

Cellular Transport

Cell membrane defends the cell from outside environment

Diffusion: The spreading of a solute across a solution until its concentration is equal on all parts

→ **simple diffusion:** Transport from high $[]$ to low $[]$

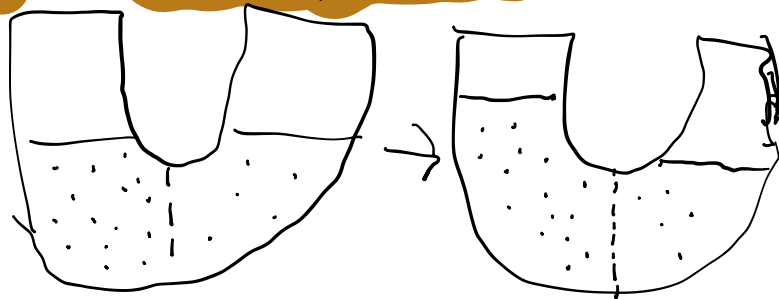
only used by small nonpolar molecules such as CO_2 and O_2

High $[]$ → Low $[]$

↳ always diffuse in this direction

Osmosis: Movement of water across the membrane; from low $[]$ to high $[]$

Demonstration of Osmosis!



Osmolality: Environment's solute $[]$ relative to the cell

Other Types of Transport

#1) **Facilitated Diffusion:** Uses transport proteins to diffuse across the membrane; requires no energy

- $[High] \rightarrow [Low]$

- Primarily charged/polar molecules

Includes:

- **Channel proteins:** Forms a tunnel for molecules to pass through

- **Carrier proteins:** Binding sites for the molecule; exposed to one side of the cell at a time depending on whether a binding molecule is present

includes aquaporins

#2) **Primary Active Transport:**

- Against concentration gradient

- $[Low] \rightarrow [High]$

- Expend ATP (energy)

Examples: **$\text{Na}^+ - \text{K}^+$ pump** (3 Na^+ out, 2 K^+ in)

- **Ca^{2+} pump** keeps low $[\text{Ca}^{2+}]$ in the cell

- **$\text{H}^+ - \text{K}^+$ pump** in the stomach

includes GLUT transporters, which bring glucose into the cell

#3) Secondary Active Transport

- Uses concentration gradient generated by primary active transport
- Uses energy from one molecule's gradient to move another

Cotransport / Symport: Same Direction, 2 molecules

↳ Na^+ - Glucose Cotransport

↳ Na^+ - K^+ - 2Cl^- Cotransport

Countertransport / Antiport: Opposite Direction

↳ Ca^{2+} - Na^+ Exchange

↳ Na^+ - H^+ Exchange

Cellular Ingestion

Endocytosis: Used for very large molecules and liquids; uses part of the membrane to form a vacuole for the molecule

Has 3 types:

- **Receptor mediated endocytosis**: Attach a specific receptor to start the vesicle creation process
- **Pinocytosis**: Uses endocytosis to pick up liquids
- **Phagocytosis**: Uses endocytosis to pick up larger molecules