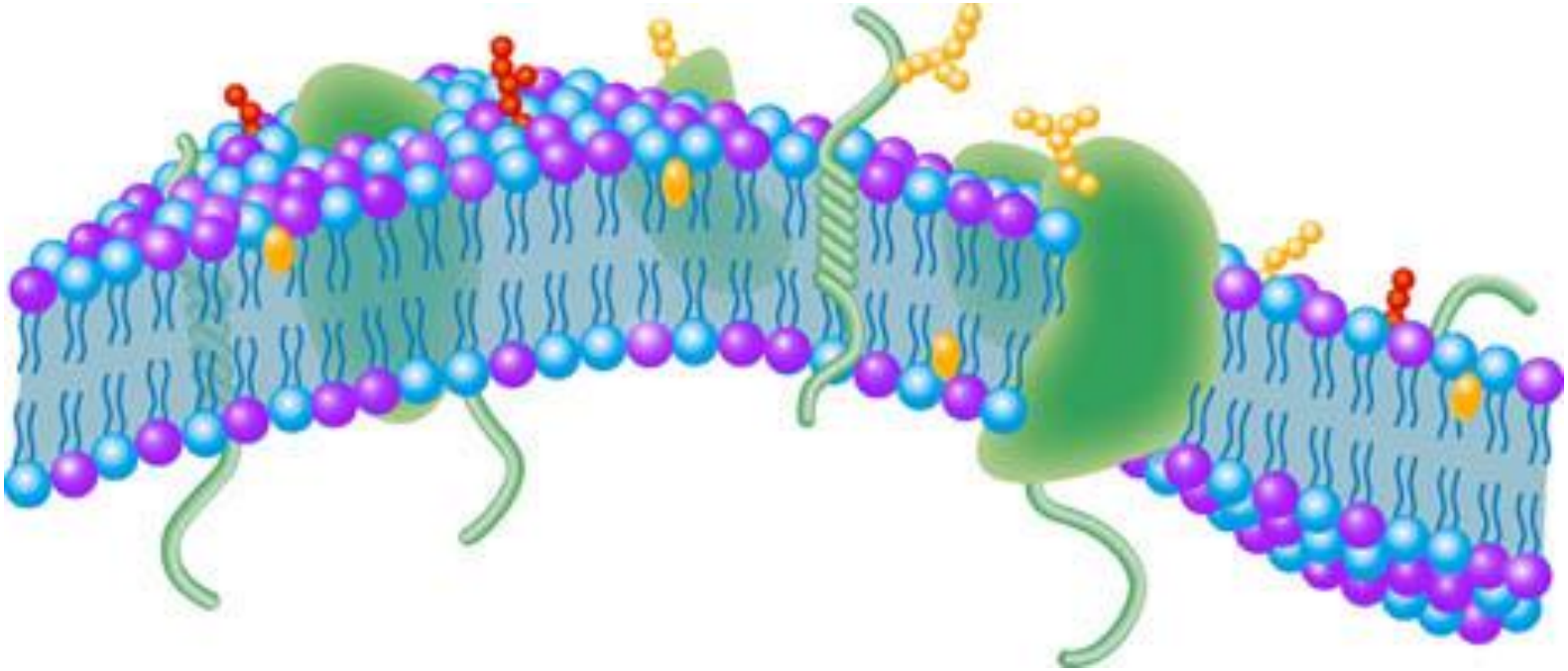
7-3 Cell Boundaries



Cell Membrane

The cell membrane regulates what enters and leaves the cell and also provides protection and support.

Cell membrane- barrier that surrounds cell.

The cell membrane is a double-layered sheet called a **lipid bilayer**.

