

Basic Cell Physiology

Jacob Guzior

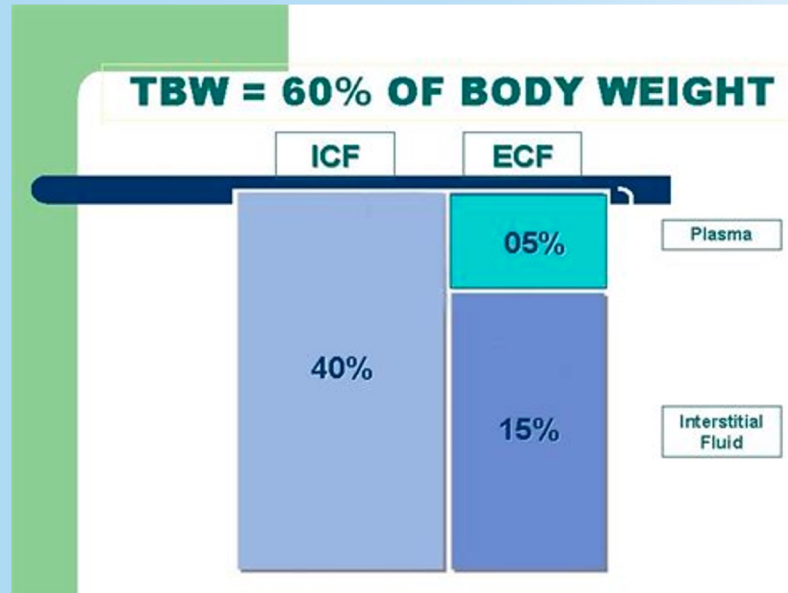
Basic Cell Physiology

- 1) Fluids and the Membrane
- 2) Passive Transport
 - Diffusion
 - Facilitated Diffusion
 - Osmosis & Tonicity**
- 1) Active Transport
- 2) Secondary Active Transport

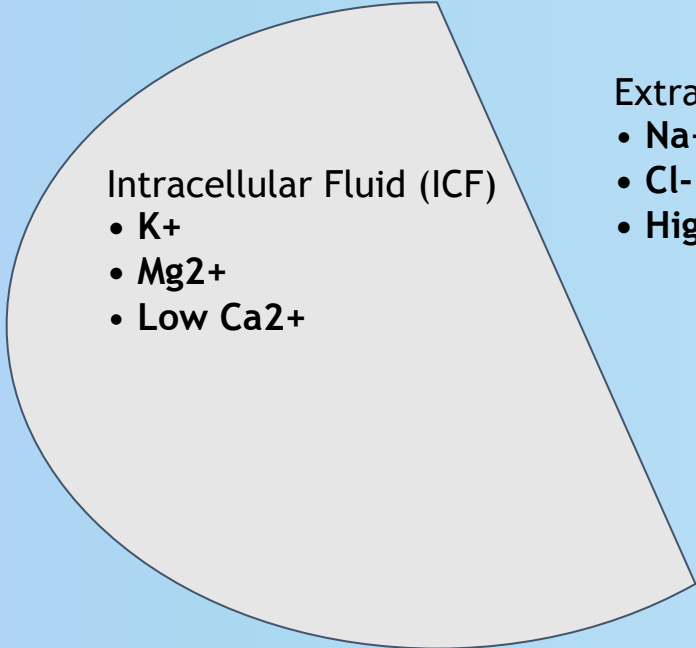
Fluids

Do not confuse total body water with total body weight

Both = TBW



Fluids



Intracellular Fluid (ICF)

