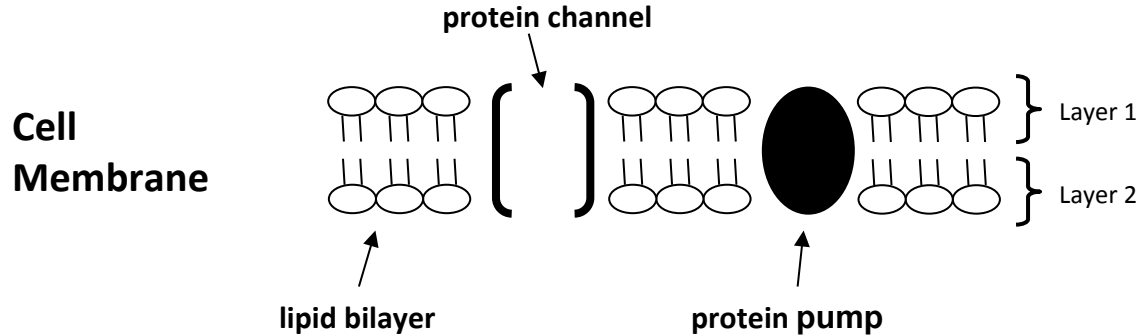


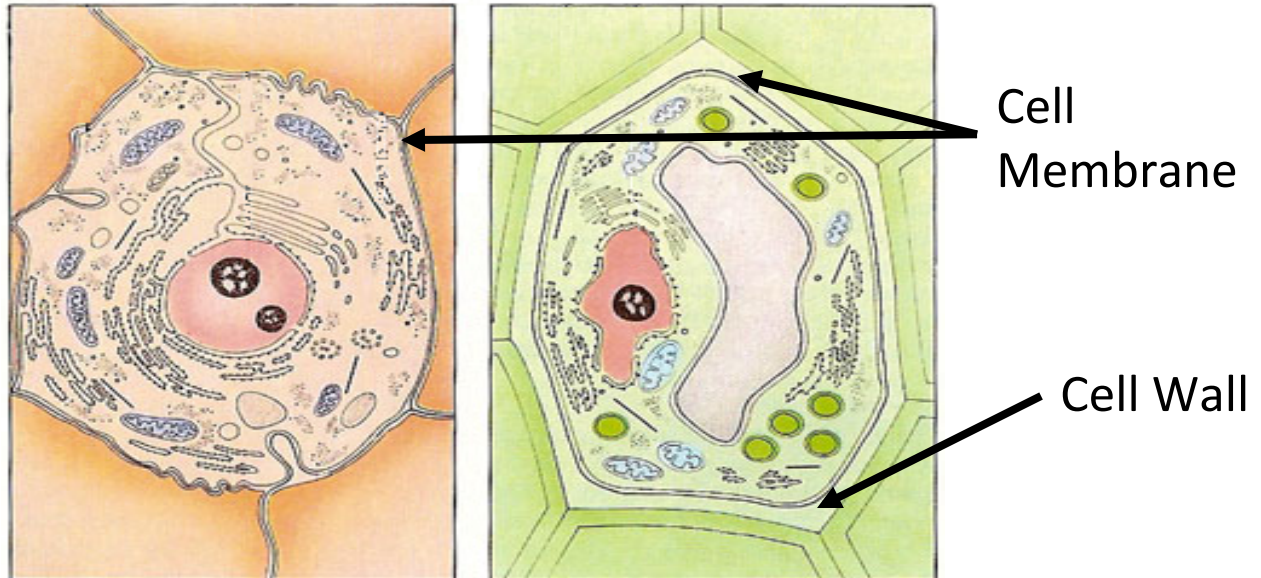
# Cell Membrane and Transport

## Cell Membrane and Cell Wall:

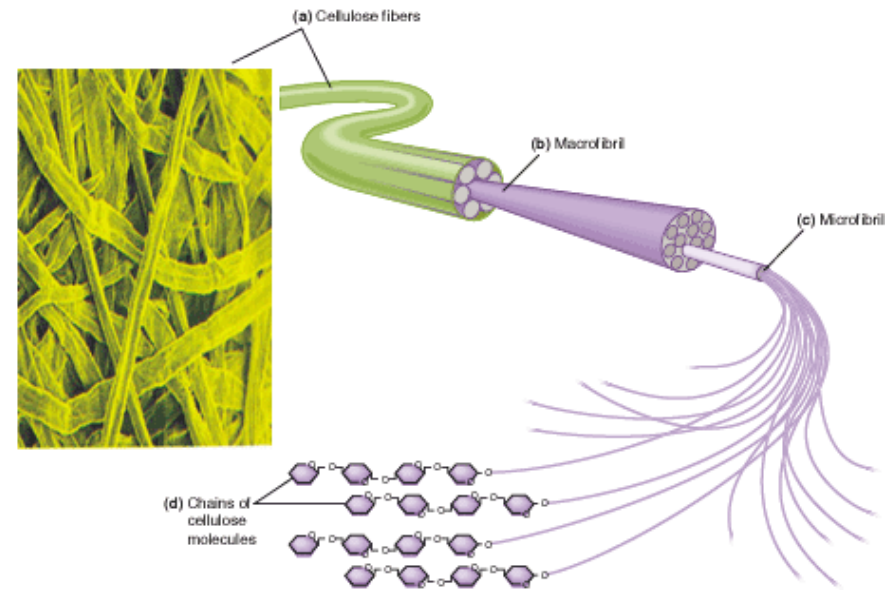
- ALL cells have a cell membrane made of proteins and lipids



