# Cell Membrane Transport

- **Details about the movement of particles in and out of a cell.**

# Cell Transport

SB1.

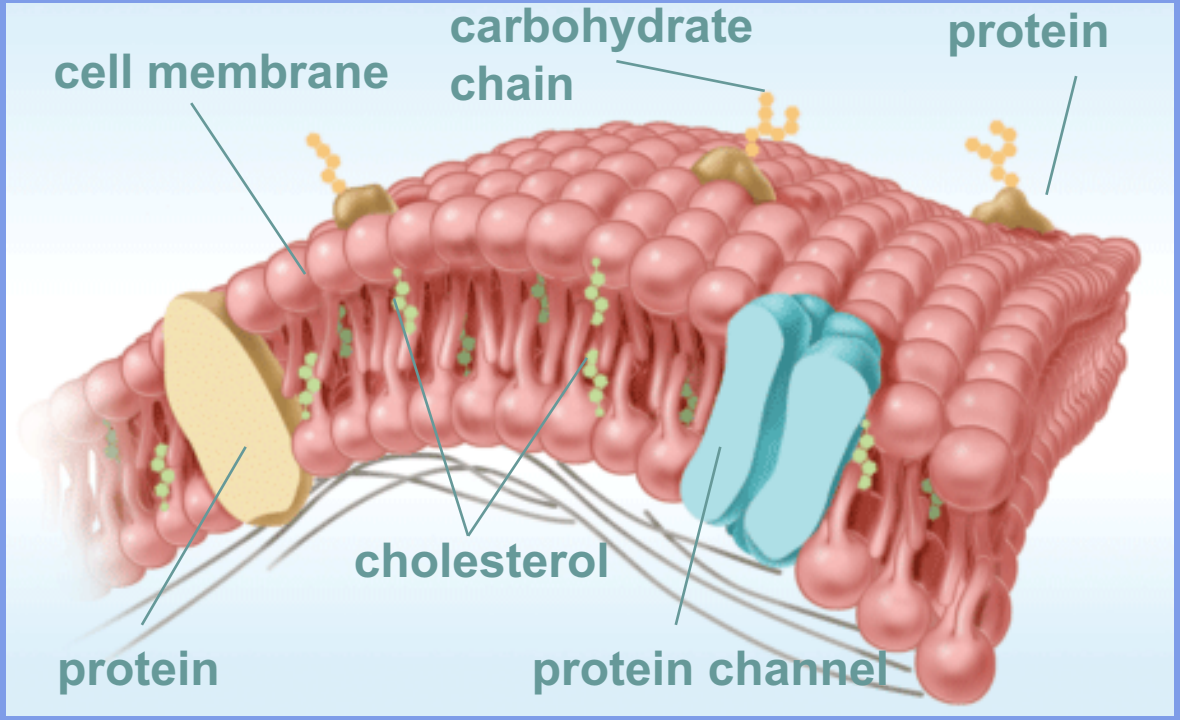
a. Students will be able to explain the role of the cell membrane in maintaining homeostasis.

d. What is the impact of water on life processes? (i.e. osmosis and diffusion)

