Movement of Materials through the Cell Membrane

Cell Transport

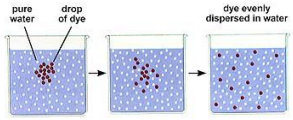
I. Passive transport

Movement of molecules of a solute from areas of high to low concentration **without the use of energy**

Types of Passive Transport

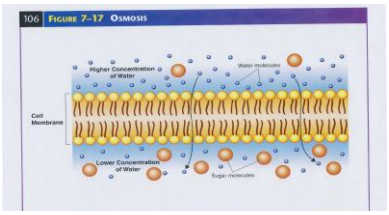
1. diffusion:

- movement of molecules **other than H2O** from areas of high to low concentration until equilibrium is reached
- **equilibrium**: steady state where equal numbers of molecules move in each direction
- **concentration gradient**: differences in concentration of a substance across a space



2. Osmosis

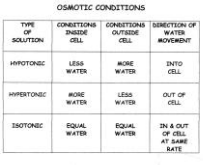
- movement of **water** from areas of high to low concentration until equilibrium is reached
- direction of movement depends on **CONCENTRATION OF WATER** on either side of the concentration gradient

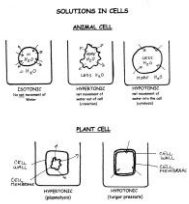


Types of osmotic solutions

-hyptonic
-hypertonic
-isotonic

indicates relative concentration of two solutions being compared





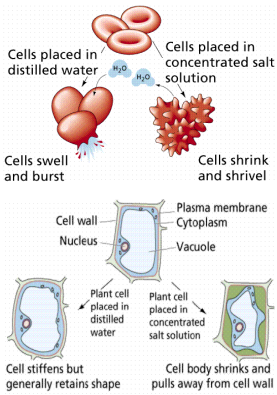
Osmotic pressure
force caused by osmosis

Results of water transport in and out of cells:

Animal Cells
Hypertonic: crenation
Hypotonic: cytolysis

Plant cells
Hypertonic: plasmolysis
Hypotonic: turgor pressure

Plant cell adaptations:
Cell wall: limits amount of water into cell
Contractile vacuole: rhythmically pumps water out of cell (unicellular org.)



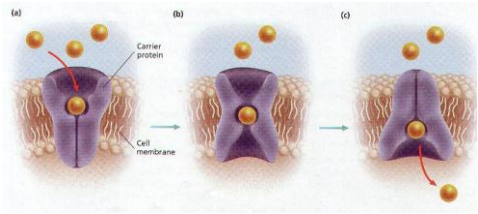
3. facilitated diffusion

- movement of a substance from areas of high to low concentration with the aid of a carrier protein (driven by diffusion)
- type of passive transport **(no energy used)**

ex: glucose into a RBC

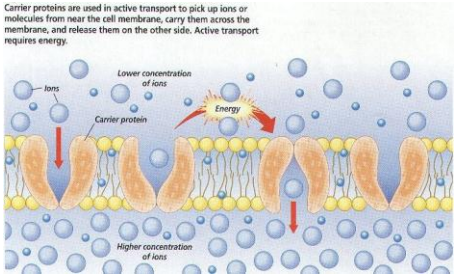
Steps of Facilitated Diffusion

1. carrier protein binds a specific molecule on one side of membrane
2. change in shape of carrier protein exposes one molecule to other
3. carrier protein shields the molecule from interior of lipid bilayer
4. molecule is released from carrier protein which goes back to original shape



II. Active transport

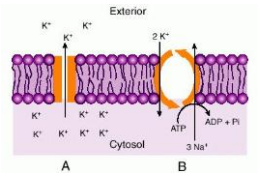
- movement of substances through a membrane against (up) a concentration gradient
- requires energy (from ATP)



2 types active transport

1. **membrane pumps**
   - involves carrier proteins which act as pumps
   - ions in lower concentration bind to carrier protein and are released to areas of higher concentration (Ca+, K+, Na+, others)

   ex: sodium potassium pump

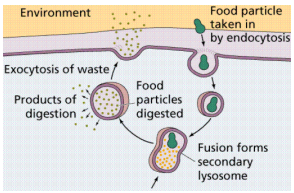


2. endocytosis/exocytosis

Endocytosis

process where cells engulf substances too large to enter by passing through membrane

Types
- **phagocytosis**: solid particles
- **pinocytosis**: liquid substances

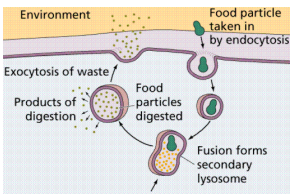


Exocytosis
- process of removing large substances out of cell (opposite mechanism of endocytosis)

  Ex: cells manufacture proteins – vesicles fuse with cell membrane and dump contents out of cell

- removal of cell debris, bacteria/viruses, old organelles

animation



Cell Specialization

- Cells have special structures/ shapes to perform a specific function