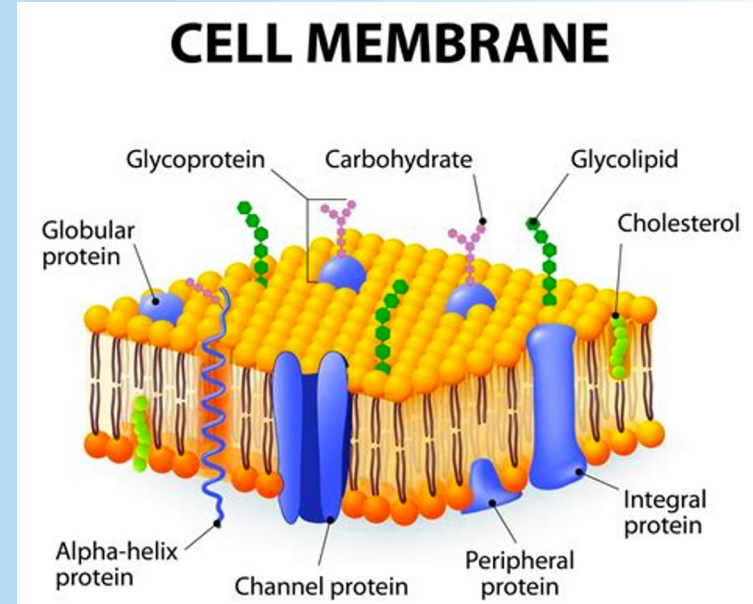
- K^+
- Mg^{2+}
- Low Ca^{2+}

Extracellular Fluid (ECF)

- Na^+
- Cl^-
- High Ca^{2+}

The Cell Membrane

- Composition varies with cell type
- Phospholipid bilayer
 - Hydrophilic heads (Phosphate+glycerol)
 - Hydrophobic tails (Lipids)
- Content: Proteins and lipids
 - Cholesterol (Rigidity/stability)
 - Membrane proteins



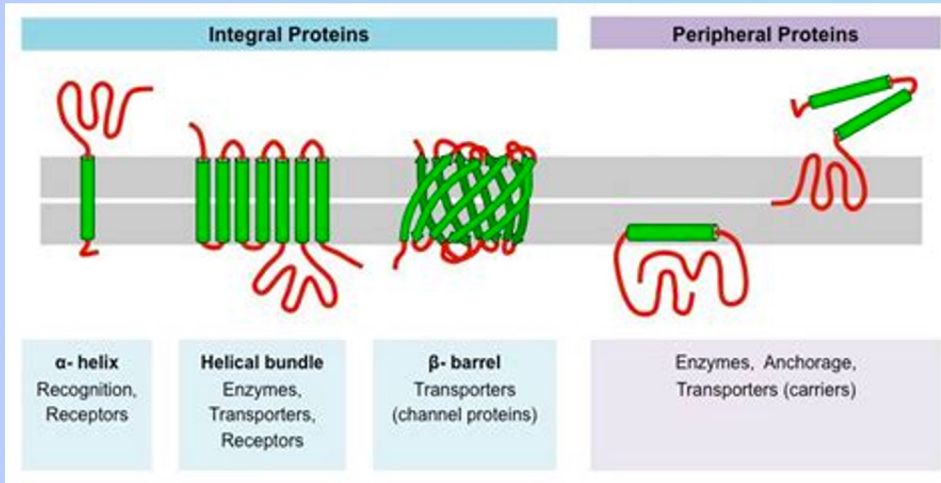
Membrane Proteins

Integral Proteins

- **Permanently** attached to membrane

Peripheral Proteins

Temporarily attached to lipid bilayer or integral proteins



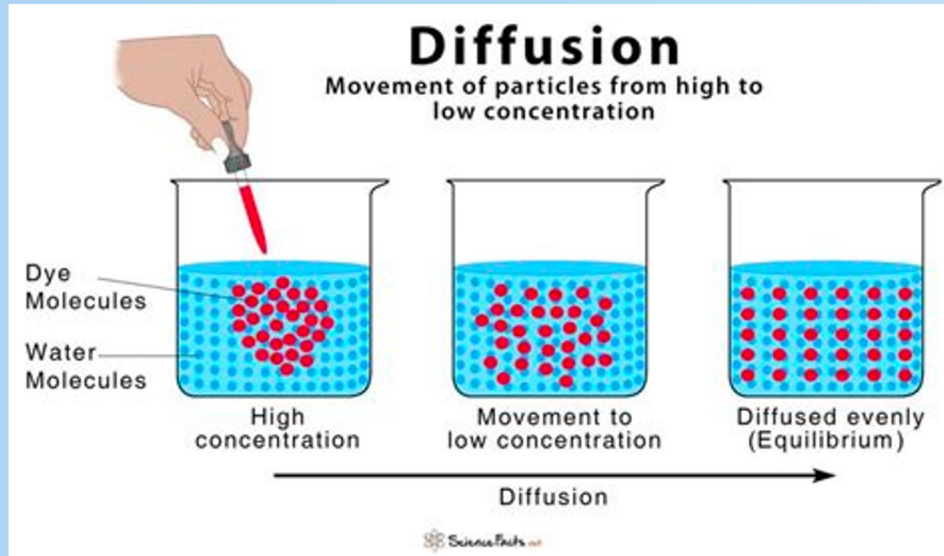
Basic Cell Physiology

- 1) ~~Fluids and the Membrane~~
- 2) Passive Transport
 - Diffusion
 - Facilitated Diffusion
 - Osmosis & Tonicity**
- 1) Active Transport
- 2) Secondary Active Transport