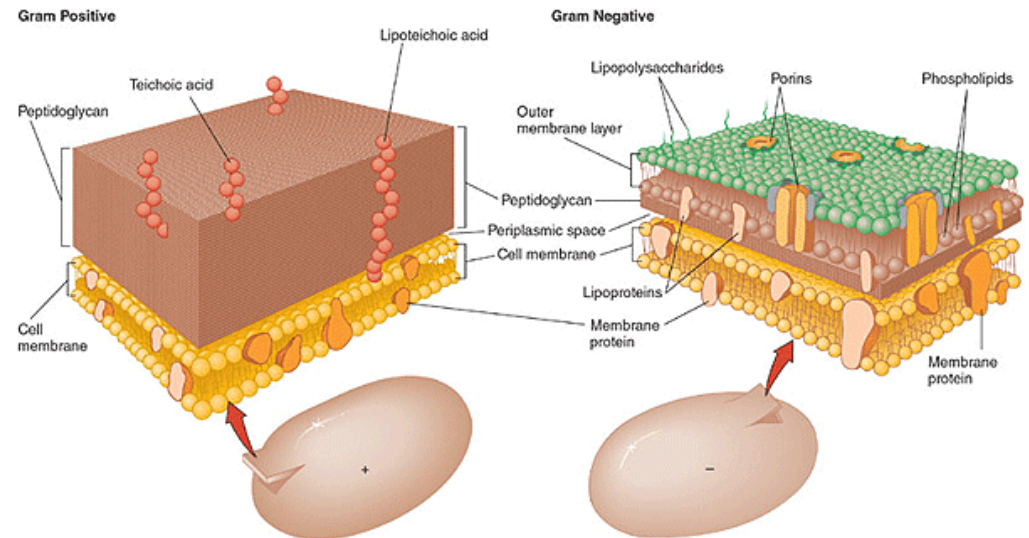
- SOME cells have cell membranes and cell walls – ex: plants, fungi and bacteria



- Cell membranes and cell walls are **porous** allowing water, carbon dioxide, oxygen and some **nutrients** to pass through easily

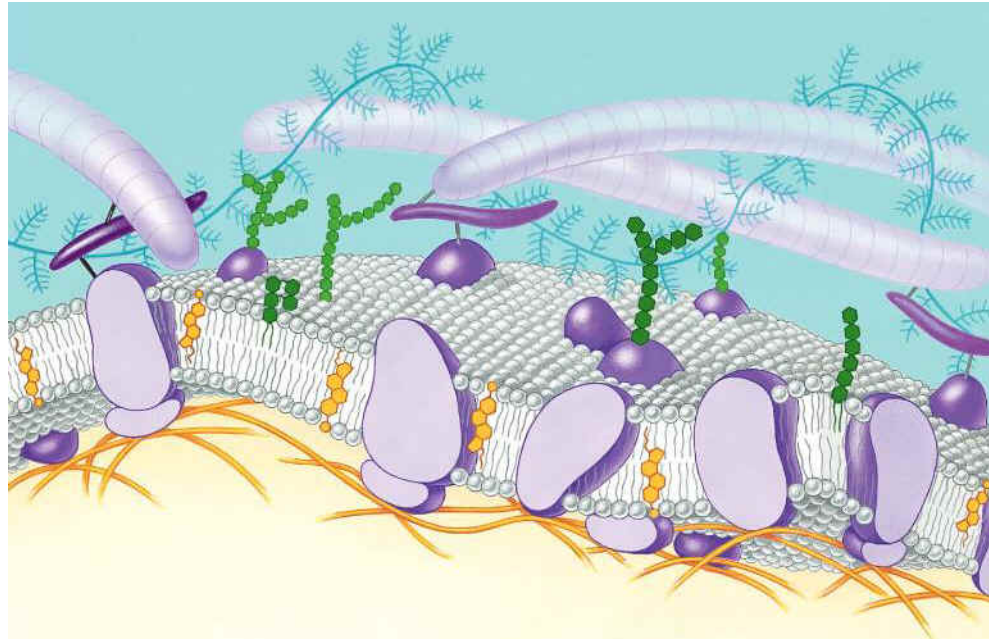


Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



# Function of the Cell Membrane:

- Cell membrane separates the components of a cell from its environment—surrounds the cell
- “Gatekeeper” of the cell—regulates the flow of materials into and out of cell—selectively permeable
- Cell membrane helps cells maintain homeostasis—stable internal balance



# Passive Transport

A process that does not require energy to move molecules from a **HIGH to LOW** concentration

