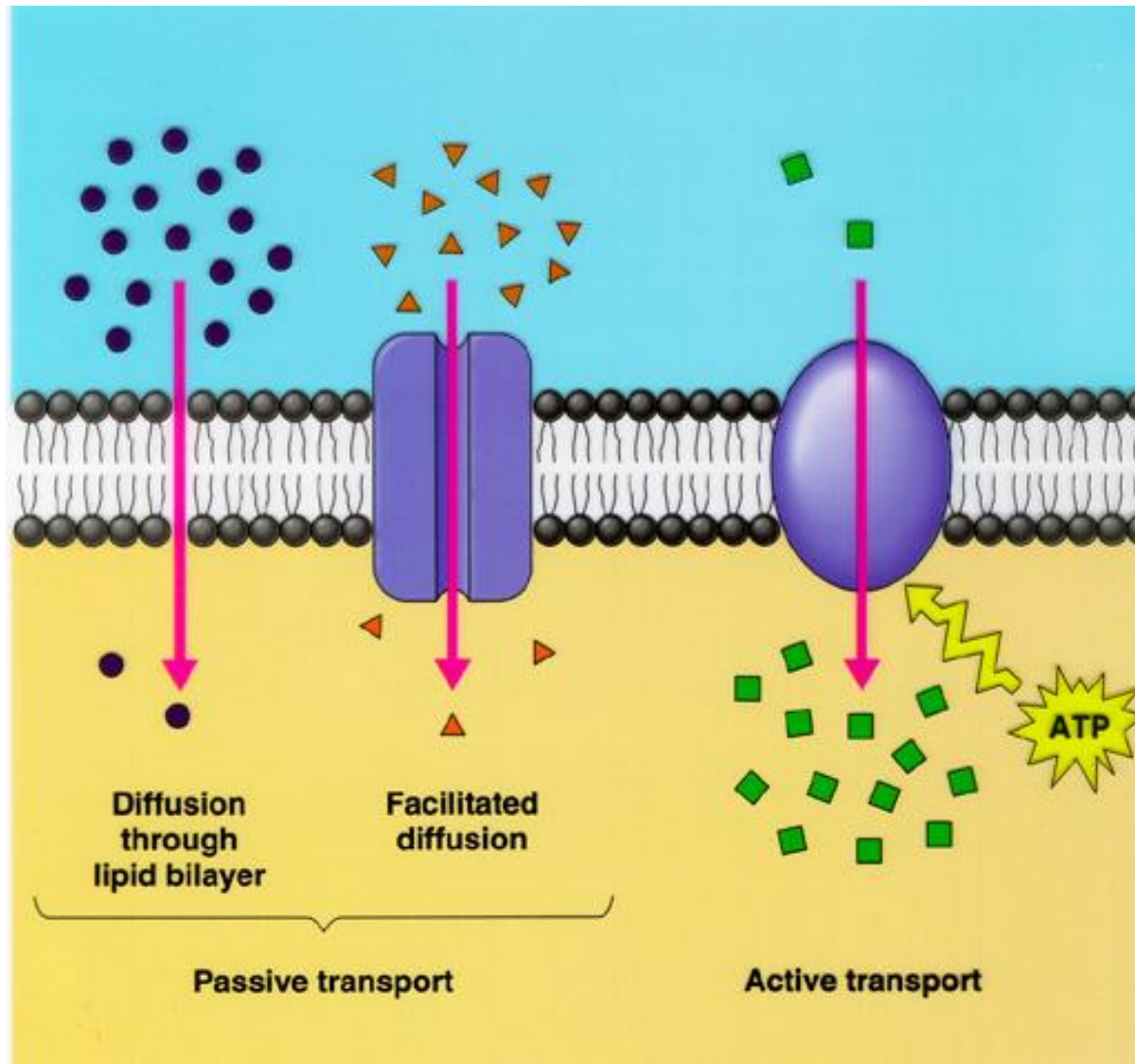
## ■ Molecular Transport

- In active transport, small molecules and ions are carried across membranes by proteins in the membrane.
- These Proteins need ENERGY

# Active Transport



# Cellular Transport





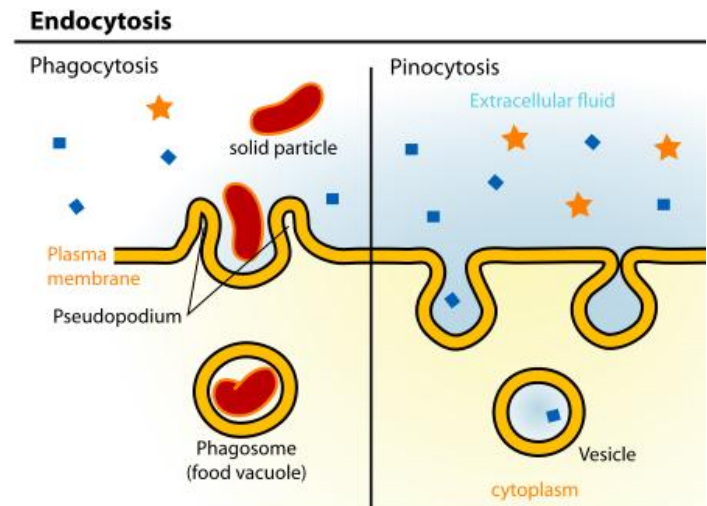
# What about the big boys?