Fluid Movement

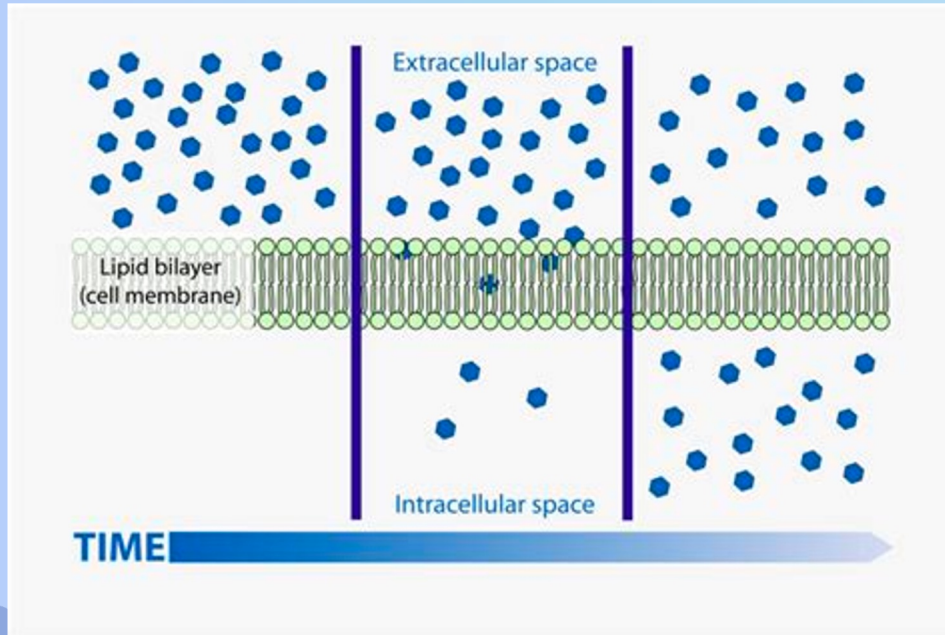
- **Diffusion**->Movement of a substance from high concentration to a area of low concentration

-Gradient- difference in concentration



Simple Diffusion

- Substance passes between components of semipermeable membrane
- No energy required



Basic Cell Physiology

- ~~1) Fluids and the Membrane~~
- ~~2) Passive Transport~~
 - Diffusion
 - Facilitated Diffusion
 - Osmosis & Tonicity**
- 1) Active Transport
- 2) Secondary Active Transport



Facilitated

Substances require transport channels or carriers, due to chemical properties (Polar/hydrophilic = cannot cross)

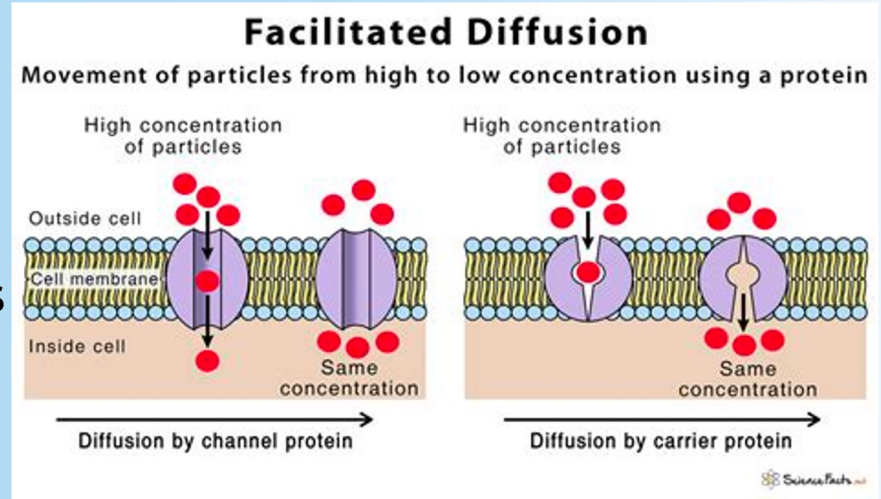
★ Selective/specific, transport along conc. gradient