- Diffusion
- Facilitated Diffusion
- Osmosis

## Transport Concepts

Passive  
vs.  
Active



Passive

No energy needed

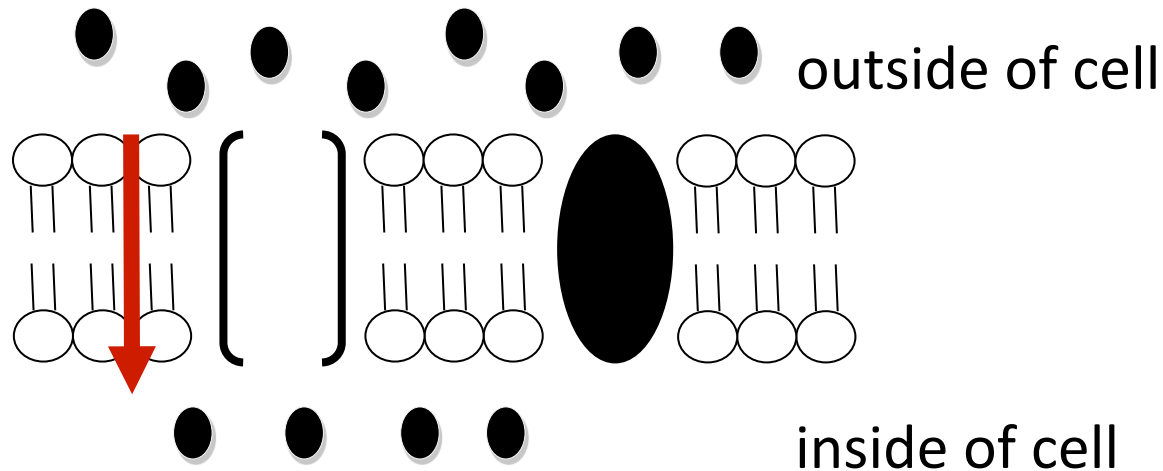


Active

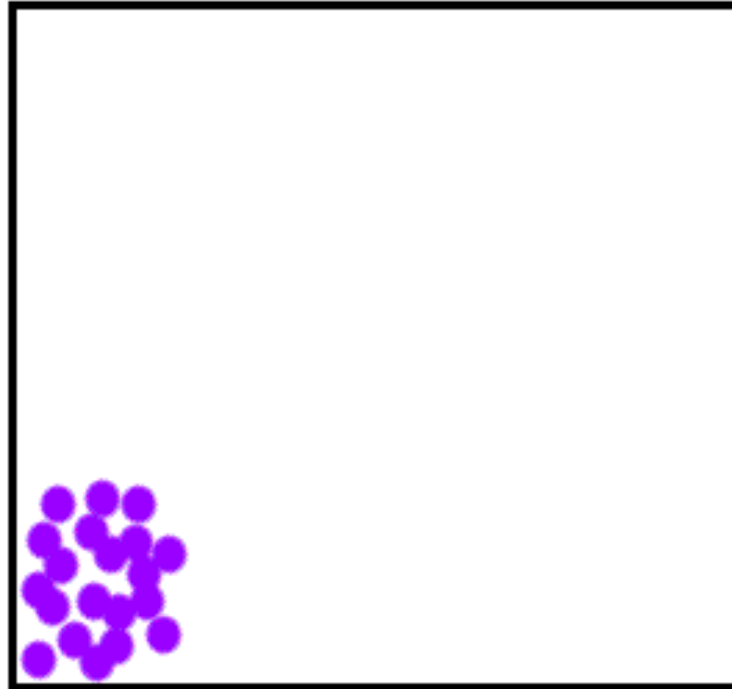
Energy needed

- **Diffusion** is the movement of **small** particles across a **selectively permeable** membrane like the cell membrane until **equilibrium** is reached.

These particles move from an area of **high concentration** to an area of **low concentration**.