# LEQ4:
# What is the role of the cell membrane in maintaining homeostasis?

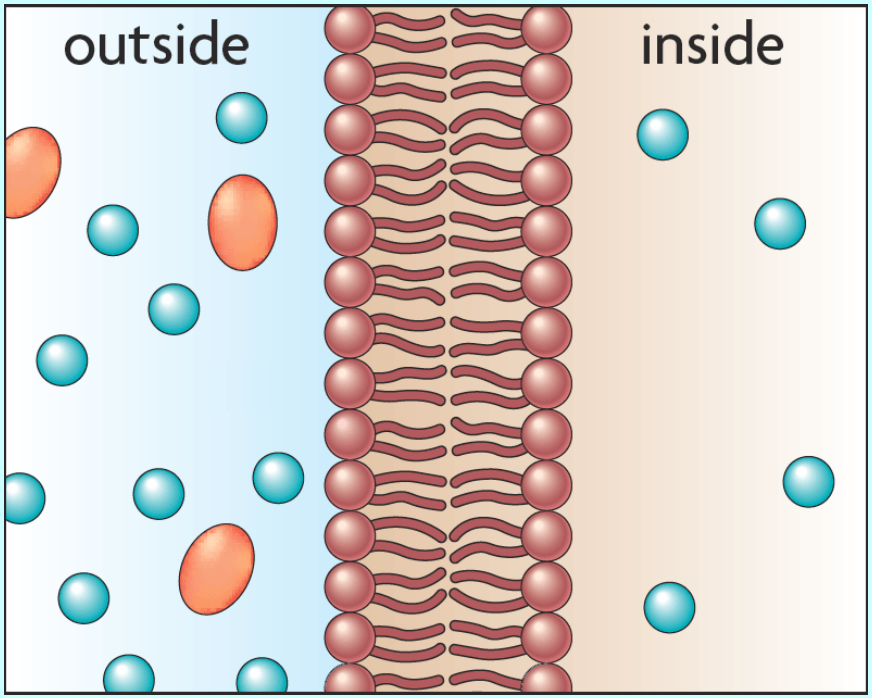
# Structure: Cell/Plasma Membrane

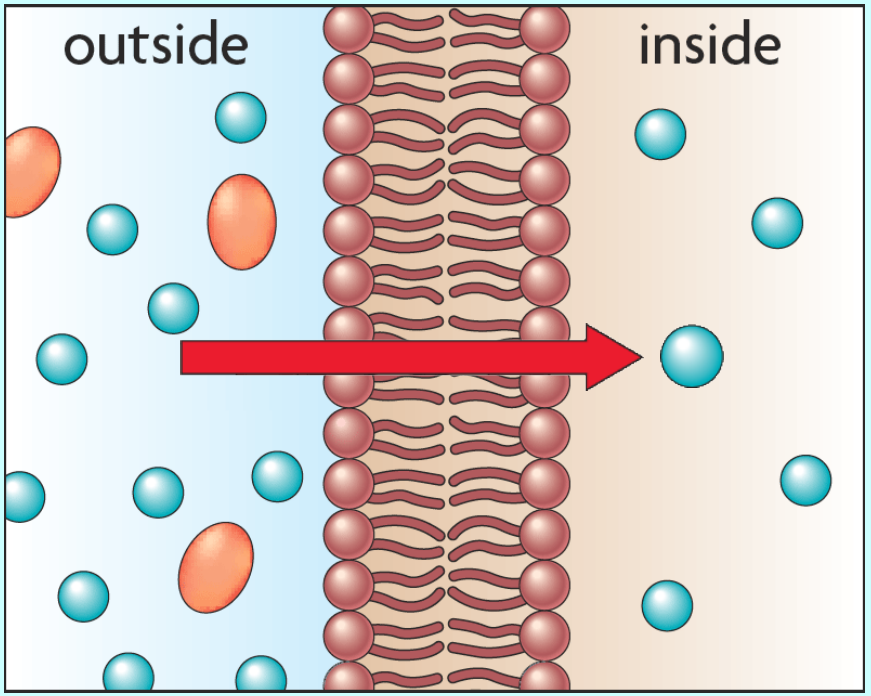
- Composed of two phospholipid layers (bilayer)
- There are other molecules embedded in the membrane (proteins, carbohydrates)
- The fluid mosaic model describes the membrane



# Characteristics of Cell/Plasma Membrane

- The cell membrane is selectively permeable
  - Some molecules can cross the membrane while others cannot