1. Channels

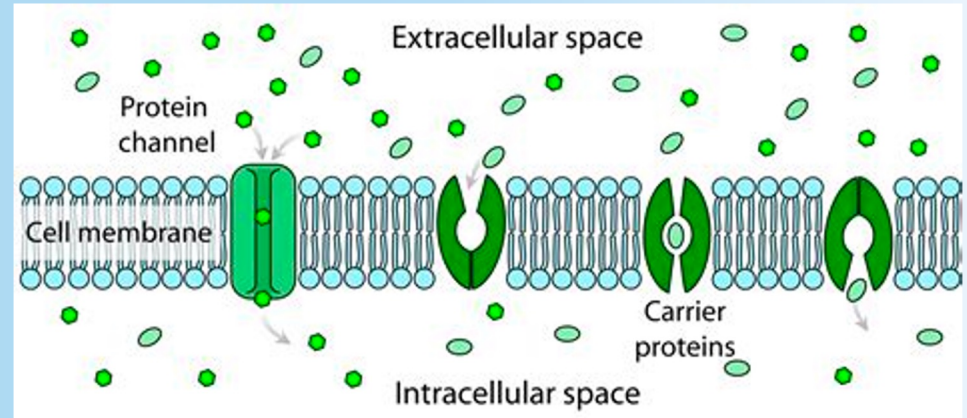
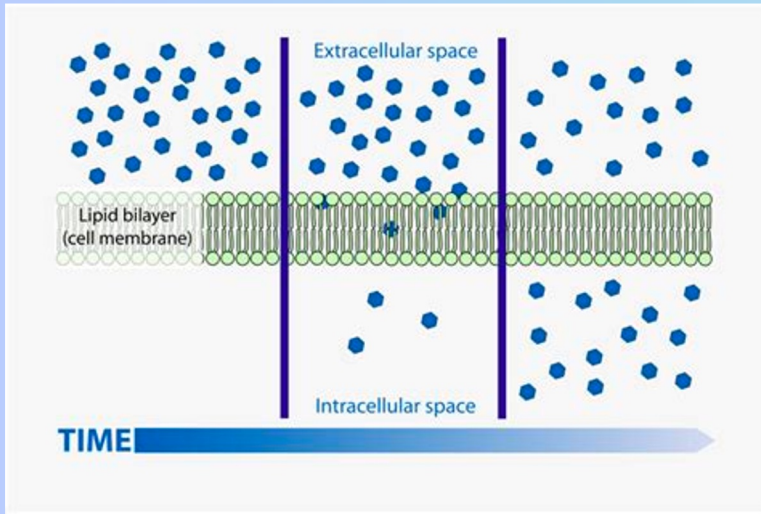
- Channel proteins
 - «Tunnel»
- Aquaporins
 - Specific for water
 - Urine concentration in kidneys