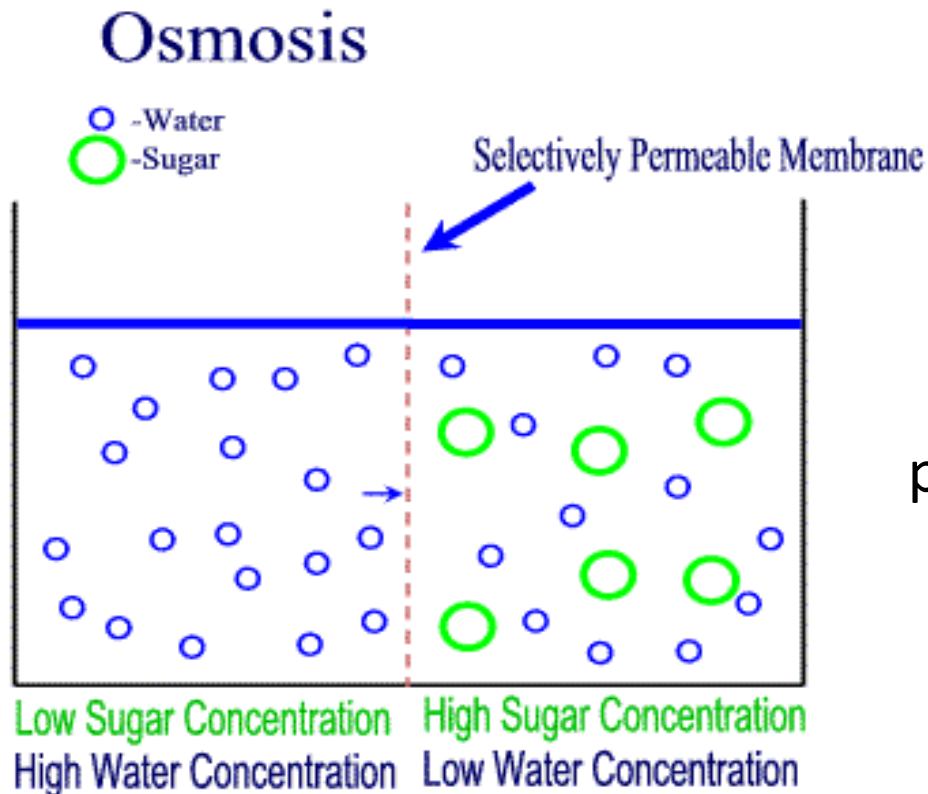
# DIFFUSION



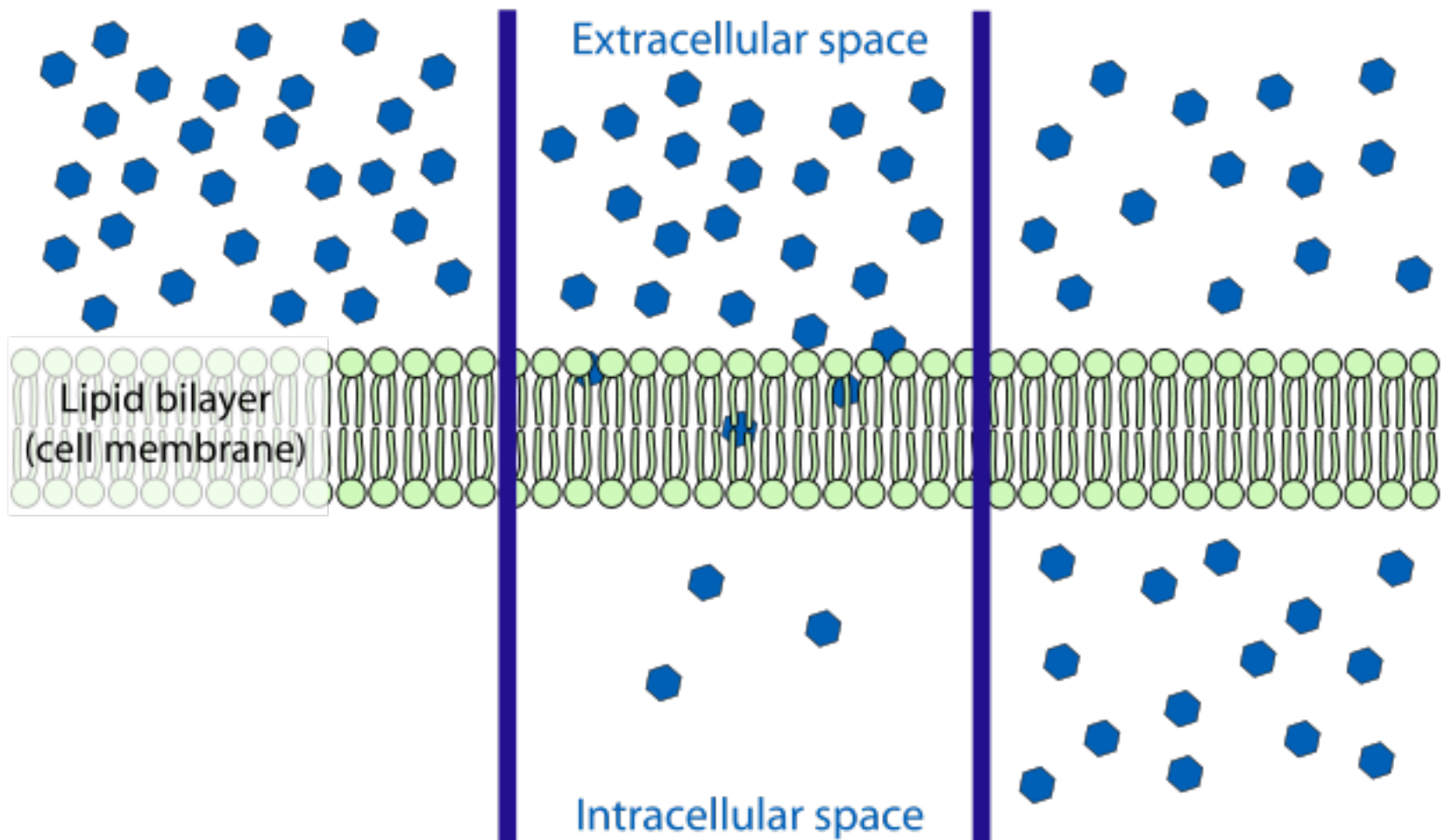
HIGH to LOW concentration

- **Osmosis** is the **diffusion** of **water** through a selectively permeable membrane like the cell membrane

Water diffuses across a membrane from an area of **high concentration** to an area of **low concentration**.



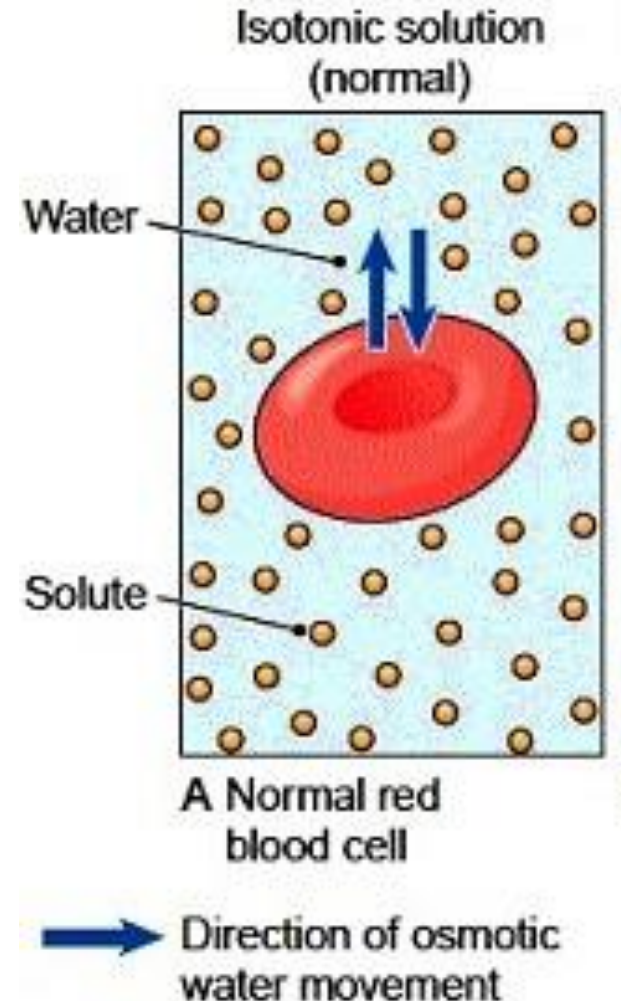
Semi-permeable membrane is permeable to water, but not to sugar