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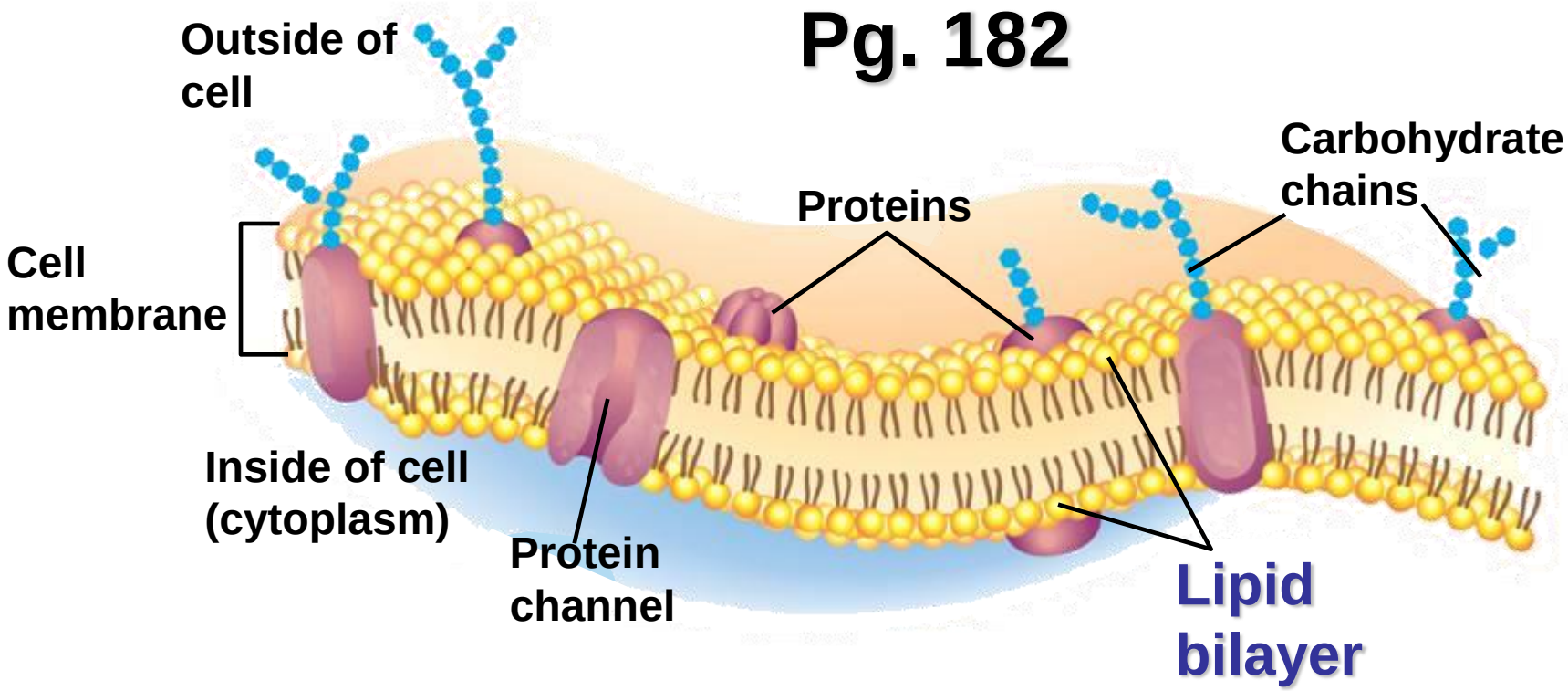
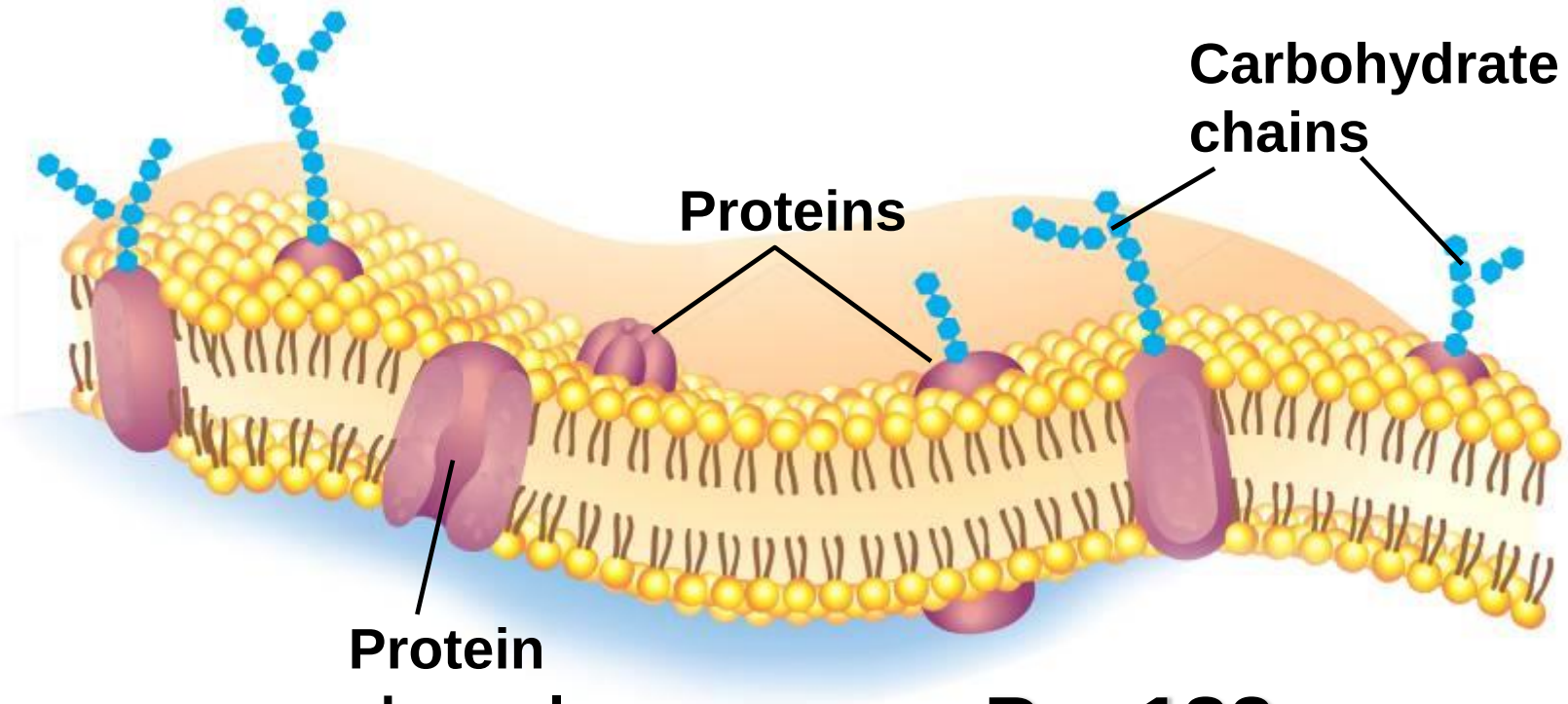


