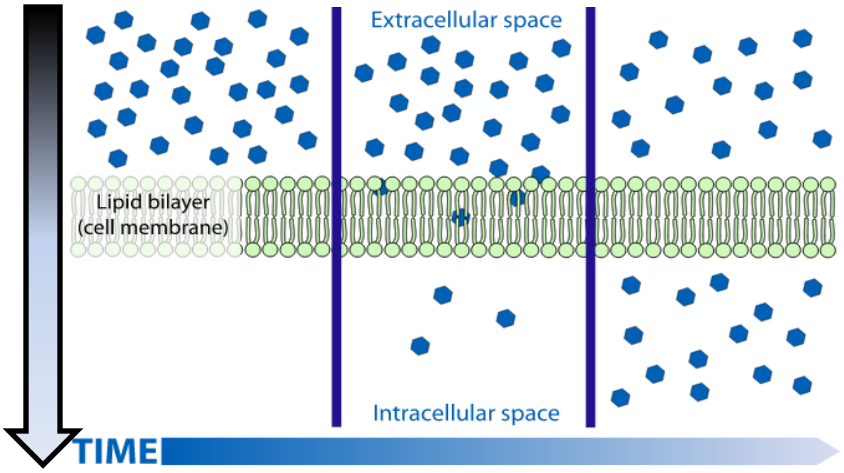
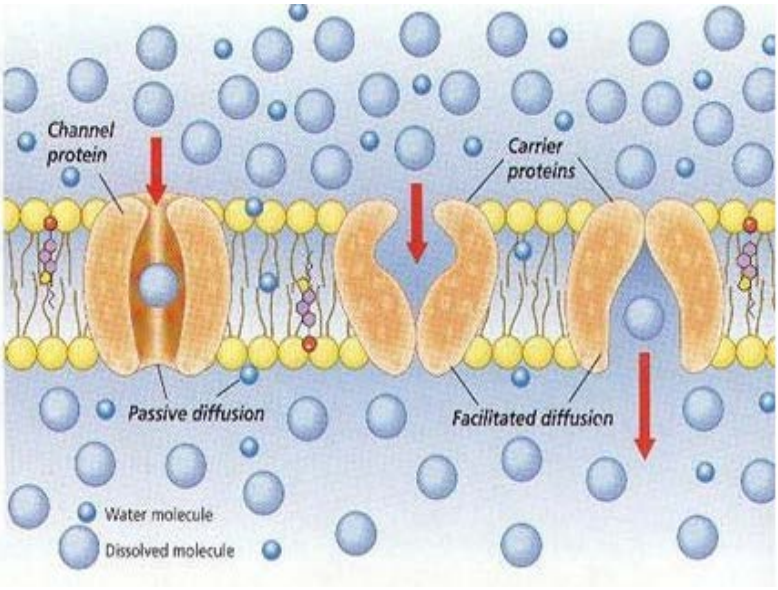
# Membrane Transport
## Passive Transport – ATP NOT Required!

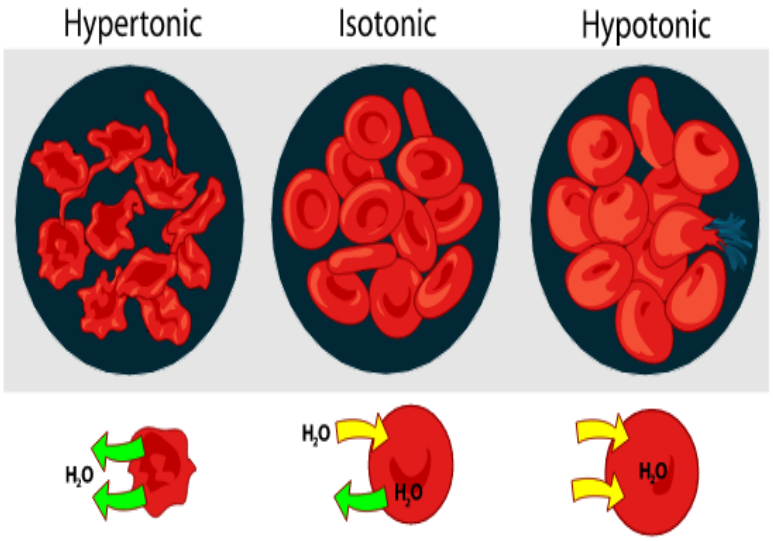
**Diffusion:** The net movement of material ***from an area of high concentration to an area with lower concentration.*** The difference between the concentrations is called the ***"concentration gradient".*** Diffusion goes ***down*** the gradient until ***an equilibrium is reached***. No carriers/membrane proteins required.




**Facilitated Diffusion:** Can't get through the cell membrane on your own? Are you charged, polar, water soluble, or just too big? Don't worry! The cell has ***channels*** and ***carrier proteins*** to "***facilitate***" your transport into the cell. Better yet, it requires ***zero ATP*** AND you still flow ***down the concentration gradient***! What a deal!

**Osmosis:** The spontaneous movement of water ***from a region of low solute concentration to a region of high solute concentration.*** The movement continues until an equilibrium is reached. ***Hypertonic*** = high concentration of solute outside the cell. ***Isotonic*** = same concentration of solute. ***Hypotonic*** = low concentration of solute outside the cell.

