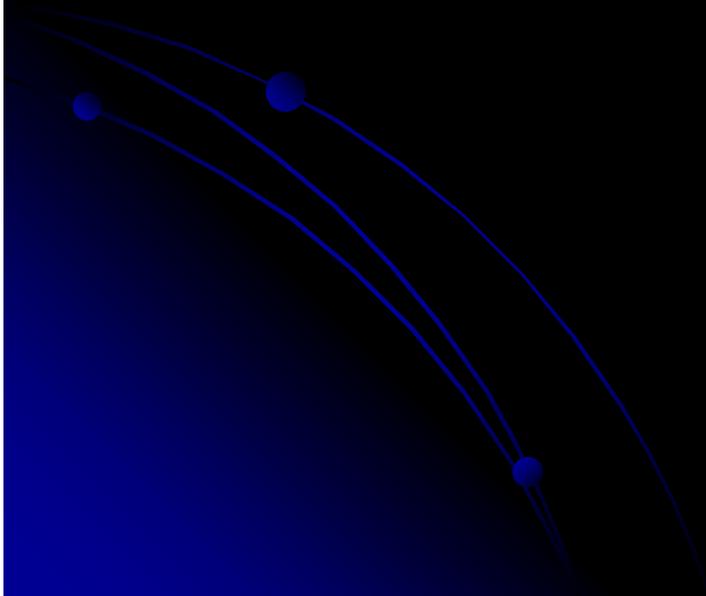


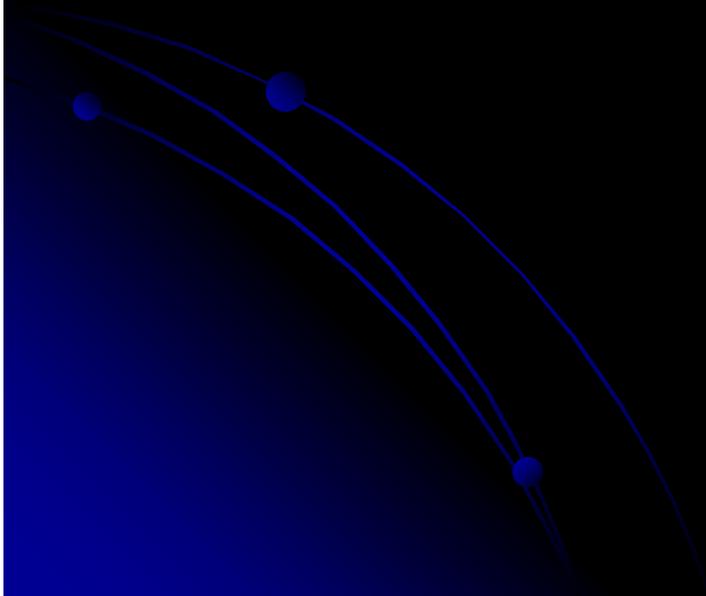
Chapter 7-3 Cells and Their Environment



7-3 Passive Transport

- Passive transport-the movement of substances across the cell membrane without using NRG
- Concentration Gradient-difference in concentration of a substance across a space
- Equilibrium-the concentration of a substance is equal throughout a space