Cell membranes contain protein and carbohydrate molecules embedded in the lipid bilayer. These molecules are free to float throughout the lipid bilayer **(Fluid Mosaic Model)**



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Cell Wall

The main function of the cell wall is to provide support and protection for the cell.

Cell Wall

- found in plants, algae, fungi, and many prokaryotes.
- lies outside the cell membrane.
- porous (have holes) to allow water, oxygen, carbon dioxide, and other substances to pass into and out of cell.

Movement of materials into and out of a cell

4 Ways Materials move into and out of a cell:

1. Diffusion
2. Osmosis
3. Facilitated Diffusion
4. Active Transport

Diffusion Through Cell Boundaries

Every living cell exists in a liquid environment.

The cell membrane regulates movement of dissolved molecules into and out of the cell.

Measuring Concentration

A solution is a mixture of two or more substances.

The substances dissolved in the solution are called solutes.

The **concentration** of a solution is the amount of solute in a given solution.

Diffusion

The movement of solute from an area of high concentration to an area of low concentration.

Equal concentration of the solute on both sides of the membrane means the system has reached **equilibrium**.

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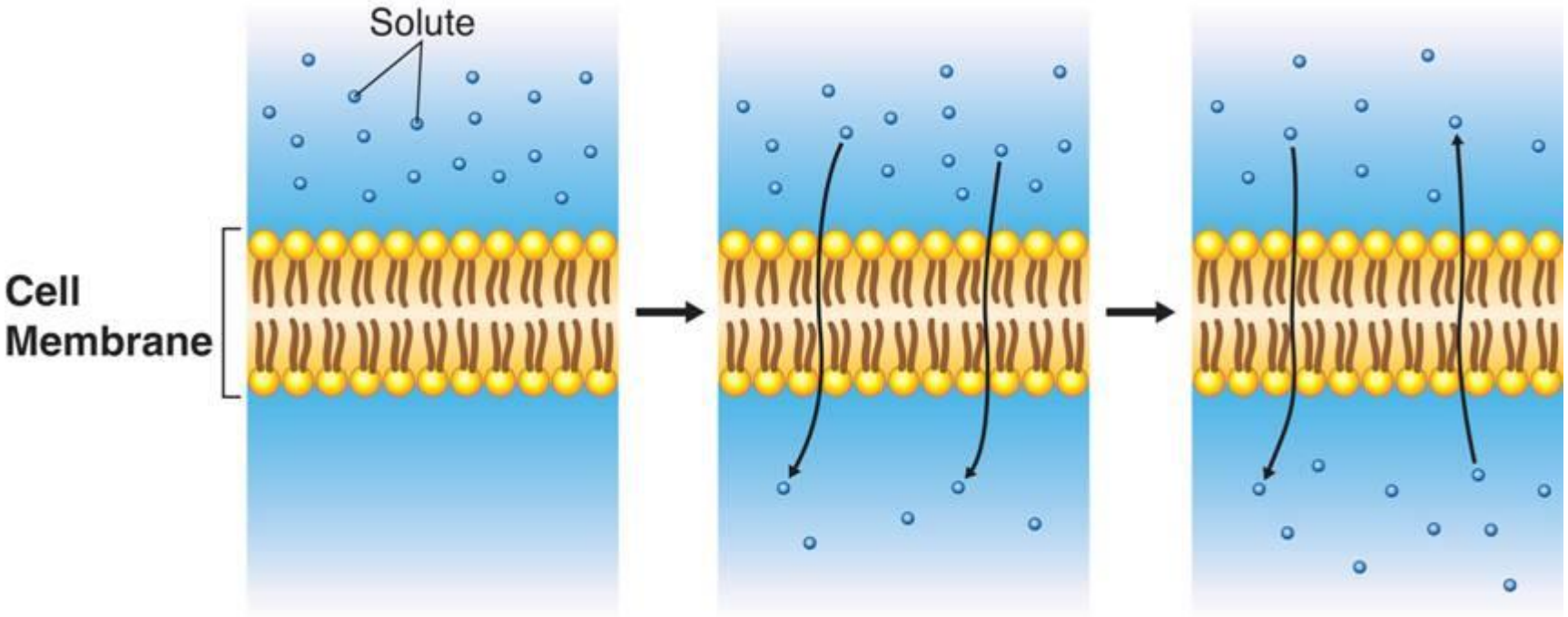
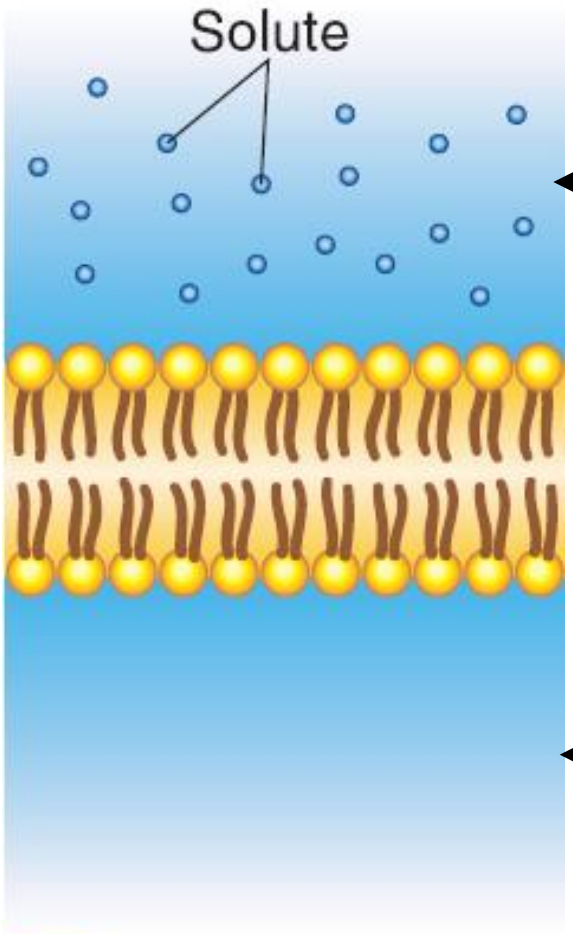