2. Carrier proteins

- Change conformation



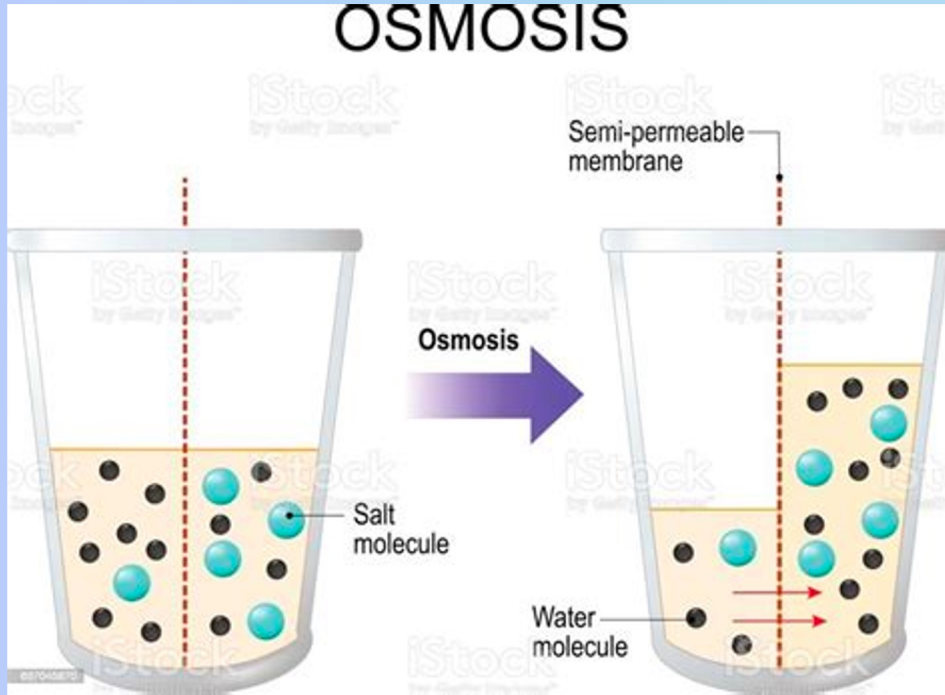
Simple Vs. Facilitated Diffusion



Basic Cell Physiology

- ~~1) Fluids and the Membrane~~
- ~~2) Passive Transport~~
 - ~~————-Diffusion~~
 - ~~————-Facilitated Diffusion~~
 - Osmosis & Tonicity**
- 1) Active Transport
- 2) Secondary Active Transport

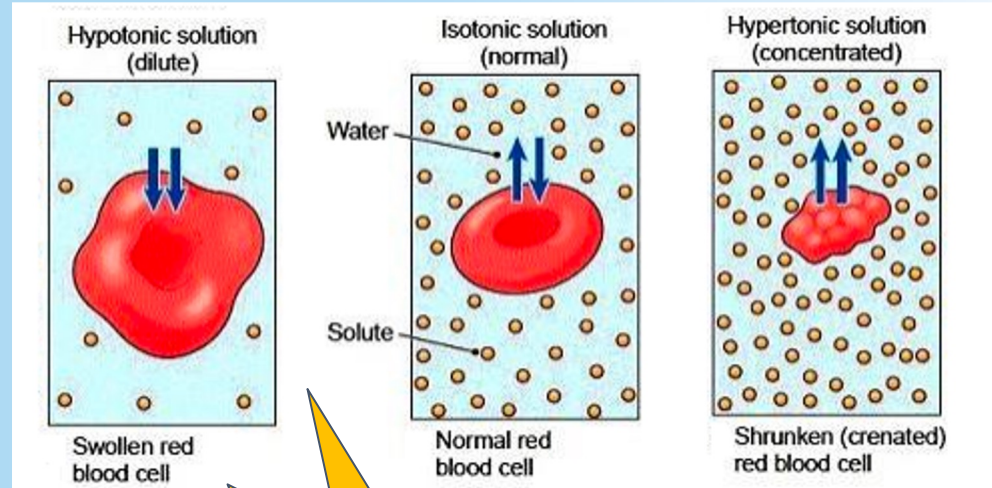
Osmosis



- Diffusion of H₂O
- Semipermeable membrane
 - Allows water diffusion
 - Doesn't allow solute to cross
- Water follows the solute

Tonicity

- Tonicity describes the solution not the cell->
- Osmolarity is concentration of solute Particles/liter
- Hypo osmotic and hyper osmotic
- Pure water is hypotonic to our bodies
- Saline



Important for Exam!

Basic Cell Physiology

- ~~1) Fluids and the Membrane~~
- ~~2) Passive Transport~~
 - ~~————-Diffusion~~
 - ~~————-Facilitated Diffusion~~
 - ~~————-Osmosis & Tonicity~~
- 1) Active Transport
- 2) Secondary Active Transport