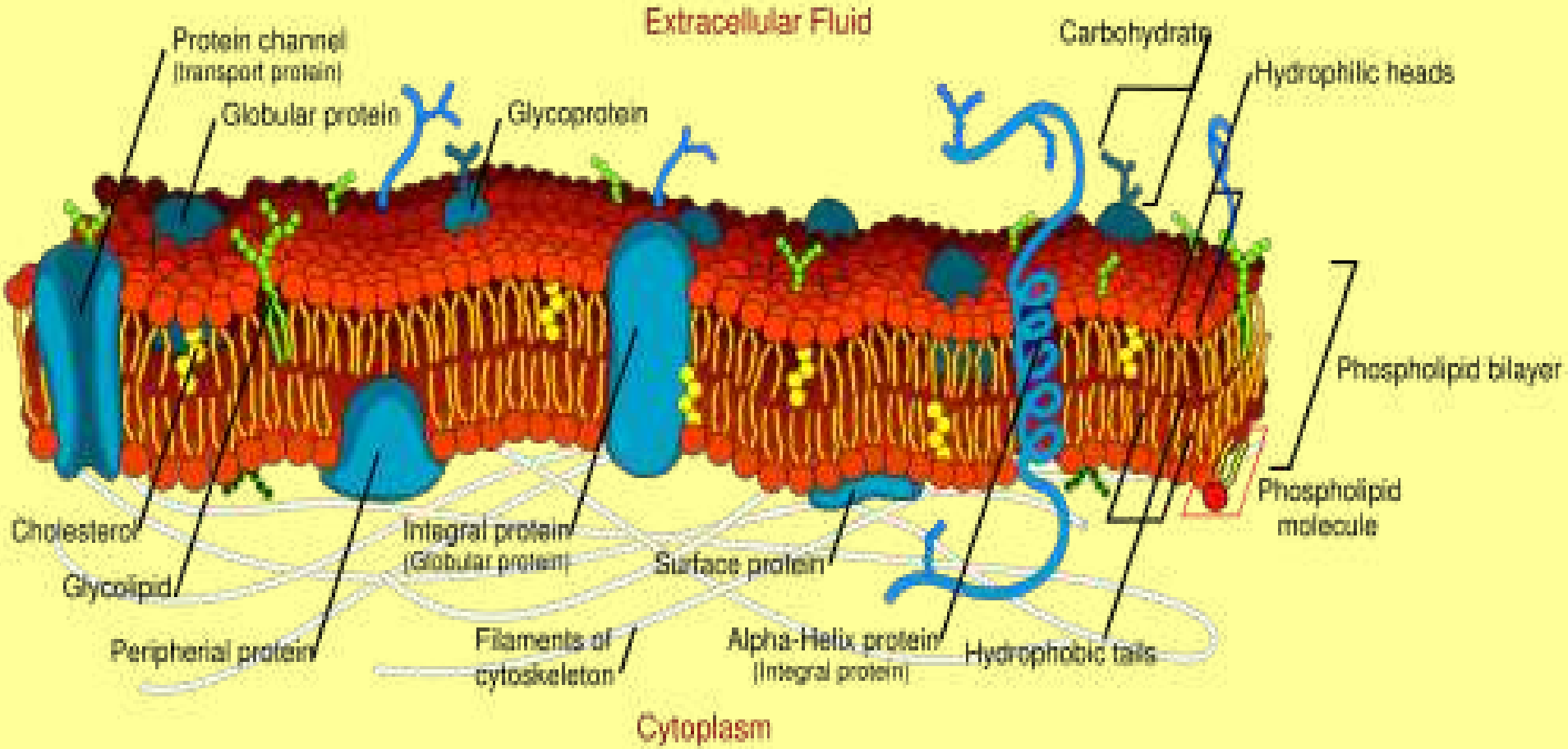
# So…

- The cell membrane is a double layer of membranes of fat that only let certain things get in and out of a cell.
- Also called the “gatekeeper” of the cell because it does in essence choose what enters or does not.

# Recap—what is the cell membrane?

- Also called the plasma membrane
- Is a semi-permeable lipid bilayer
  - Semi—only some
  - Permeable—passes through
  - Lipid—made of fats
  - Bi—two
  - Layer—flat sheets

# Plasma Membrane

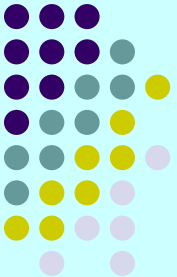


# Function: Plasma/Cell Membrane

- Forms a boundary between inside and outside of the cell
- Controls passage of materials

  Materials include:
  - Water
  - Glucose
  - Nutrients
- Protects and supports the cell
- Transmits chemical signals across cell

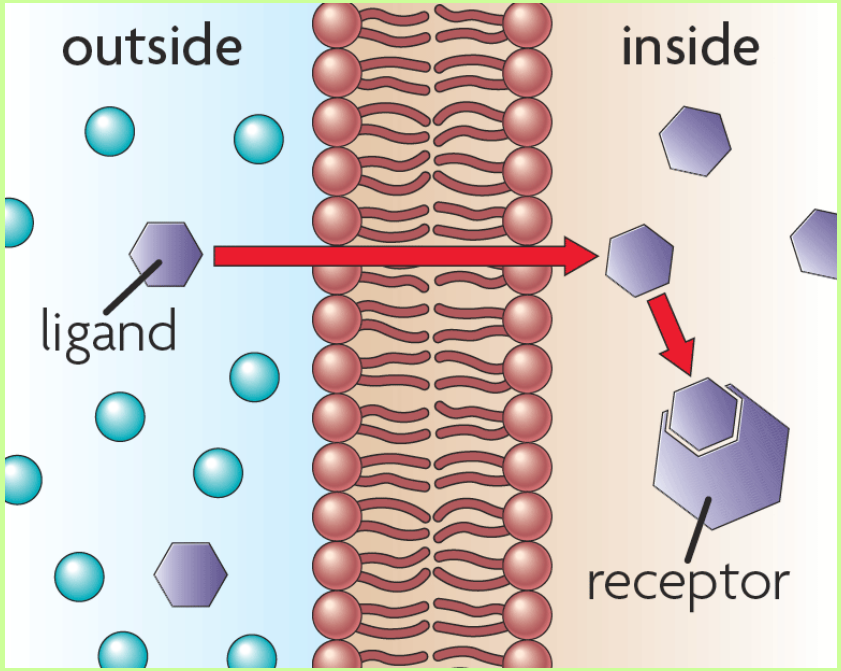
# Function: Cell/Plasma Membrane



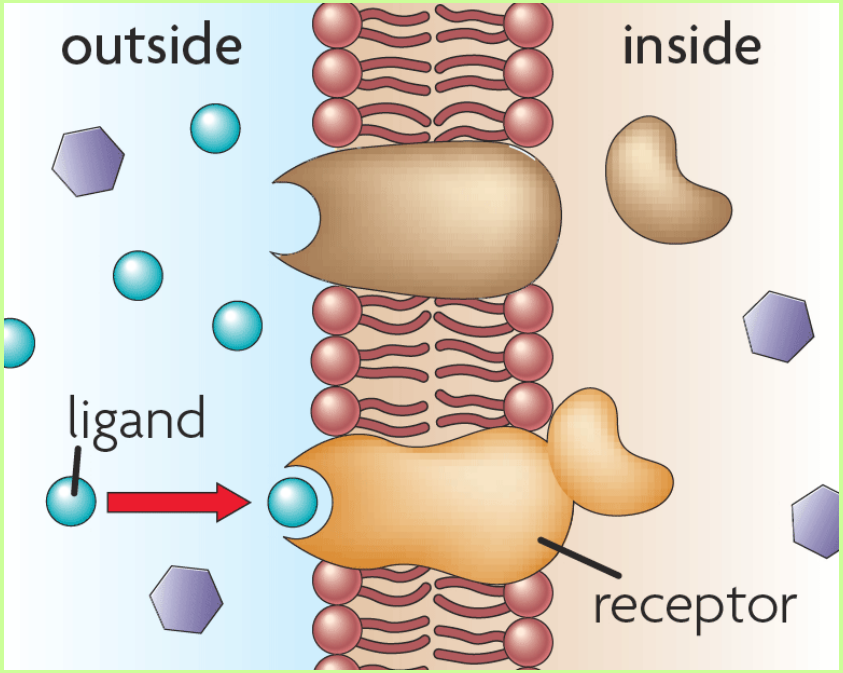
- Chemical signals are transmitted across the cell membrane
- Receptors bind with ligands and change shape