**TIME**



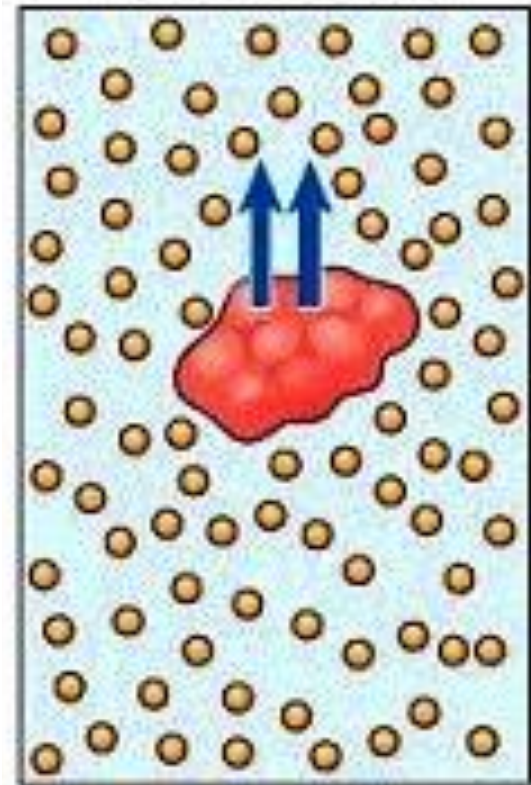
**Isotonic Solutions:** contain the **same concentration** of solute as another solution (e.g. the cell's cytoplasm). When a cell is placed in an isotonic solution, the water diffuses **into and out** of the cell at the same rate. The fluid that surrounds the body cells is isotonic.



## Hypertonic Solutions:

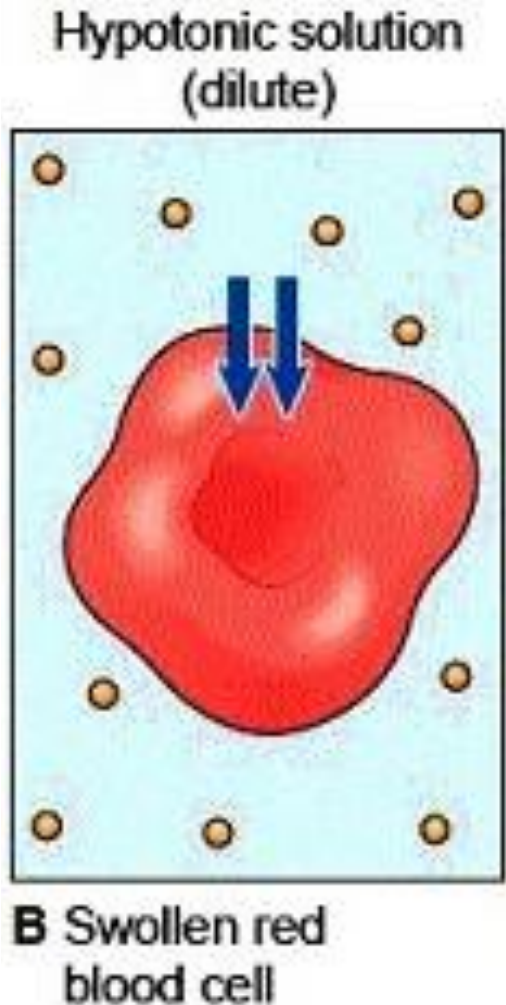
contain a high concentration of solute relative to another solution (e.g. the cell's cytoplasm). When a cell is placed in a hypertonic solution, the water diffuses out of the cell, causing the cell to shrink.

Hypertonic solution  
(concentrated)



**C** Shrunken (crenated)  
red blood cell

**Hypotonic Solutions:** contain a **low concentration** of solute relative to another solution (e.g. the cell's cytoplasm). When a cell is placed in a hypotonic solution, the water diffuses **into** the cell, causing the cell to **swell** and possibly **explode**.



If a cell is placed in an **isotonic** solution it would cause the cell to:

A) Swell

B) Shrink

C) Swell then shrink

D) Remain the same

If a cell is placed in an **hypotonic** solution it would cause the cell to:

A) Swell

B) Shrink

C) Swell then shrink

D) Remain the same

If a cell is placed in an **hypertonic** solution it would cause the cell to:

A) Swell

B) Shriveled

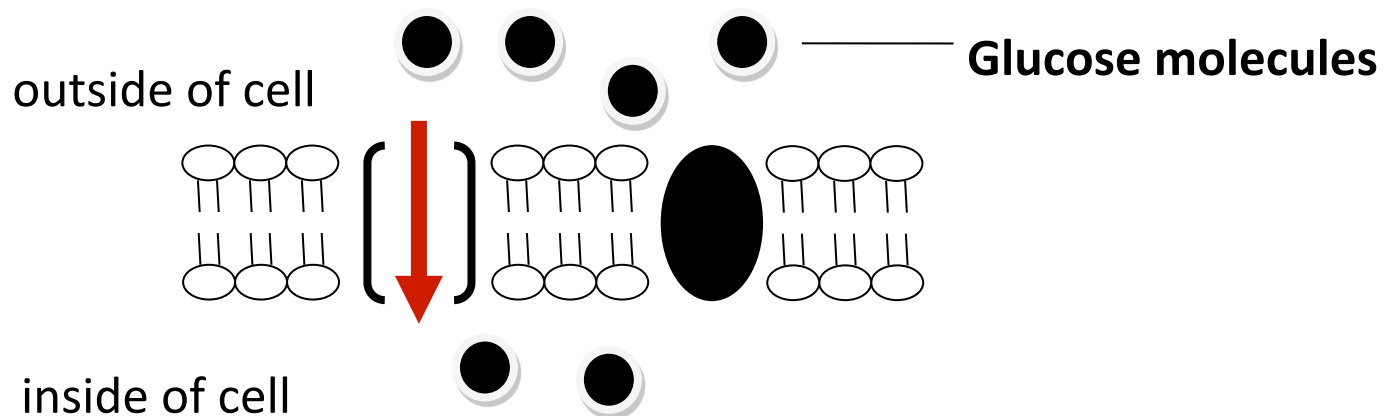
C) Swell then shrivel

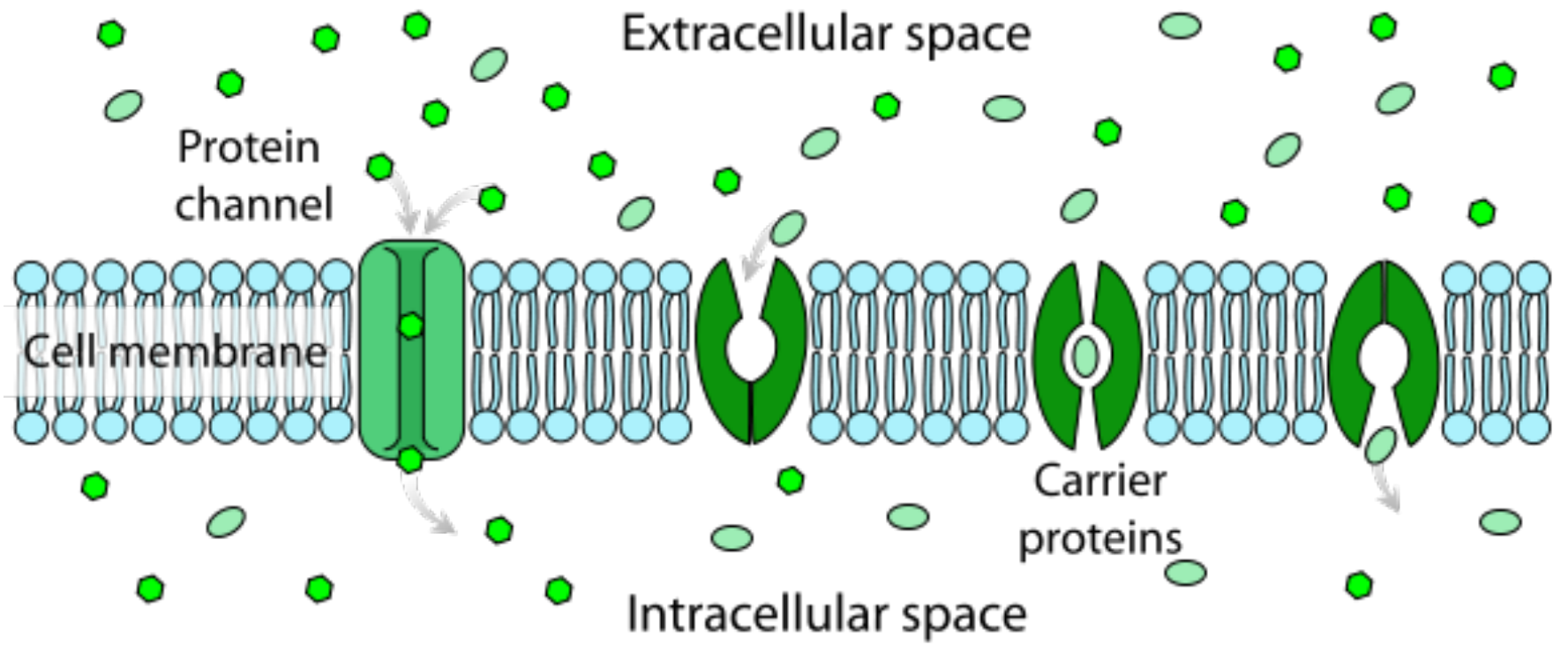
D) Remain the same

- **Facilitated Diffusion** is the movement of **larger molecules** like glucose through the cell membrane – larger molecules must be “helped”

Proteins in the cell membrane form **channels** for **large molecules** to pass through

Proteins that form channels (pores) are called **protein channels**







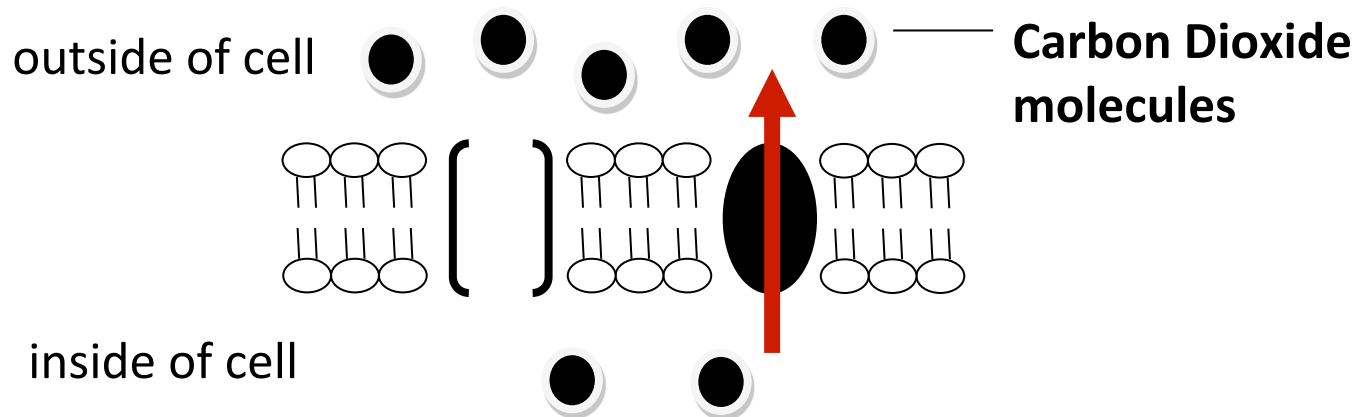
# Active Transport

Active transport is the movement of molecules from **LOW to HIGH** concentration.