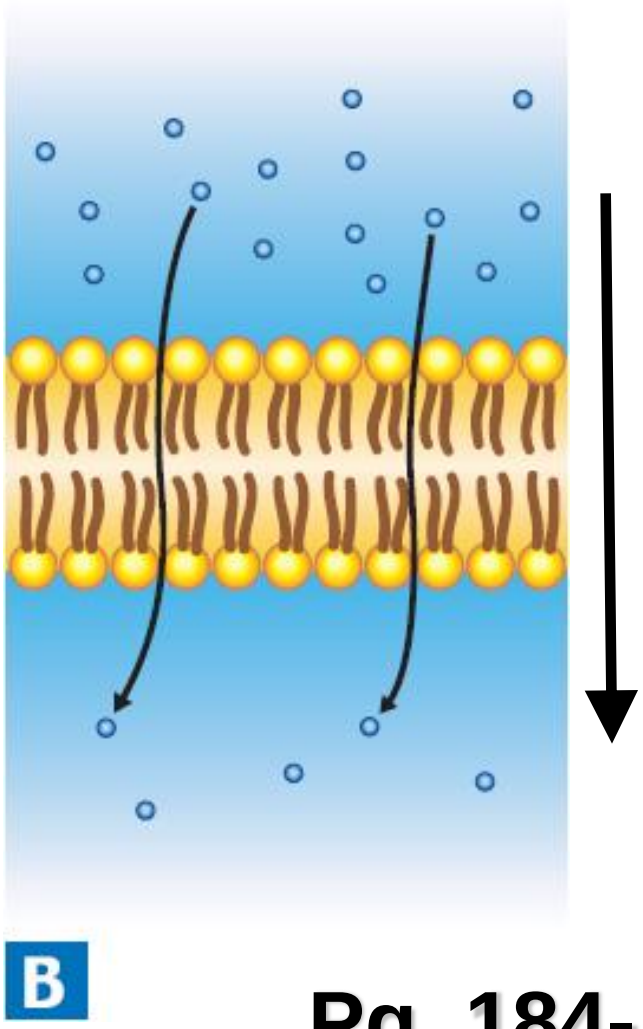


High concentration of solute.

Low concentration of solute.

A

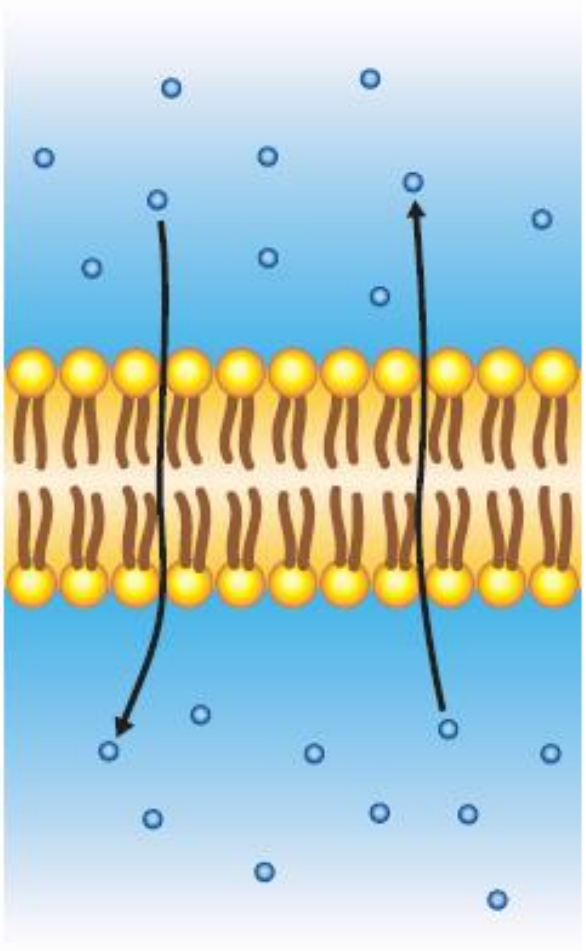
Pg. 184- Diagram A



Pg. 184-Diagram B

Solute particles move from area of high concentration to an area of low concentration.