# Characteristics of Cell/Plasma Membrane

- There are two types of receptors
  - Intracellular receptor
  - Membrane receptor




Intracellular



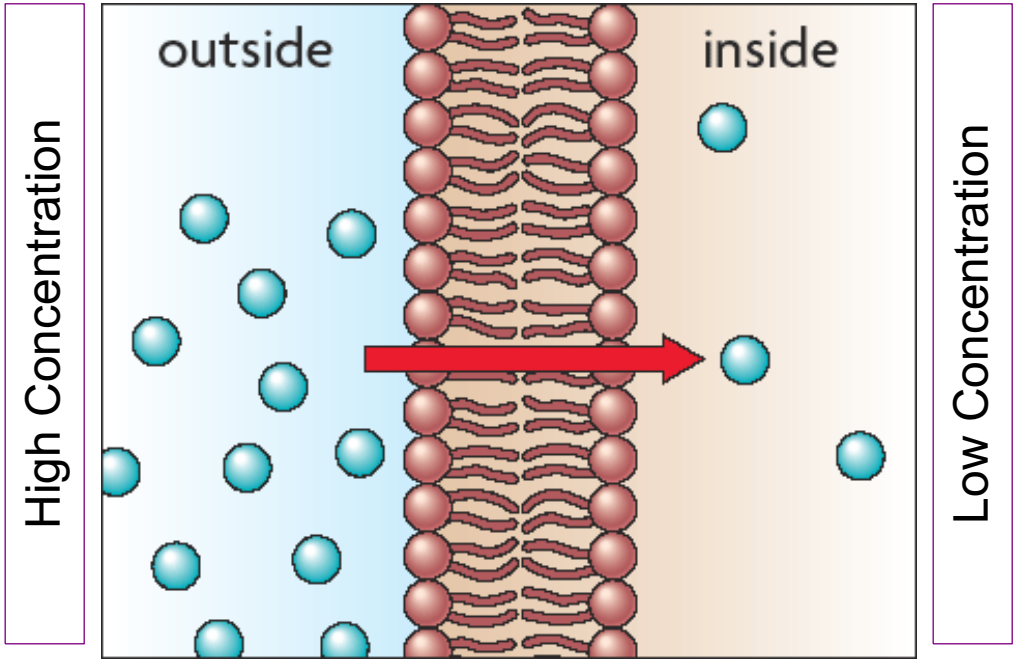

Membrane

# Concept Check

List 3 reasons why membrane receptors are important in maintaining homeostasis.

# Cell Transport
# Osmosis and Diffusion

- Materials move across membranes because of concentration differences/gradient.




- Substances move from high to low concentration.

# Cell Transport
# Osmosis and Diffusion

Passive transport does not require energy input from cell.

- Molecules can move across cell membrane through passive transport.
- There are two types of passive transport:
  - Diffusion
  - Osmosis

# Concept Check

Explain the term concentration gradient.

How does it affect the movement of a molecule?

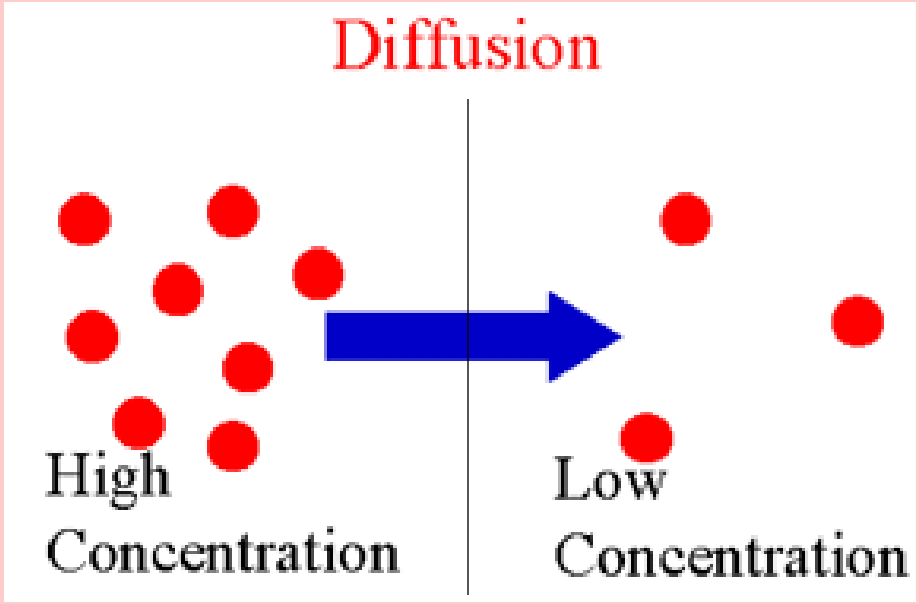
# Cell Transport
# Osmosis and Diffusion

Diffusion and osmosis are types of passive transport.