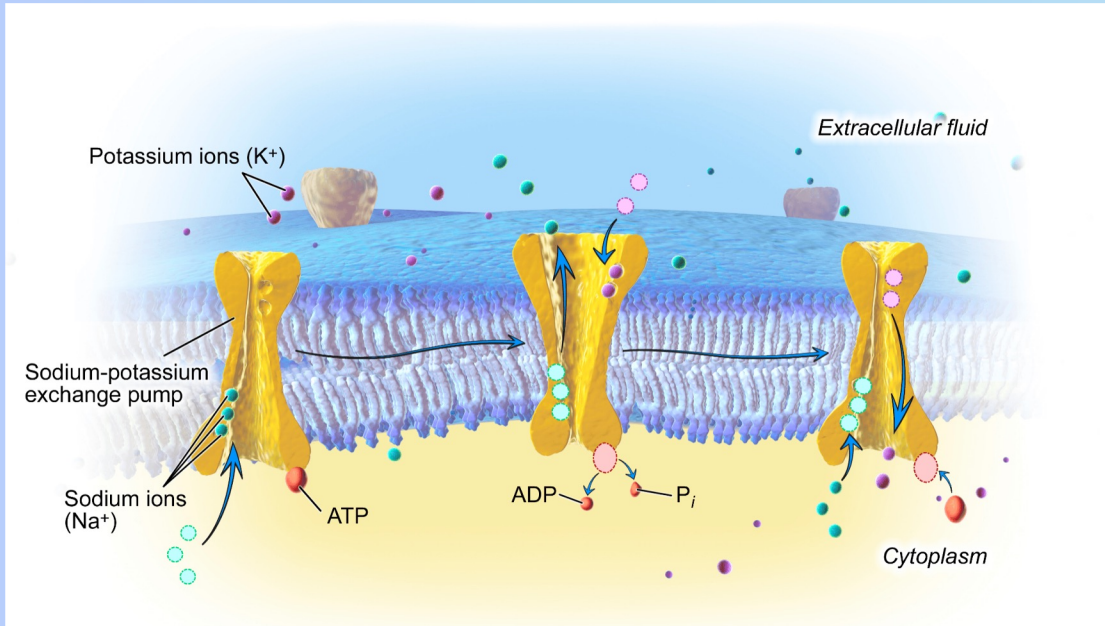
Active Transport

- Active transport AGAINST concentration gradient
- Requires ATP



Na⁺-K⁺ ATPase

- Present in all cells
- 3 Na⁺ OUT, 2 K⁺ IN**
- Physiologically important charge difference
- *Cardiac glycosides; Ouabain, digitalis*

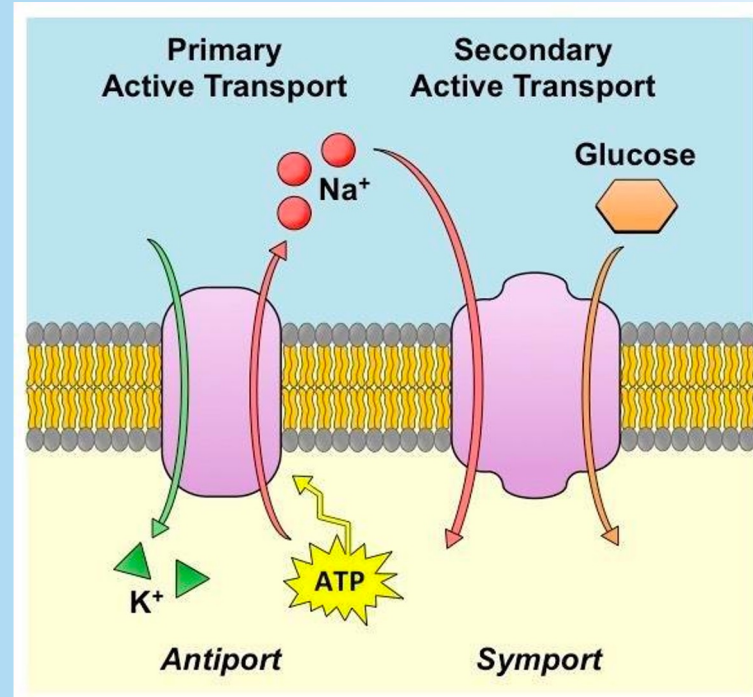


Basic Cell Physiology

- ~~1) Fluids and the Membrane~~
- ~~2) Passive Transport~~
 - ~~————-Diffusion~~
 - ~~————-Facilitated Diffusion~~
 - ~~————-Osmosis & Tonicity~~
- ~~1) Active Transport~~
- ~~2) Secondary Active Transport~~

Secondary Active Transport

- Coupled transport
- Typically Na^+
- Indirect use of ATP (Na/K ATPase):
 - ATP required to generate the Na^+ concentration gradient driving secondary active transport
 1. Cotransport/symport:
 - Same direction
 2. Counter-transport/antiport:
 - Different directions