Solute particles will continue to diffuse across the membrane until equilibrium is reached.



When equilibrium is reached, solute particles continue to diffuse across the membrane in both directions.

C

Pg. 184- Diagram C

The process of diffusion does not require the cell to use energy.

Osmosis

Osmosis is the diffusion of water through a selectively permeable membrane.

Osmosis does not require the cell to use energy.

Osmosis

Water diffuses from an area of high concentration to low concentration.

If you compare two solutions, the more concentrated solution is **hypertonic** (“above strength”).

The more dilute solution is **hypotonic** (“below strength”).

When concentrations of solutions are the same on both sides of a membrane, the solutions are **isotonic** (”same strength”).

How Osmosis Works

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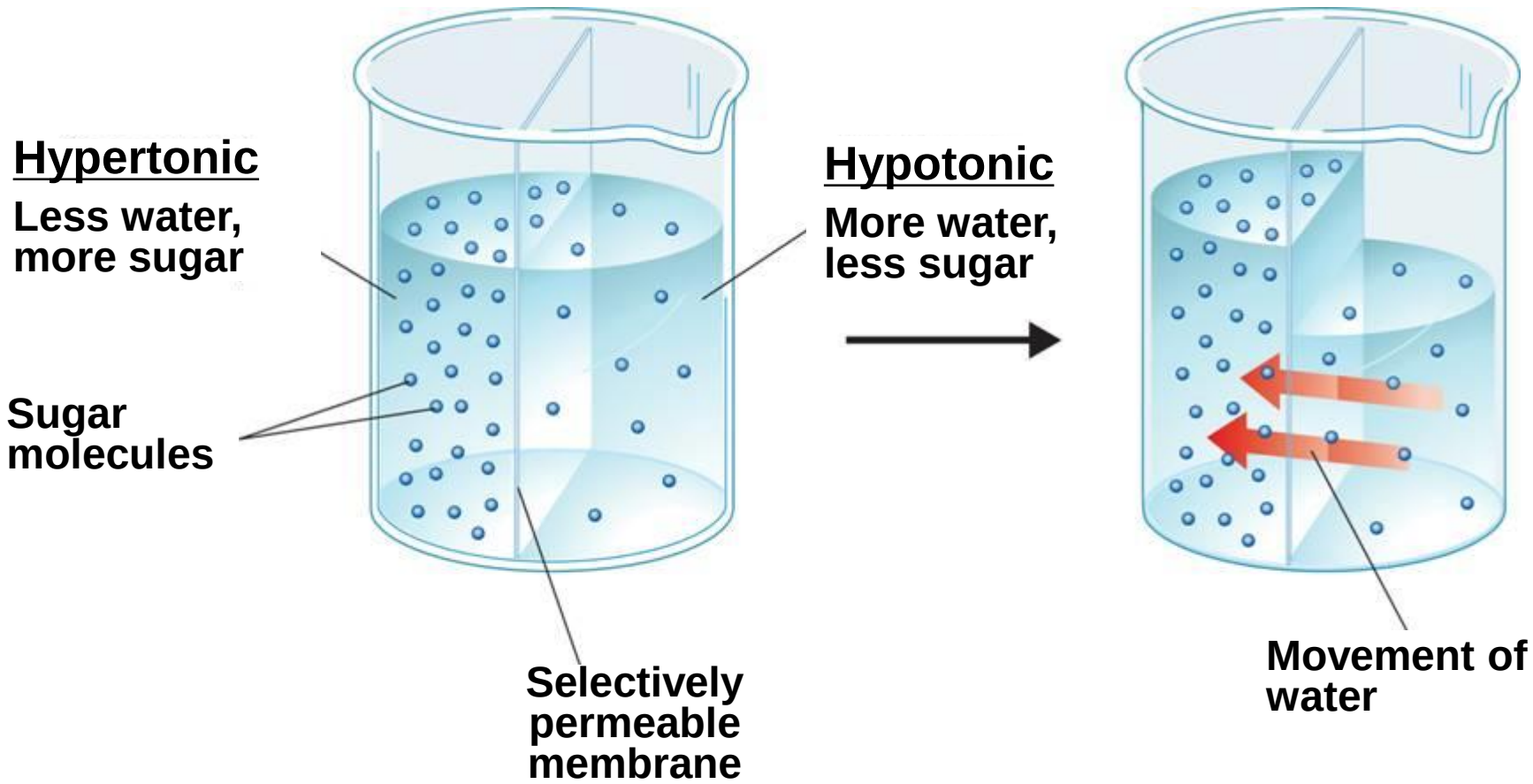


Osmotic Pressure

Pressure due to water moving across the membrane.