- Molecules diffuse down a concentration gradient.
  - From High to Low

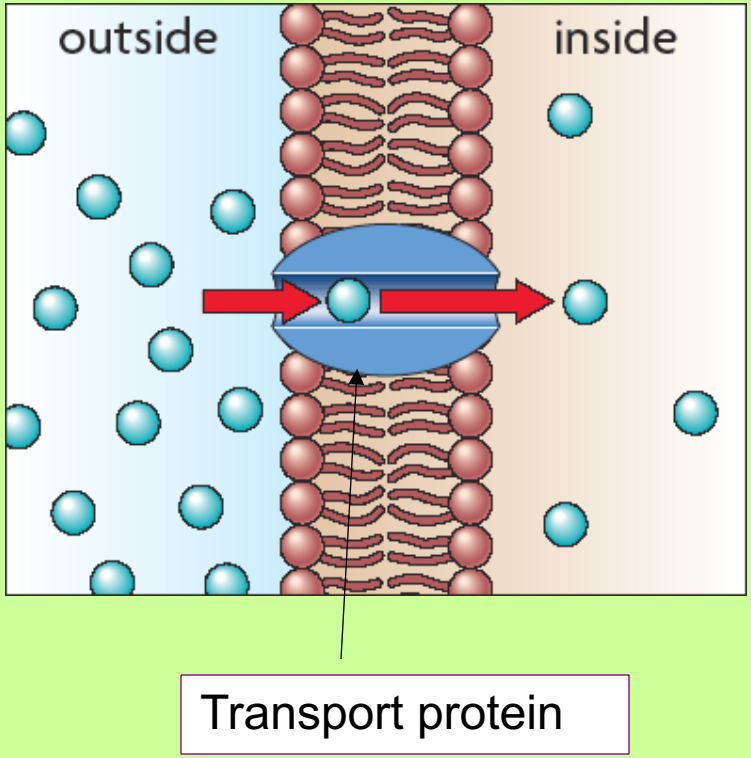
# Cell Transport
# Diffusion

- Movement of molecules, other than water, from an area of HIGH concentration to an area of LOW concentration
- No ATP energy is used.
- Example:
  - Spraying air freshener in a room and eventually smelling it across the other side



# Cell Transport
# Diffusion

- Some molecules cannot easily diffuse across the cell membrane
- Substances that are not soluble in lipids, like glucose and amino acids, must have help getting across the membrane.
- Facilitated diffusion is diffusion through transport proteins
- Does not require energy



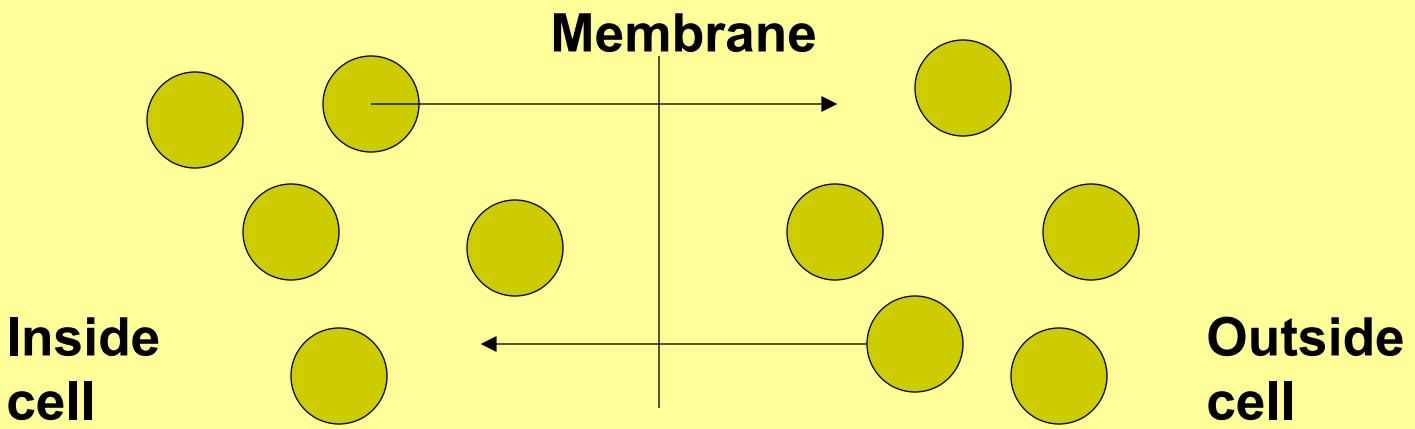
# What can affect diffusion?