- Substances move down the concentration gradient to reach equilibrium



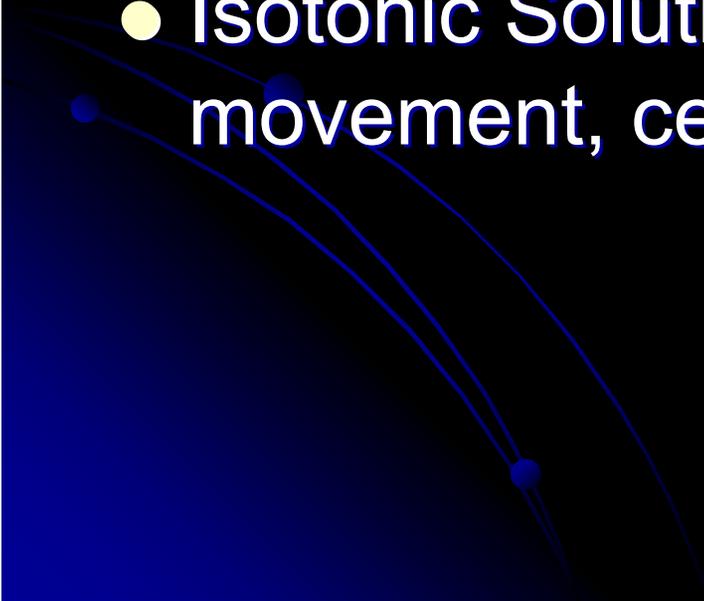
Diffusion

- Diffusion-the movement of a substance from an area of high concentration to an area of low concentration caused by random motion of particles
- Cell membrane's nonpolar interior prevents ions and most polar molecules from diffusing down the concentration gradient
- Very small molecules or nonpolar can diffuse into and out of a cell down the concentration gradient

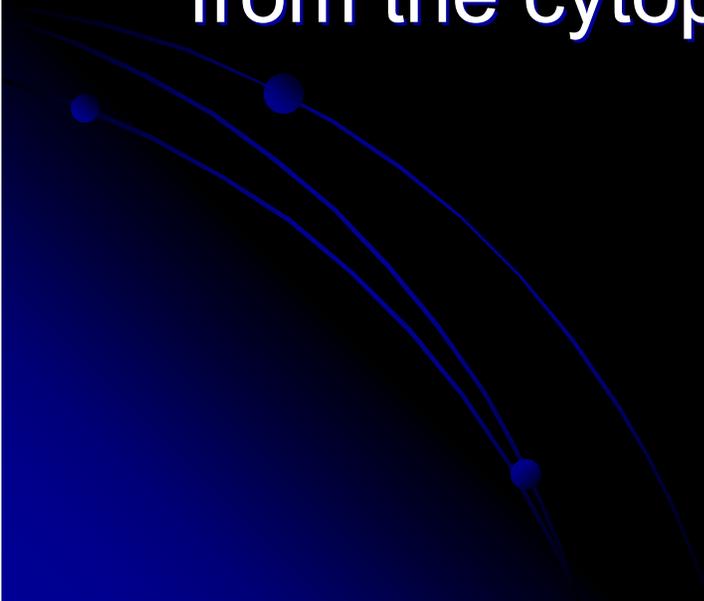
Osmosis

- Osmosis-the diffusion of free water through a selectively permeable membrane down the concentration gradient
 - Free Water-water molecules not forming a hydration shell with a solute particle
- 

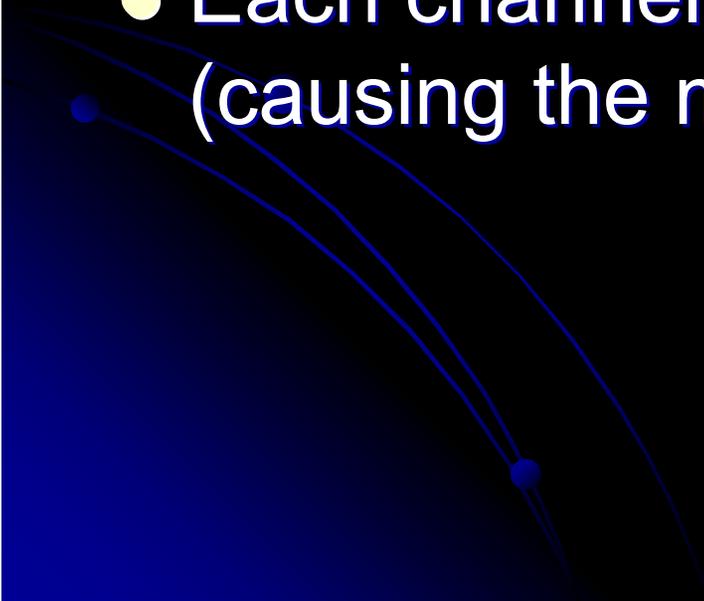
Effects of Osmosis on Cells

- Hypertonic Solution-water moves out of cell, cell shrivels
 - Hypotonic Solution-water moves into the cell, cell expands
 - Isotonic Solution-there is no net water movement, cell remains the same size
- 

- Some cells have evolved contractile vacuoles that can pump water out of a cell when in a hypotonic solution
- Other cells remove dissolved particles from the cytoplasm



Proteins and Diffusion

- Transport proteins called channel proteins aid in the movement of substances across the cell membrane (polar molecules and ions)
 - Each channel is specific to one substance (causing the membrane to be selective)
- 