Example- filling up a water balloon.

What happens to the balloon if the water has no where to escape?

Osmosis

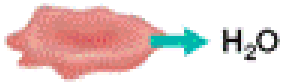
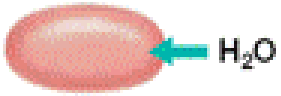
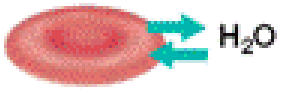
If you have more solute inside the cell than outside the cell, how does water want to move?

What happens to the cell if the movement of water above continues?

Osmosis

Cells in large organisms are not in danger of bursting because they are bathed in isotonic solutions (blood).

Other cells (plant cells) have a cell wall that prevents the cell from expanding even under tremendous osmotic pressure.

If the fluid outside the cell has…	Then outside fluid is…	Water diffuses…	Effect on cell
…lower free water molecule concentration than cytoplasm	…hypertonic.	…out of cell. 	Cell shrinks.
…higher free water molecule concentration than cytoplasm	…hypotonic.	…into cell. 	Cell swells.
…same free water molecule concentration as cytoplasm	…isotonic.	…into and out of cell at equal rates. 	Cell stays same size.

Not in book, but similar to Diagram on pg. 186

Facilitated Diffusion

Cell membranes have protein channels that act as carriers (passageways), making it easy for certain molecules to diffuse across.

Movement of specific molecules across cell membranes through protein channels is known as **facilitated diffusion**.

Facilitated diffusion does not require the cell to use energy.

Facilitated Diffusion

Facilitated Diffusion

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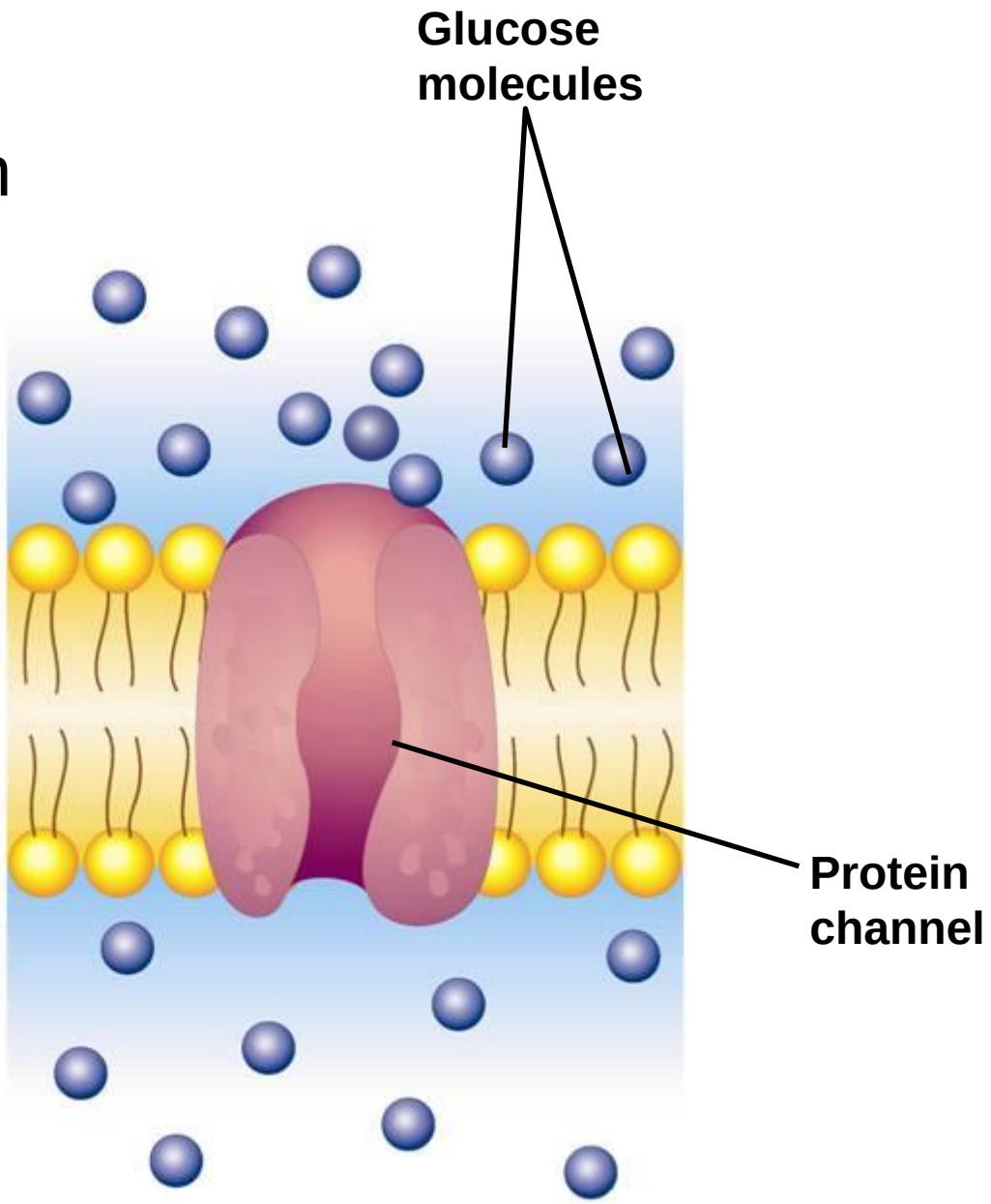

Facilitated Diffusion

Facilitated diffusion is fast and specific.