- **Size of the molecules**
  - Large molecules do not pass through easily
- **Temperature**
  - The warmer the water or atmosphere the faster the reaction of diffusion

- **Size of concentration gradient**
  - The greater the concentration difference the faster the reaction

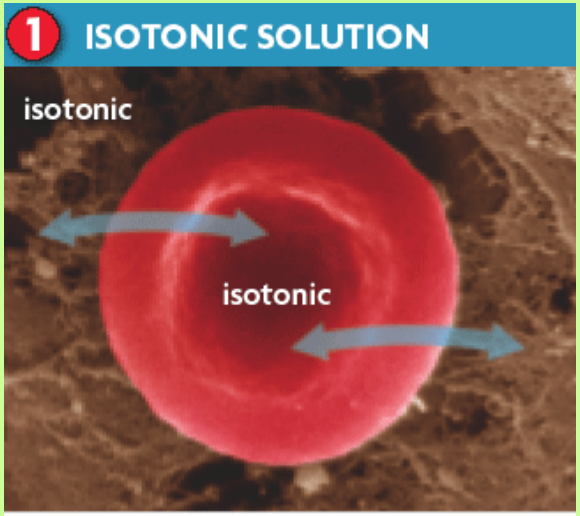
# Does diffusion ever stop?

- NO… because particles are in constant motion
- When the # of particles is equal on both sides of the membrane then equilibrium is reached
- When particles reach equilibrium the rate of diffusion is equal across the membrane

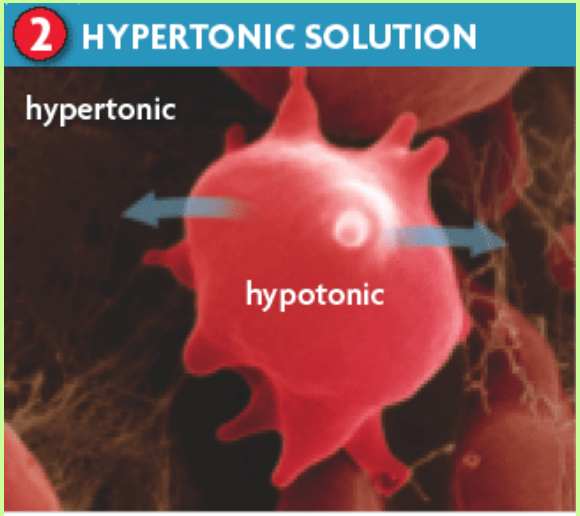


# Cell Transport
# Osmosis

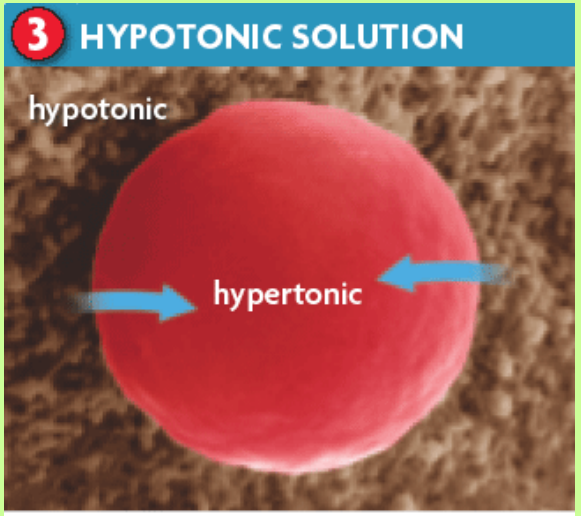
- There are three types of solutions:
  - Isotonic
  - Hypertonic
  - Hypotonic




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.

# Concept Check

Explain what would happen if you placed a cell in a:

A) Hypotonic Solution
B) Hypertonic Solution
C) Isotonic Solution

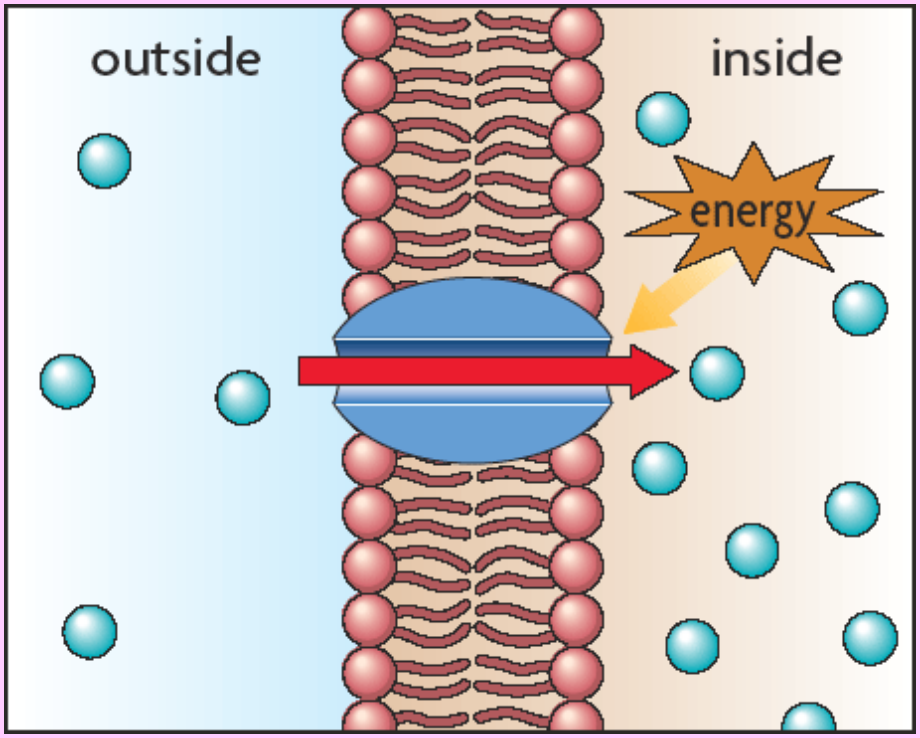
What type of solution do you think your cells are surrounded by?