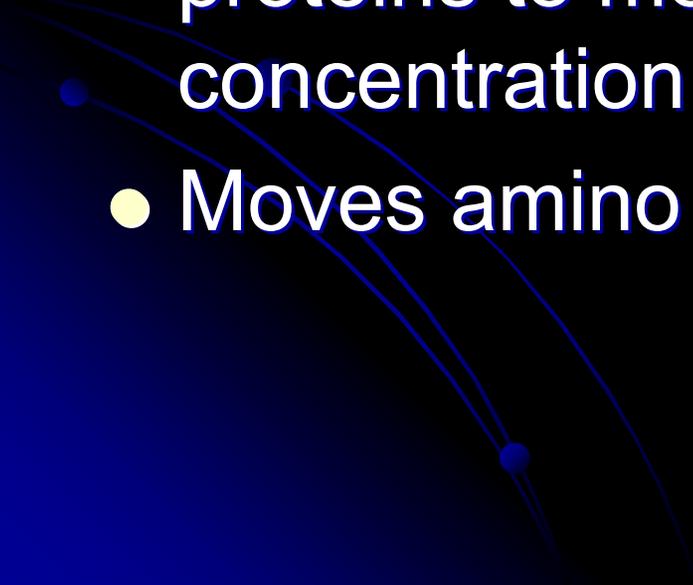
Ion Channels

- Ions are essential for many body functions (nerve functions)
- Ions diffuse through Ion Channels, which are donut shaped transport proteins with a polar pore
- Some ion channels have pores that are always open, some are closed by channel gates (opened by stretching membrane, change in electrical charge, binding of molecules to channel)

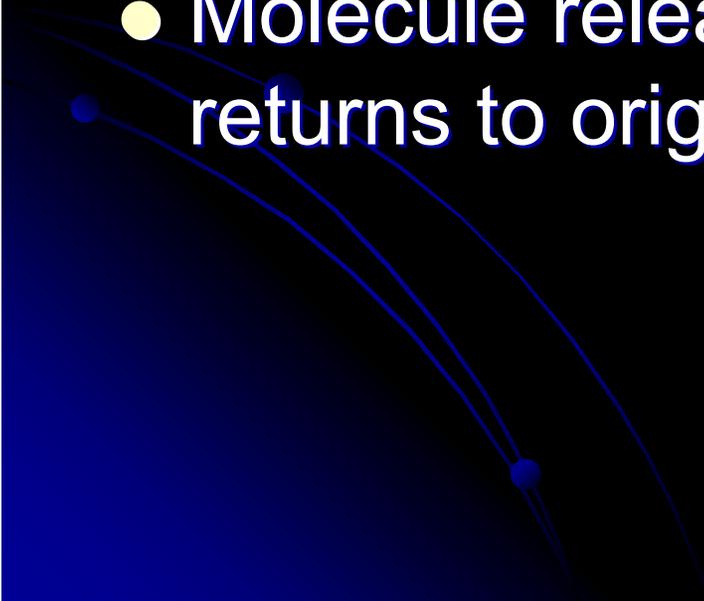
Electrical Charge Affecting Ion Transport

- Inside of cells, there is a negative charge compared to the outside environment
- Charge difference located very close to membrane exterior and interior
- Caused by large, impermeable negative ions inside and negatively charged proteins
- Opposites attract

Facilitated Diffusion

- Carrier Proteins-proteins that carry substances across the membrane and release them on the other side
 - Facilitated Diffusion-diffusion using carrier proteins to move substances down the concentration gradient
 - Moves amino acids and sugars
- 

