

Membrane Transport

Because the plasma membrane is selectively permeable, it permits some particles while excluding others. Two properties of particles influence whether they can move across the plasma membrane without assistance:

1. The relative size of the particle in relation to the pore.
2. The size of the particle.

Highly lipid soluble particles

uncharged small ions
water
CO₂
ethanol, etc.

Can diffuse in the lipid bilayer and pass through the membrane

Low lipid solubility + charged particles

ions
glucose, amino acids, etc.
need transport proteins

the lipid bilayer is impermeable to all charged particles

Transport in or out of the cell can clearly be **passive** or **active** → active transport requires energy (ATP) and passive transport requires no energy

Passive Transport the movement of molecules across the cell membrane without the use of energy

1. **Diffusion** movement from a higher concentration of solute to a lower concentration of solute in order to equalize solute concentrations. A concentration gradient (or chemical gradient) is a gradual difference in solute concentration between two areas. It is the difference between the outside of the cell and the inside of the cell. Two types of diffusion are:

a. **Simple Diffusion** does not require protein channels. It is the unassisted passage of small, hydrophobic, nonpolar molecules from a higher concentration to a lower concentration.

Ex. In the capillaries of the kidney, wastes diffuse into the Bowman's capsule of the nephron. The movement of molecules down their concentration gradient.

b. **Facilitated Diffusion** passive transport that uses integral membrane proteins to transport water, charged, hydrophilic, + polar molecules across a concentration gradient.

Two types of transport proteins:

1. **Channel Proteins** create a passageway for molecules and ions across the membrane. In channels, a pore through the hydrophilic region that allows polar molecules to pass through hydrophobic protein channels. Transports ions such as Na⁺, K⁺, Ca²⁺, Cl⁻.

Ex. Aquaporins (H₂O channel proteins), ion channels (channel of gated channels - a channel opens when it gets a signal).

2. **Carrier Proteins** proteins that bind to molecules to facilitate transport across the membrane.

Ex. glucose transporters (GLUTs) facilitate the transport of glucose across the membrane because it is too large to pass through a channel. Without glucose carrier proteins, the cell would be deprived of fuel.

Active Transport the movement of molecules against a concentration gradient, which requires energy in the form of ATP. Pumps or carriers carry molecules across the membrane by active transport.

Na⁺/K⁺ pump transports Na⁺ out of the cell and K⁺ into the cell. The plasma membrane is impermeable to both Na⁺ and K⁺. A pump is a protein that uses energy to move molecules across the membrane.

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HOW I TAKE NOTES
ON MY

iPad Pro