- **ENDOCYTOSIS:** cells surrounds and takes in material from environment by engulfing the material! YUMMY!
- **EXOCYTOSIS:** cells expel materials from cell, such as waste or indigestible particles. GROSS!
- Both endo and exocytosis are moving large masses of material and require energy (**ACTIVE TRANSPORT!**)



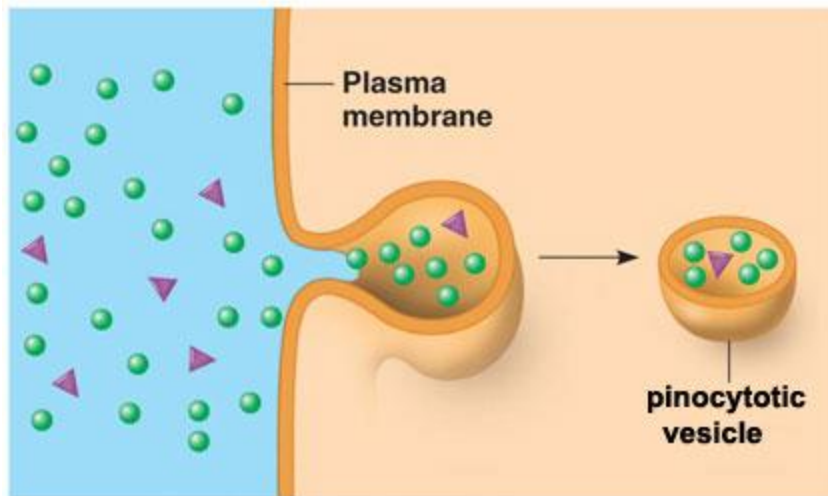
# Endocytosis

- Phagocytosis: Pseudo arms take in food particles
- Pinocytosis: NO pseudo arms are made as the cell takes in fluid.

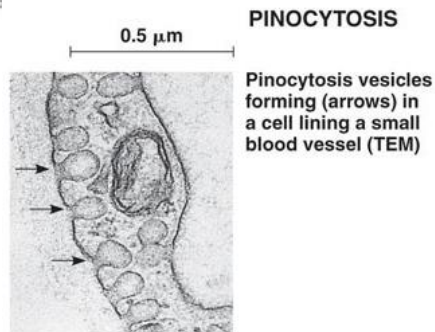


# Endocytosis and Exocytosis

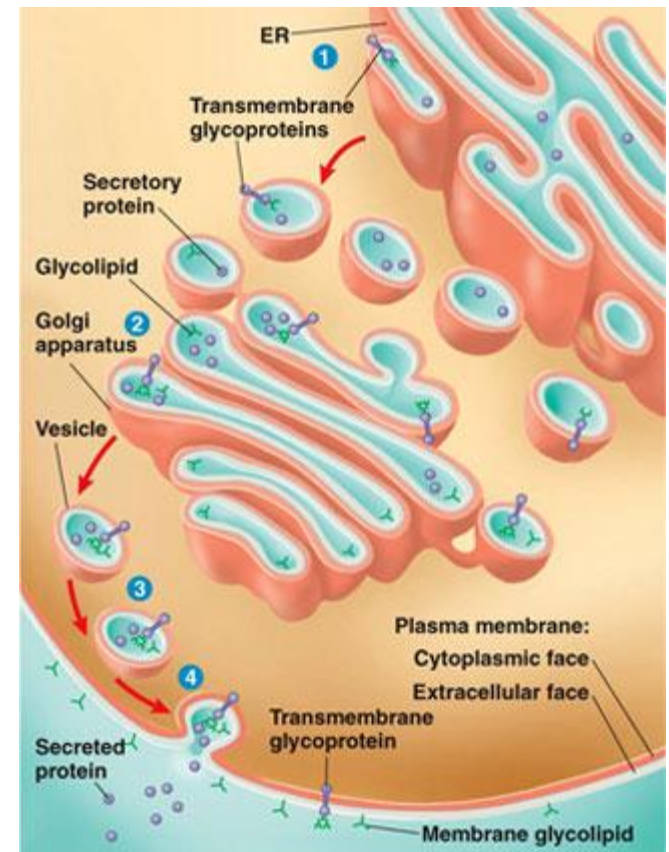
## ■ ENDOCYTOSIS



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## ■ EXOCYTOSIS



# 7-3

1



Unlike a cell wall, a cell membrane

A

- is composed of a lipid bilayer.
- provides rigid support for the surrounding cell.
- allows most small molecules and ions to pass through easily.
- is found only in plants, fungi, algae, and many prokaryotes.

# 7-3

**2** □ The concentration of a solution is defined as the

- volume of solute in a given mass of solution.

**A** ■ mass of solute in a given volume of solution.

- mass of solution in a given volume of solute.

- volume of solution in a given mass of solute.



# 7-3

**3**  If a substance is more highly concentrated outside the cell than inside the cell and the substance can move through the cell membrane, the substance will

- move by diffusion from inside the cell to outside.
- remain in high concentration outside the cell.

**A** ■ move by diffusion from outside to inside the cell.

- cause water to enter the cell by osmosis.

# 7-3

4

□ The movement of materials in a cell against a concentration difference is called

■ facilitated diffusion.

A


■ active transport.

■ osmosis.

■ diffusion.

# 7-3

- 5** □ The process by which molecules diffuse across a membrane through protein channels is called
- active transport.
  - endocytosis.
  - facilitated diffusion.
  - osmosis.
- A**



**END OF SECTION**