3 Steps to Facilitated Diffusion

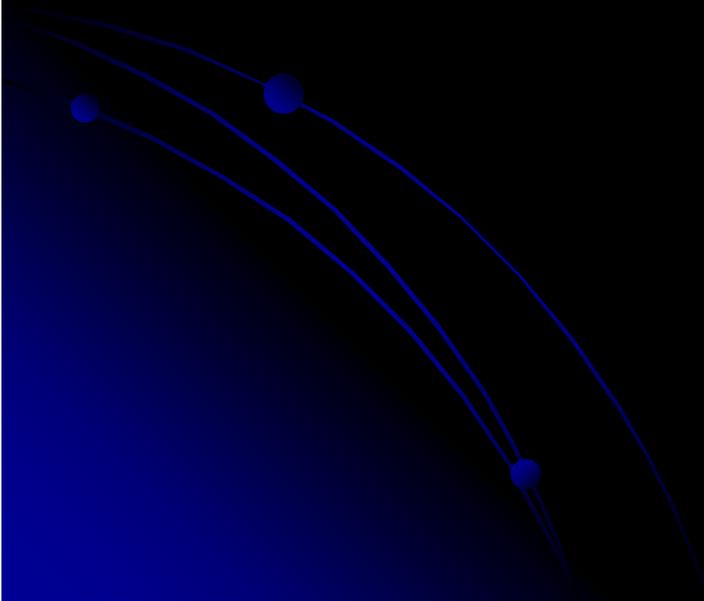
- Molecule outside the cell binds to carrier protein, changing the shape of the protein
 - Carrier protein transports molecule across membrane
 - Molecule released inside the cell, protein returns to original shape
- 

All Forms of Passive Transport

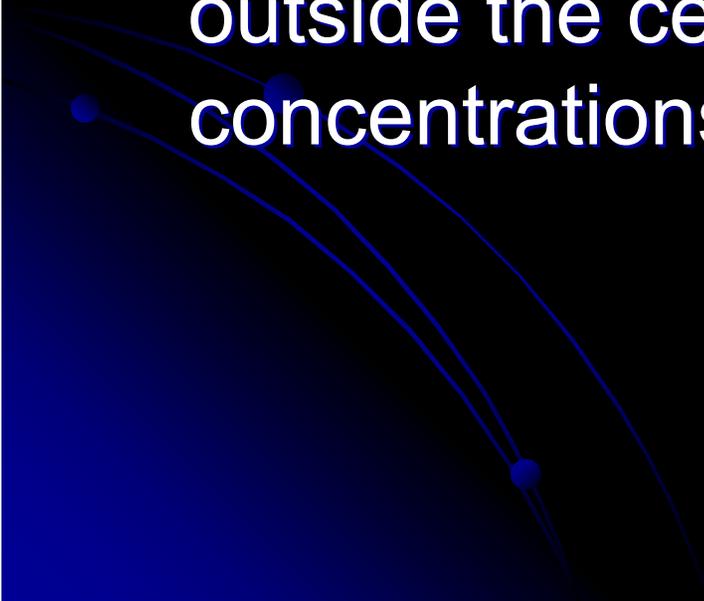
- Diffusion
 - Osmosis
 - Facilitated Diffusion
 - http://www.wiley.com/college/pratt/0471393878/student/animations/membrane_transport/index.html
- 

Active Transport

- A way to transport substances against the concentration gradient using NRG
- Carrier Proteins involved in active transport are called membrane pumps