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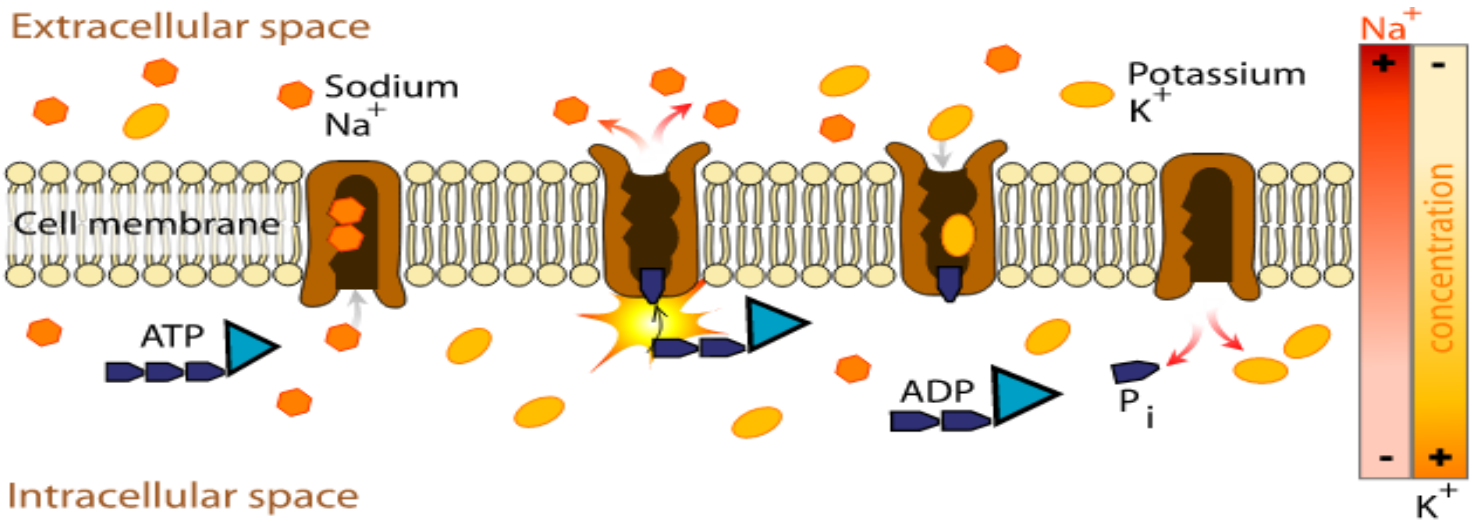
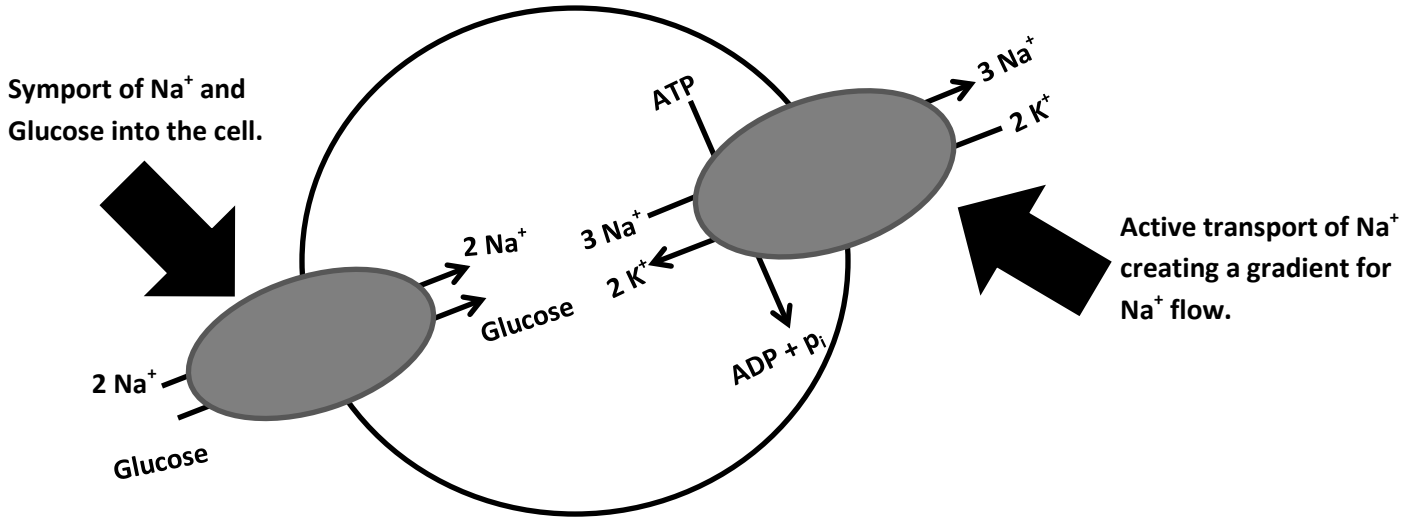
# Membrane Transport
## Active Transport – ATP Required!

**Primary Active Transport:** Transport of substances ***against a concentration*** or ***electrochemical*** – from low to high - ***gradient***. Performed across the cell membrane by a transporter/pump that also serves as an ***ATP-ase***. The requirement implies that ***ATP is needed*** for this process to occur. The standard example is the ***$Na^+$-$K^+$ ATPase Pump***. Both $Na^+$ and $K^+$ are pumped ***against*** their gradients and the hydrolysis of ATP supplies the energy necessary for the transport protein to do its job.




**Secondary Active Transport:** Cotransport (coupled transport) of two solutes across a membrane. ***Energy is supplied indirectly by the active transport of another molecule***/ion → which creates a ***gradient***. The accumulation of the molecule on the other side of the membrane and then the flow of that molecule drives the flow of another molecule. The second molecule (hence ***secondary***) can flow (via a transport protein) either with or opposite (***symport or antiport***) the first. The stereotypical example is the cotransport of $Na^+$ with glucose via a symporter.

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