# Cell Transport
# Osmosis

- Osmosis is the diffusion of water molecules across a semipermeable membrane.
- Water molecules move from high to low concentration.
- Example:
  - Water moving from your small intestine to the bloodstream

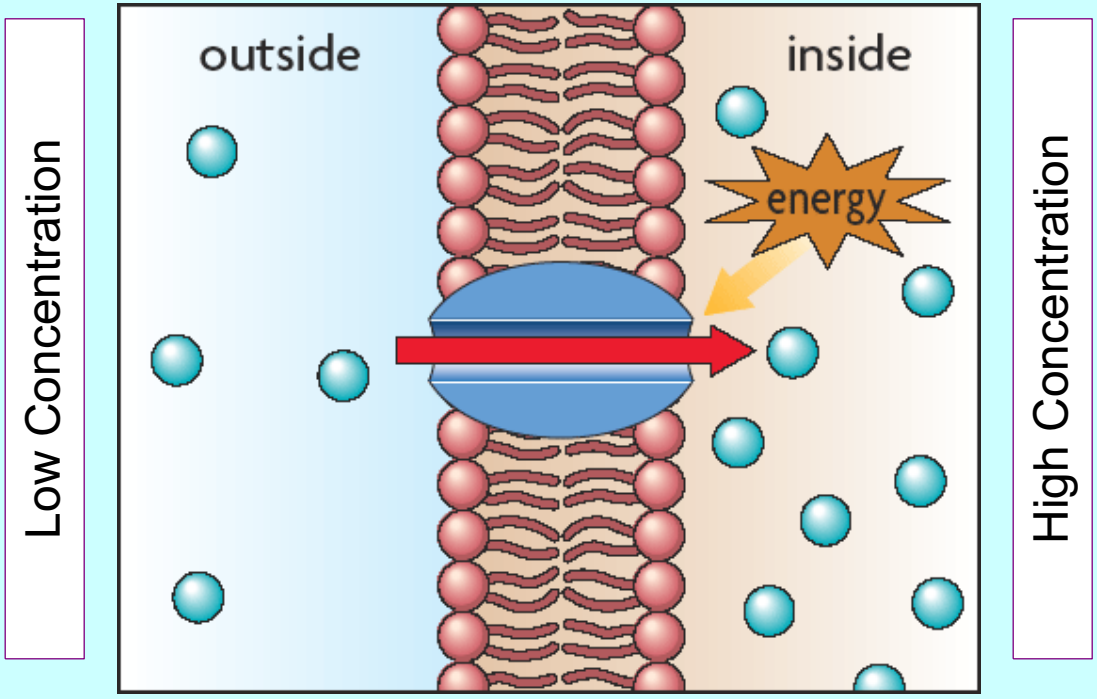
# Active Transport, Endocytosis, and Exocytosis

- Cells also use energy to transport materials that cannot diffuse across a membrane

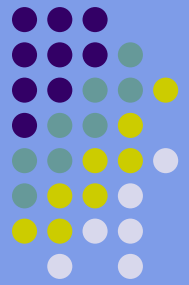


# Active Transport, Endocytosis, and Exocytosis

- Active Transport requires energy input from a cell and enables a cell to move a substance against its concentration gradient.



# Active Transport, Endocytosis, and Exocytosis



- Active transport is powered by chemical energy (ATP)
- Remember:
  - Passive transport requires no energy from the cell
- Active transport occurs through transport protein pumps.
- Cells use active transport to maintain homeostasis.

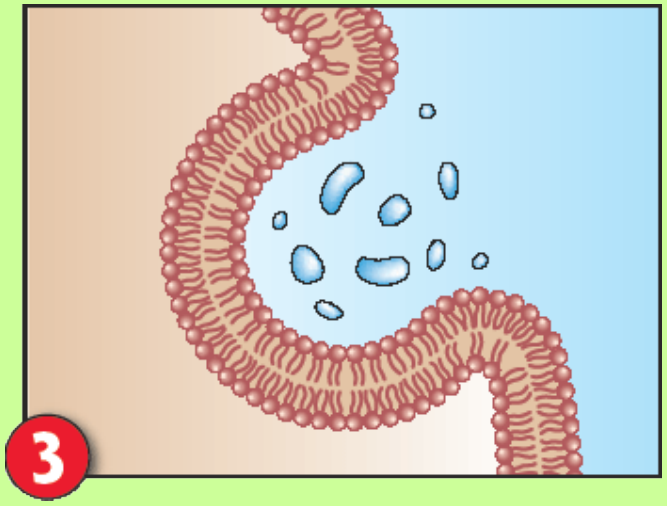
# Active Transport, Endocytosis, and Exocytosis