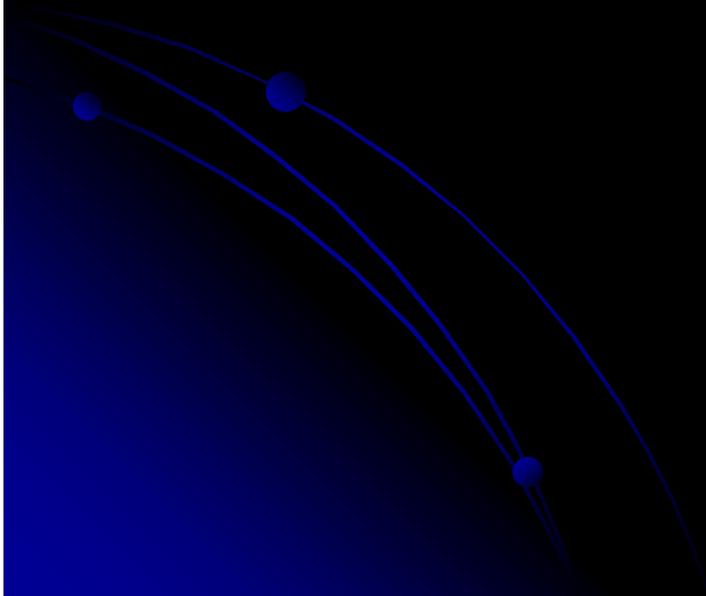


Sodium-Potassium Pump

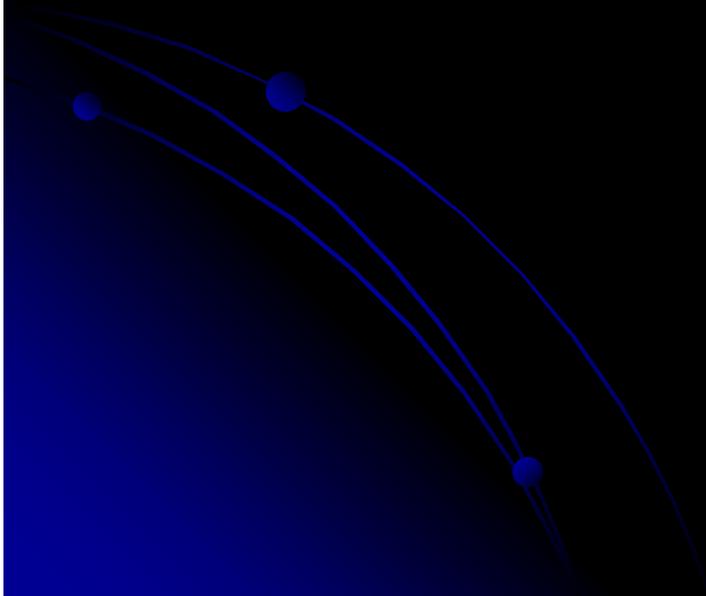
- Very important membrane pump
 - Transports three Na^+ ions out of the cell and two K^+ ions into the cell
 - Na^+ is usually in higher concentrations outside the cell, and K^+ is in higher concentrations inside the cell
- 

Steps to Pump Function

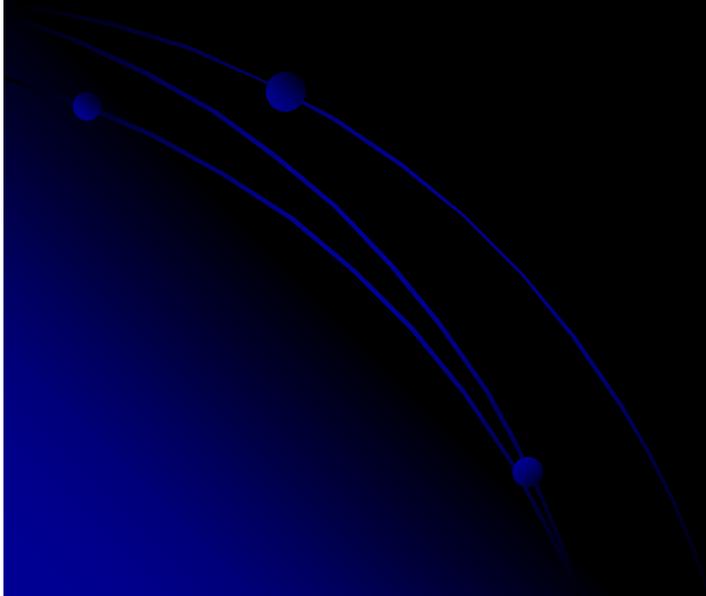
- 3 Na⁺ ions inside the cell bind to the sodium-potassium pump, while a phosphate group from an ATP binds to the pump



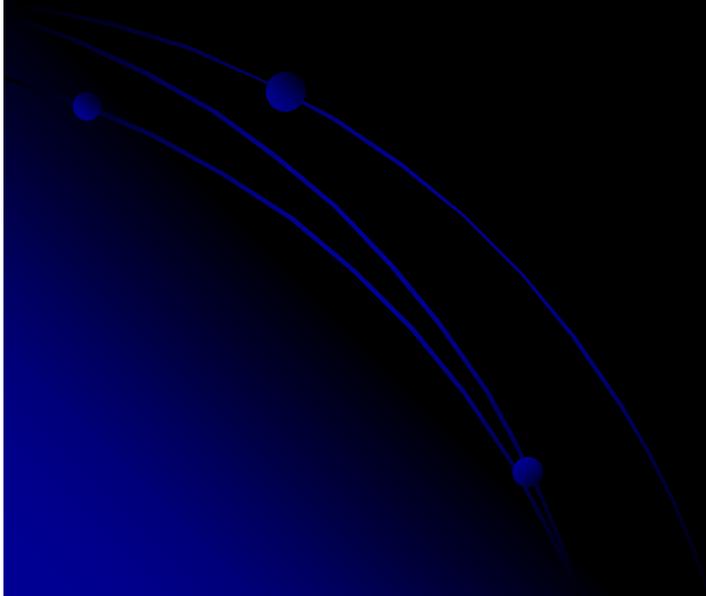
- Pump changes shape, transporting the three Na^+ ions across the membrane