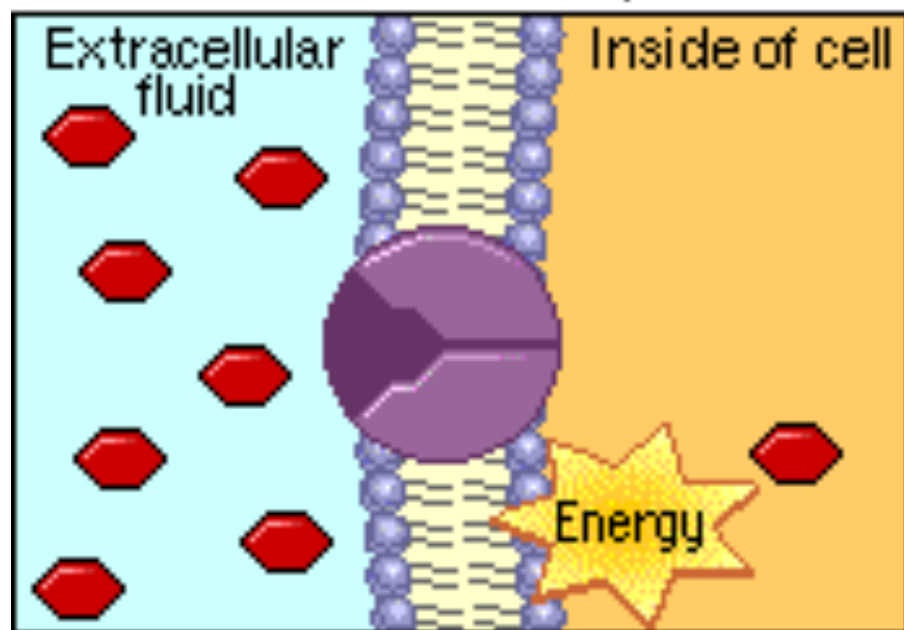
**Energy is required** as molecules must be **pumped against** the concentration gradient.

Proteins that work as pumps are called **protein pumps**.

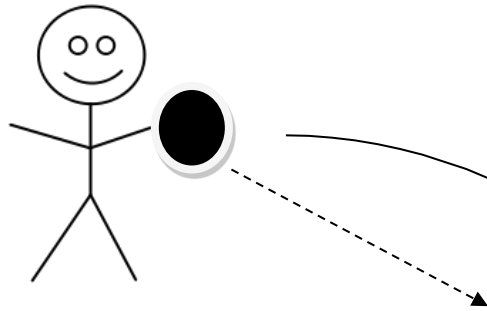
Ex: Body cells must pump carbon dioxide out into the surrounding blood vessels to be carried to the lungs for exhale. Blood vessels are high in carbon dioxide compared to the cells, so energy is required to move the carbon dioxide across the cell membrane from **LOW to HIGH** concentration.



## Active Transport



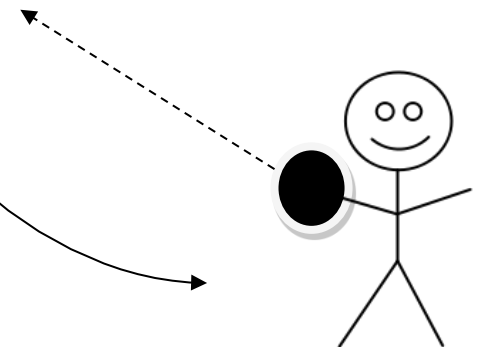
# ANALOGY:



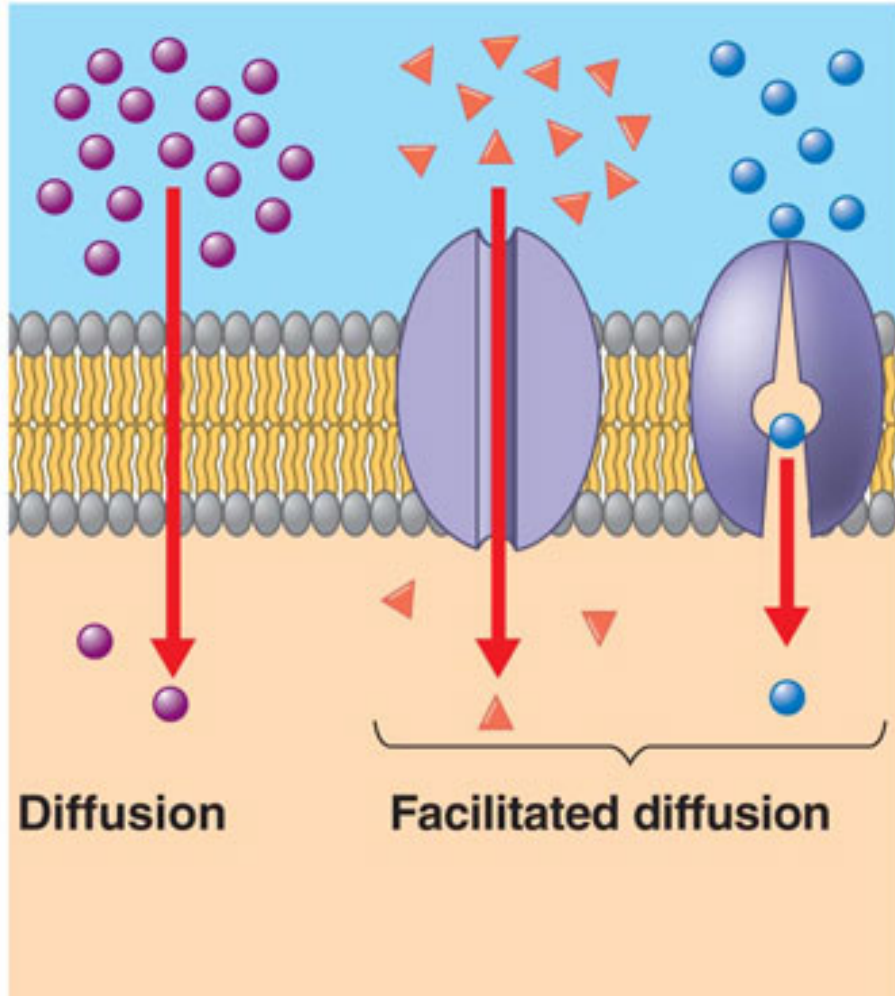
## NO ENERGY NEEDED:

- Diffusion
- Osmosis
- Facilitated Diffusion

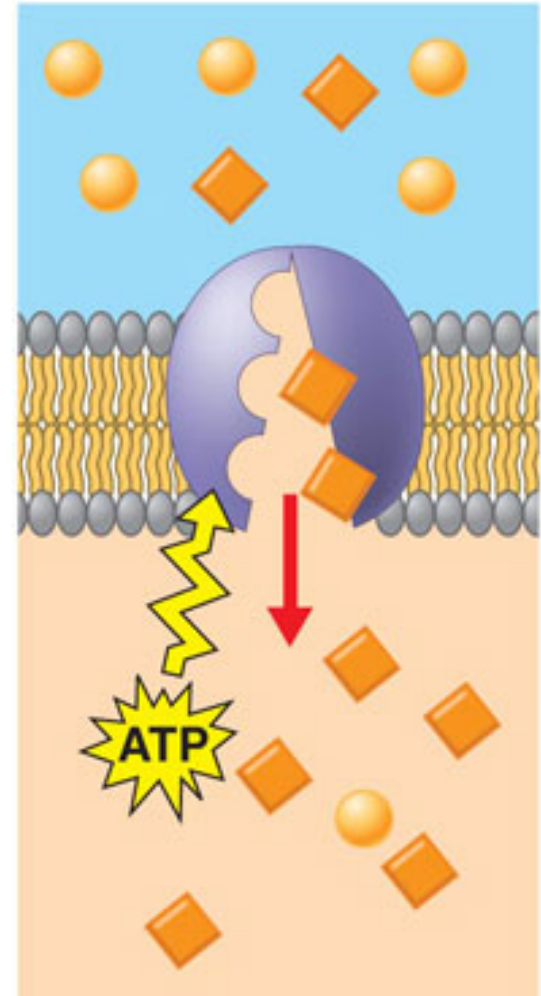
**ENERGY NEEDED:**  
Active Transport



## Passive transport



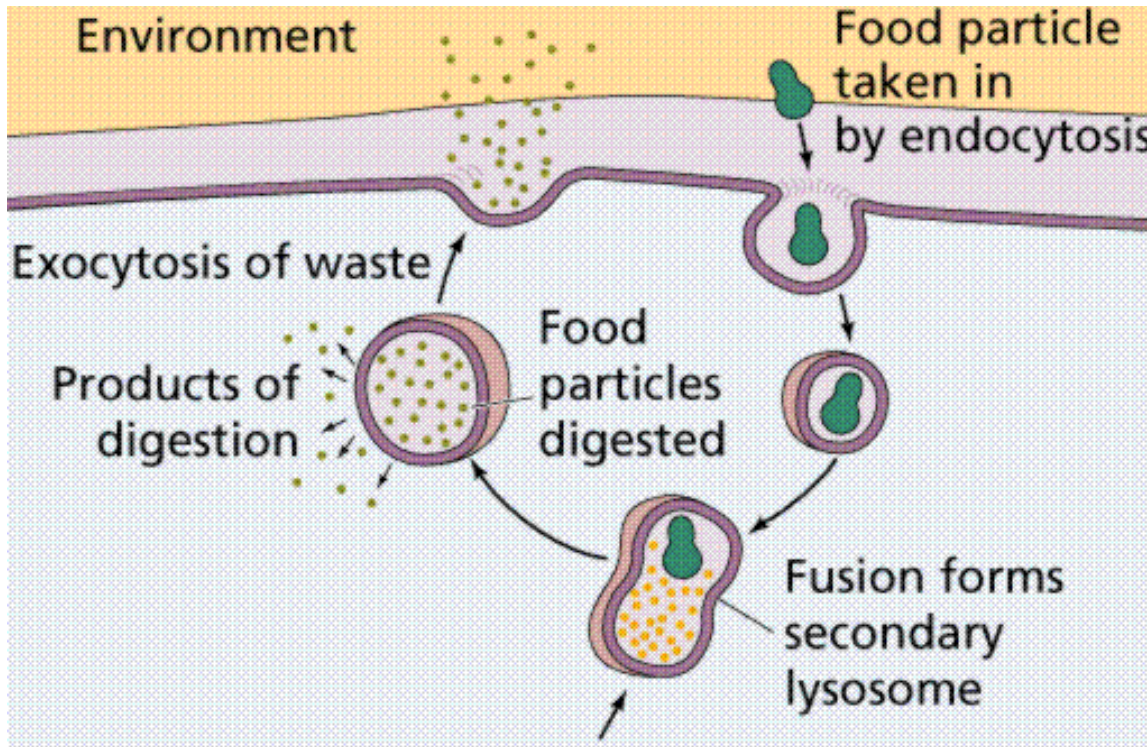
## Active transport



Which of the following requires energy?

- A) Facilitated diffusion and active transport
- B) Osmosis and active transport
- C) Active transport
- D) Passive transport

- **Endocytosis and Exocytosis** is the mechanism by which very large molecules (such as food and wastes) get into and out of the cell



Food is moved into the cell by Endocytosis

Wastes are moved out of the cell by Exocytosis

Ex: White Blood Cells, which are part of the immune system, surround and engulf bacteria by endocytosis.



