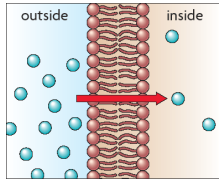


### 3.4 Diffusion and Osmosis

**KEY CONCEPT** Materials move across membranes because of concentration differences.



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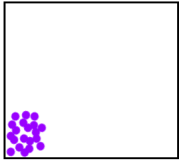
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### Diffusion

- movement of molecules from an area of high concentration to an area of low concentration

- **Example**



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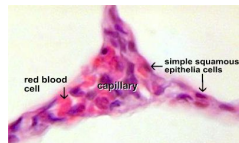
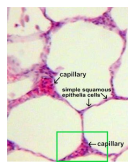
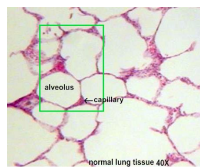
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### Lungs



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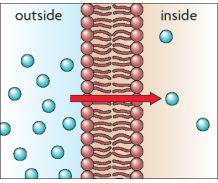
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### Passive Transport

**Passive transport does not require energy input from a cell.**

- Molecules can move across the cell membrane through passive transport.




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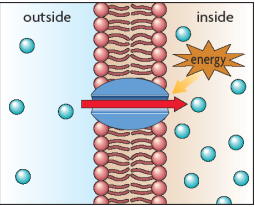
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### Active Transport

**KEY CONCEPT** Cells use energy to transport materials that cannot diffuse across a membrane.




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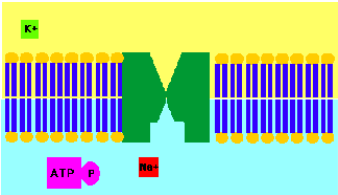
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### Active Transport

- Requires energy
- Ex) white blood cells (WBC) use energy to surround bacteria and bring them into the cell
- Example




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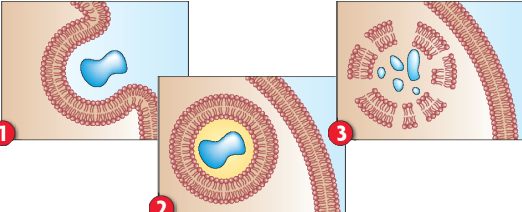
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### Endocytosis and Exocytosis

A cell can import and export large materials or large amounts of material in vesicles during the processes of endocytosis and exocytosis.

- Cells use energy to transport material in vesicles.
- **Endocytosis** is the process of taking material into the cell.



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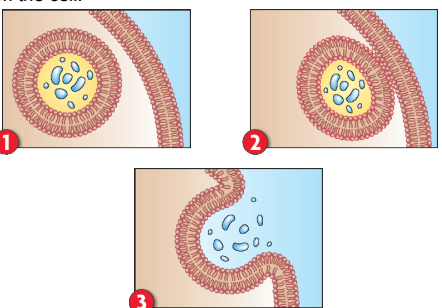
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- **Exocytosis** is the process of expelling material from the cell.



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### Energy of Motion

- Refers to atoms or molecules being in constant motion
- Occurs in all three states of matter
- Example

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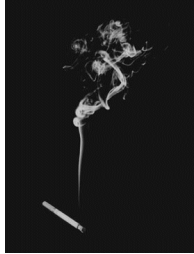
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### Brownian Movement

- Movement of large visible molecules by smaller invisible molecules
- Unorganized and random
- [Example](#)



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### Solution

- Mixture of solids (**solutes**) in a liquid (**solvent**)
- The more solute in a solution, the greater the concentration



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### Solutions

- Solutes and Solvents both diffuse through the cell membrane

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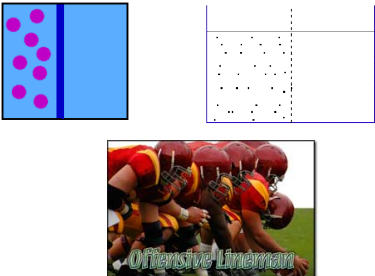
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**Impermeable Membrane**

- Nothing passes through




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**Permeable Membrane**

- Lets everything pass through in both directions

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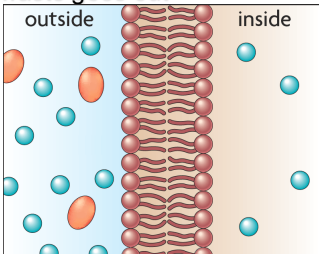
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**Selectively Permeable**

- Only allows some things to pass through the membrane (the essential things)
- Nutrients go in, waste goes out
- Example




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### Osmosis

- the diffusion of water molecules across a semipermeable membrane.
- From higher concentration to lower concentration

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### Osmotic Balance

- The amount of water inside the cell is equal to the amount of water outside the cell

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### Osmotic Pressure

- Force that water exerts on living cells
- ex) [blooming flower](#), [venus flytrap](#)

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### Dialysis

- Diffusion of solutes (things other than water) through a membrane
- Osmosis and dialysis occurs simultaneously

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### 3.4 Diffusion and Osmosis

Diffusion and osmosis are types of passive transport.

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

**1 ISOTONIC SOLUTION**

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.

**2 HYPERTONIC SOLUTION**

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.

**3 HYPOTONIC SOLUTION**

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.

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Hypotonic → Isotonic → Hypertonic

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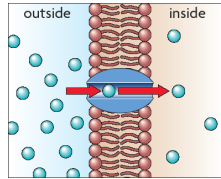
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### 3.4 Diffusion and Osmosis

**Some molecules can only diffuse through transport proteins.**

- Some molecules cannot easily diffuse across the cell membrane.
- Facilitated diffusion is diffusion through transport proteins.



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