- Pump is now exposed to the surface of the cell, and two K^+ ions attach to the pump, the phosphate group is then released which changes the shape of the pump

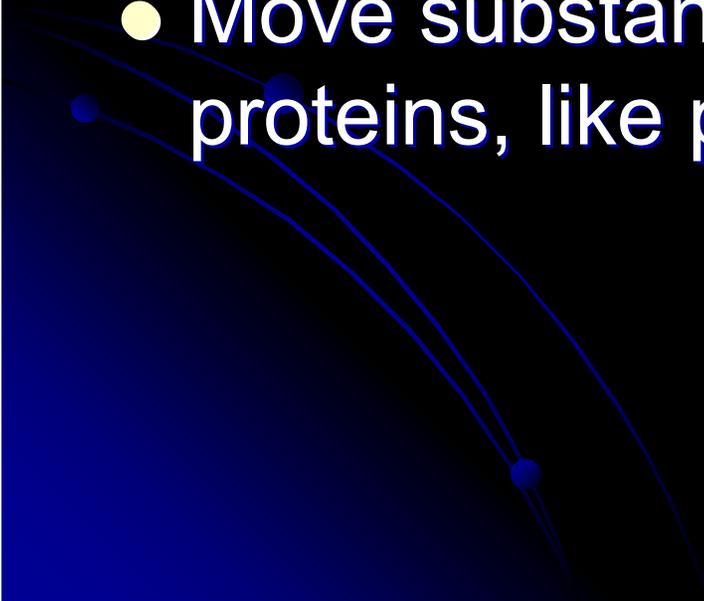


- Pump is exposed to the inside of the cell, and transports the K^+ into the cell



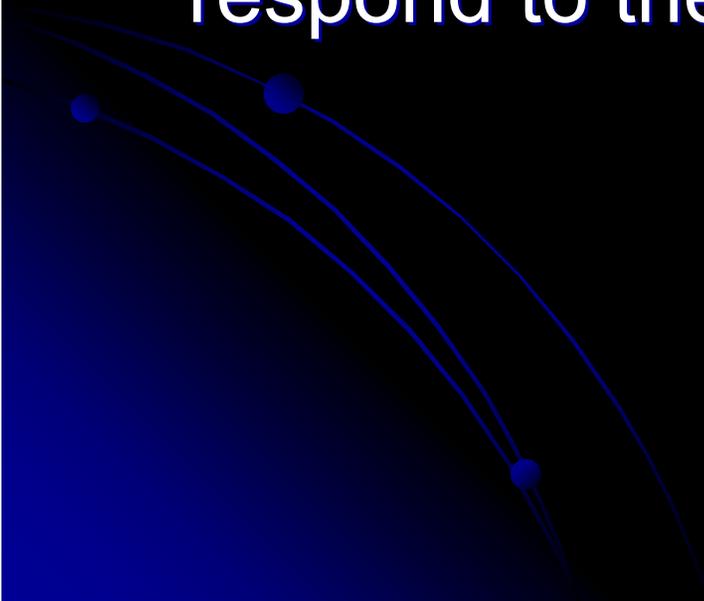
- Important because it prevents Na^+ ions from building up inside the cell (toxic)
- Maintains the Na^+ and K^+ gradient across the membrane, used to help transport other substances like glucose across the membrane

Vesicles Moving Substances

- Endocytosis-movement of substances into a cell by a vesicle
 - Exocytosis-movement of substances out of a cell by a vesicle
 - Move substances too large for carrier proteins, like polysaccharides and proteins
- 

Receptor Proteins

- Cell's communicate using receptor proteins
- Receptor Protein-protein that binds to specific signal molecules, letting the cell respond to the signal molecule



Functions of Receptor Proteins

- Changing membrane permeability when receptor is coupled with an ion channel
 - Receptor may cause the formation of a secondary messenger inside the cell (signal molecule inside the cytoplasm)
 - Receptor make at as an enzyme, speeding up chemical RXNs inside the cell
- 