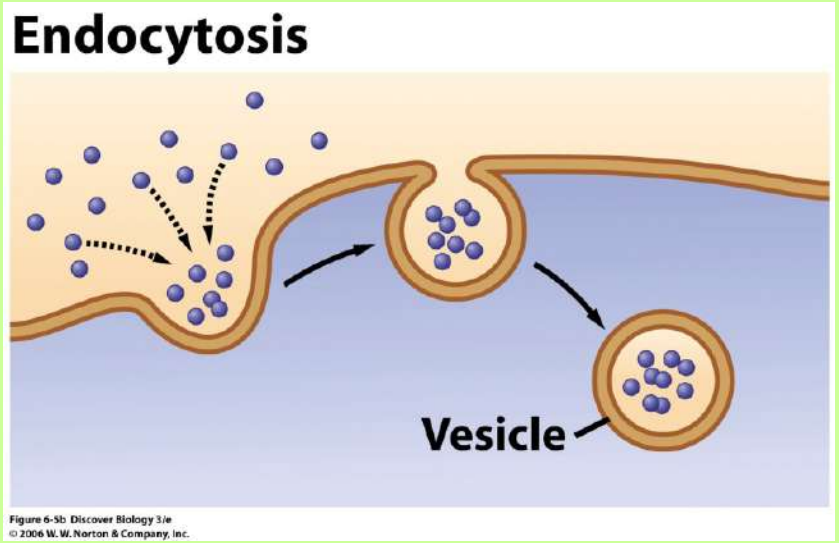
- Two types of Active Transport:
  - Endocytosis
  - Exocytosis
- A cell can import and export large materials or large amounts of materials in vesicles during the processes of Endocytosis and Exocytosis.

# Active Transport, Endocytosis, and Exocytosis

## Endocytosis

- Process of taking material into the cell
  - Phagocytosis is a type of Endocytosis.
- Cells require energy to transport material in endocytosis.

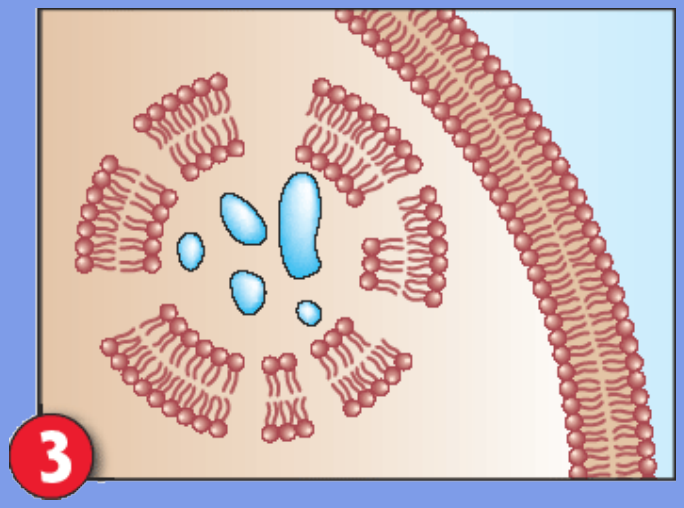


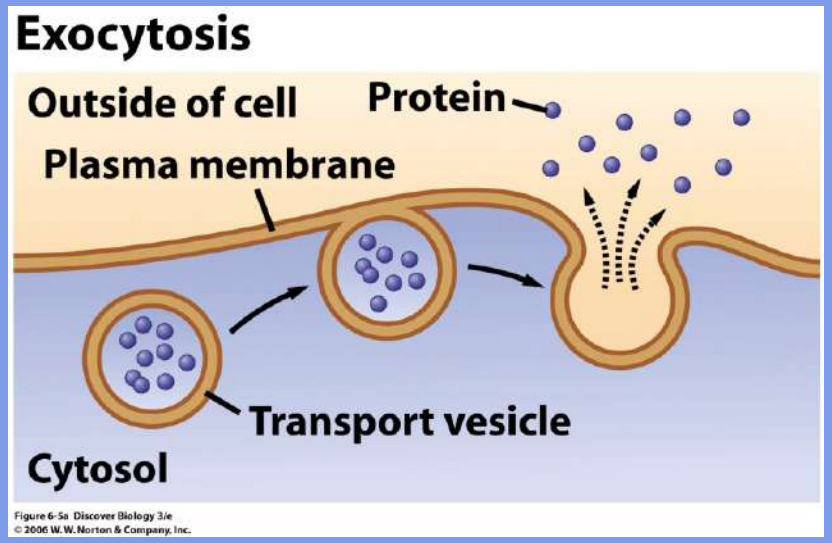



# Active Transport, Endocytosis, and Exocytosis

## Exocytosis

- Process of expelling materials from the cell
- Cell requires energy to transport materials in endocytosis.



# Concept Check

Complete the Tchart comparing and contrasting Active and Passive Transport.

Include Diagrams to help you with your answer.

| PASSIVE | ACTIVE |
| --- | --- |
| | |