Facilitated diffusion will only occur if there is a higher concentration of solute on one side of a cell membrane as compared to the other side.

Active Transport

<u>Active transport-</u> the movement of substances in the opposite direction of diffusion (against the concentration difference).

Active transport requires energy.

Molecular Transport

In active transport, small molecules and ions are carried across membranes by proteins (pumps) in the membrane.

This movement of molecules and ions requires energy.

Active Transport

Active Transport

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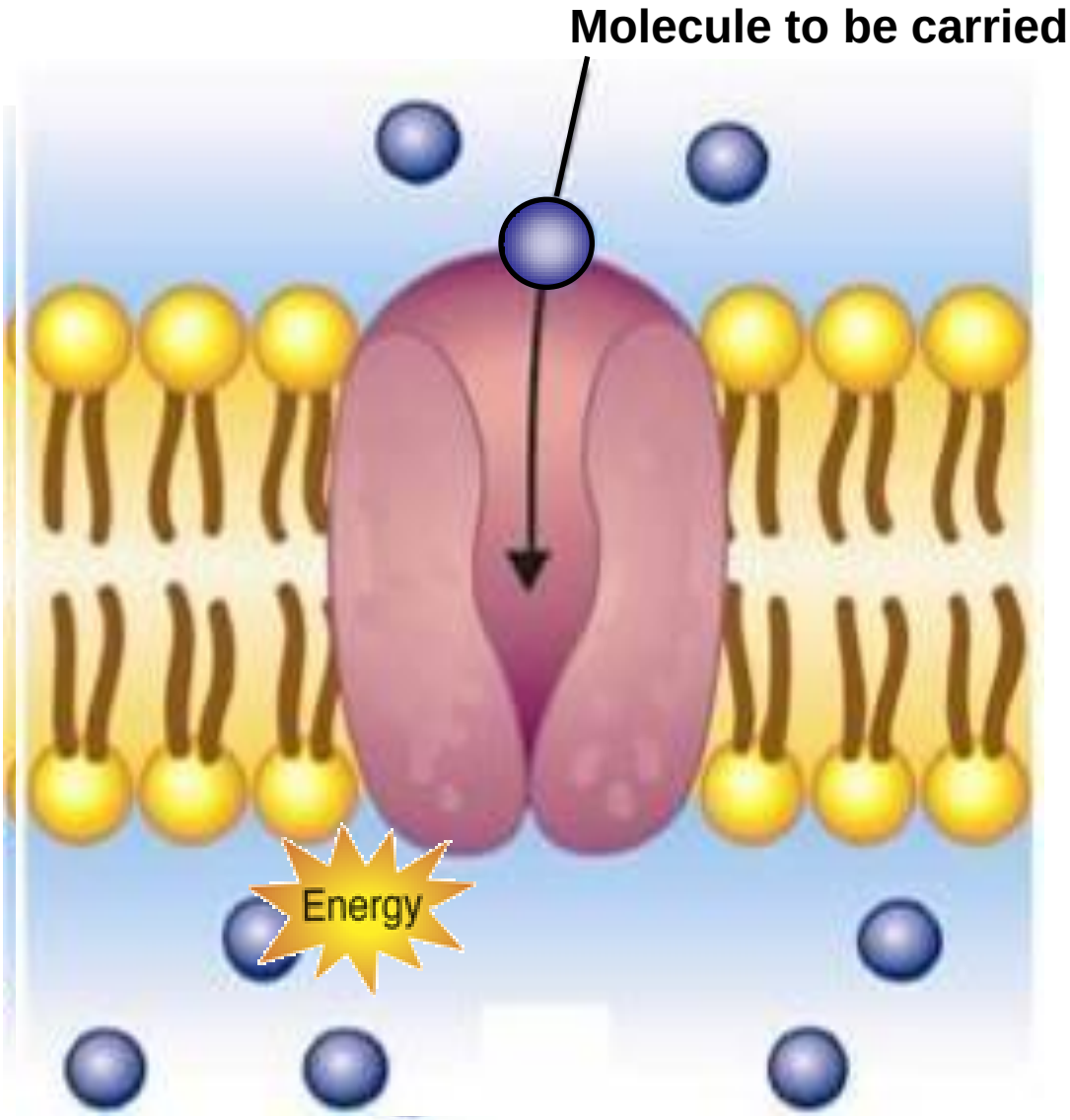