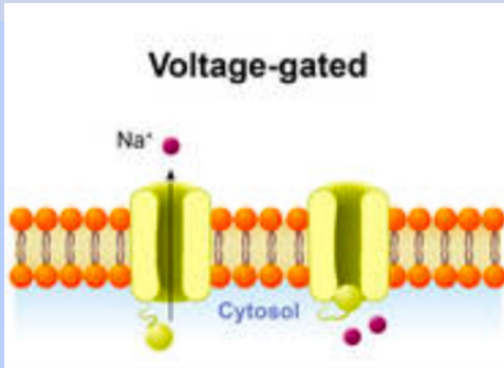


Ion Channels

- Integral, membrane spanning, selective
- Site of entry is blocked until opened

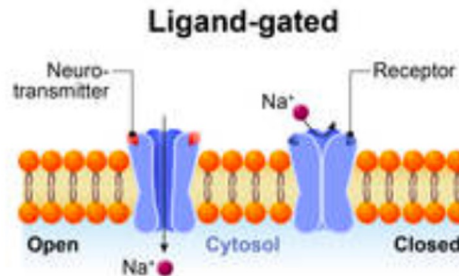
Voltage gated

- Gates controlled by changes in membrane potential



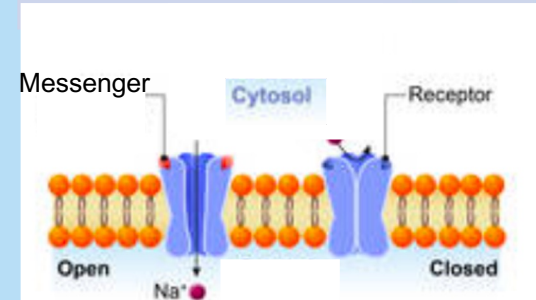
Ligand gated

- EC located sensors
- Hormones, neurotransmitters

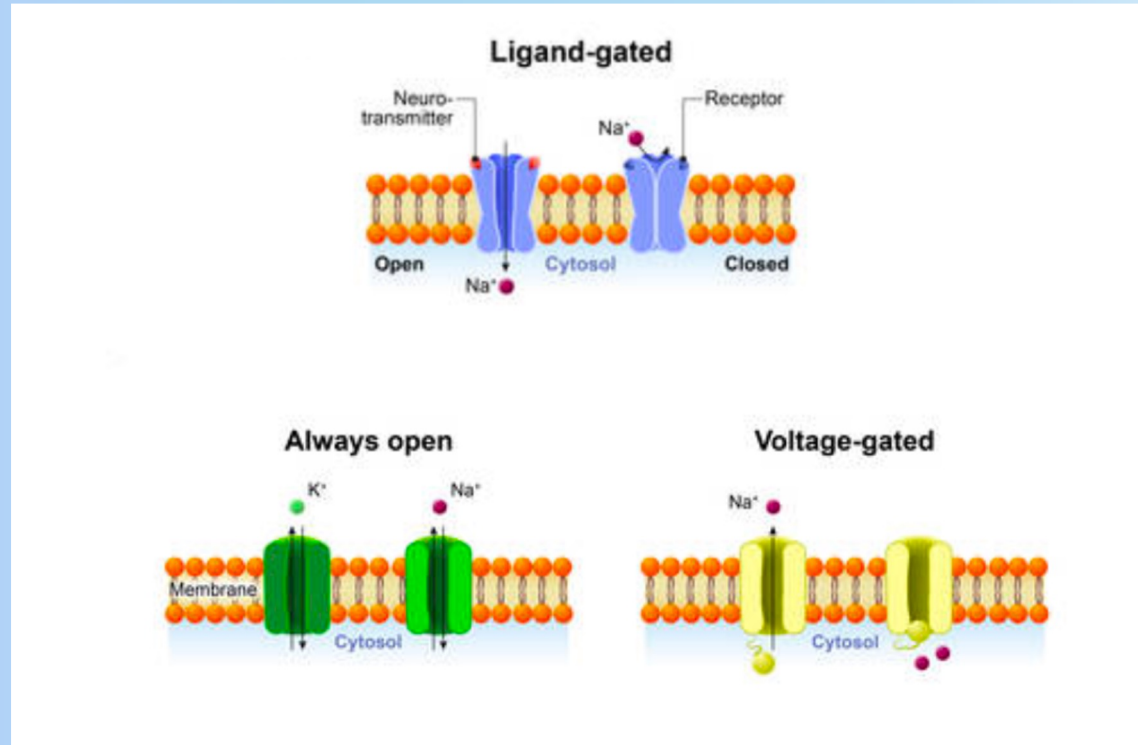


2nd messenger gated

- Controlled by changes in IC 2nd messengers
 - IP₃, DAG, cAMP



Ion Channels



Wooclap MCQ Questions



1

Go to wooclap.com

2

Enter the event code in the top banner

Event code
MMLFKL