Endocytosis and Exocytosis

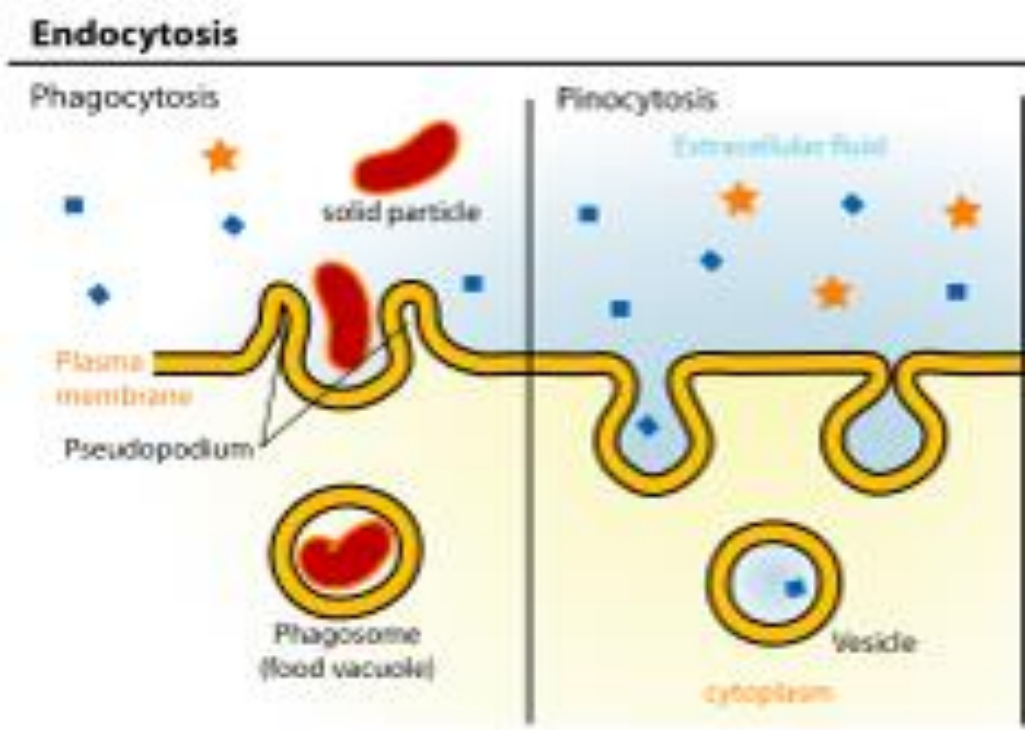
Endocytosis is the process of taking material into the cell by means of infoldings, or pockets, of the cell membrane.

Two examples of endocytosis are:

- phagocytosis
- pinocytosis

In **phagocytosis**, extensions of cytoplasm surround a particle and package it within a food vacuole. The cell then engulfs it.

In **pinocytosis**, tiny pockets form along the cell membrane, fill with liquid, and pinch off to form vacuoles within the cell.

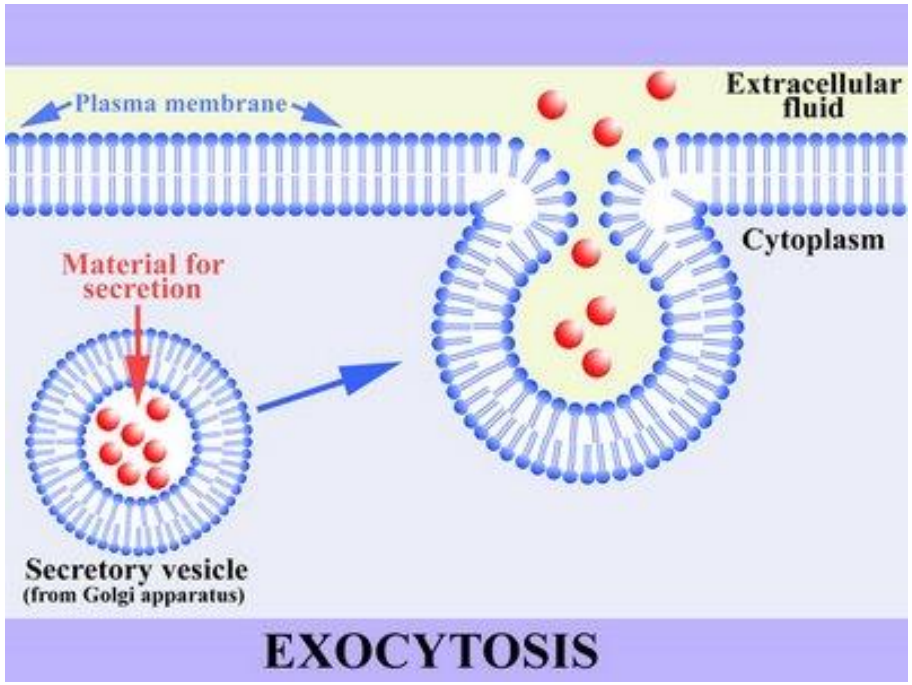


Not in book

Exocytosis

Movement of materials out of the cell.

During **exocytosis**, the membrane of the vacuole (filled with materials) fuses with the cell membrane, forcing the contents out of the cell.



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