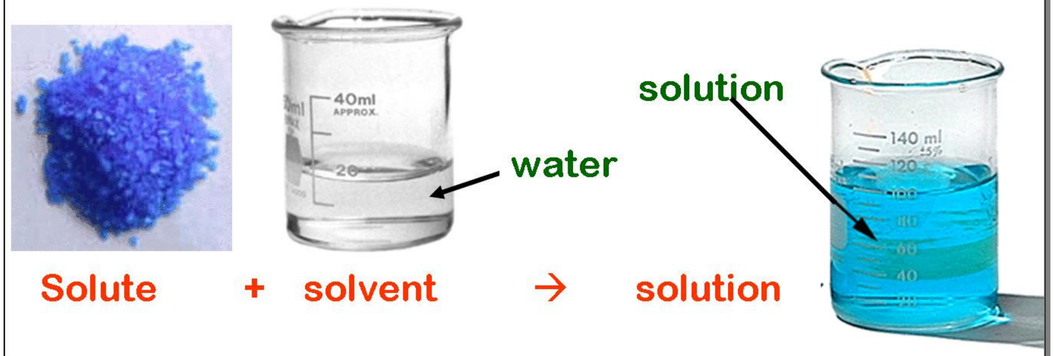
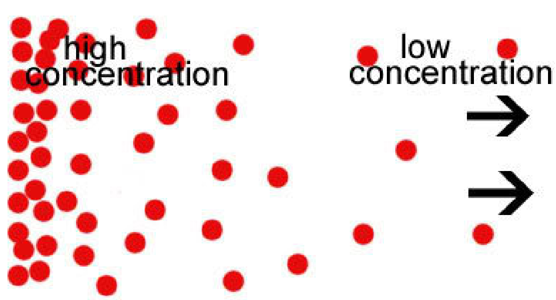
I. Describing Solutions

1. **Solute:** particles that are dissolved
2. **Solvent:** substance that dissolves particles—water is the universal solvent

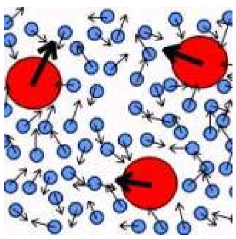


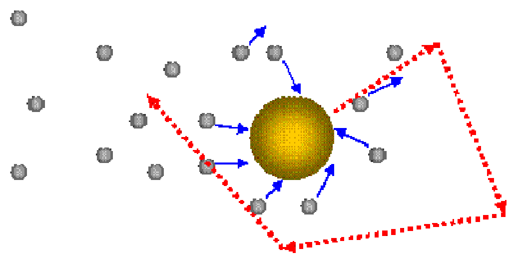
C. Concentration: how much solute is contained in a given volume of a solution

1. When there is an area of low concentration near an area of high concentration, a **concentration gradient** exists.

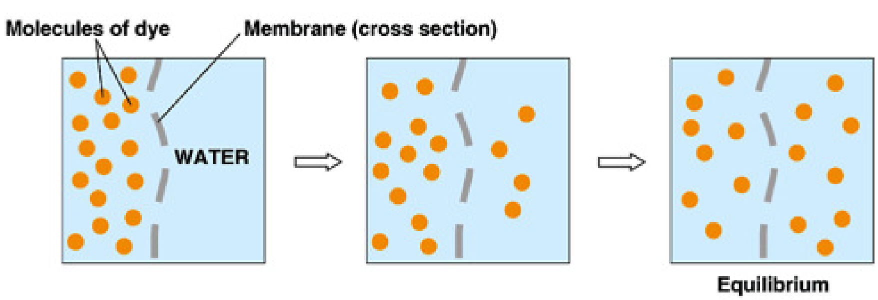


2. Particles will natural move from an area of high concentration to an area of low concentration. This is because of the random motion of the individual atoms and molecules that make up all matter.





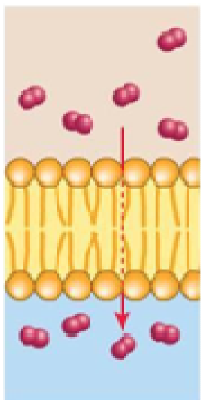
3. When the concentration of a solution is the same throughout, then **equilibrium** has been reached. At equilibrium particles still move, but it is not an overall movement in one direction or another.



II. **Passive transport:** the movement of particles into or out of the cell that happens without the use of energy

A. Simple Diffusion

1. Some particles diffuse directly through the membrane

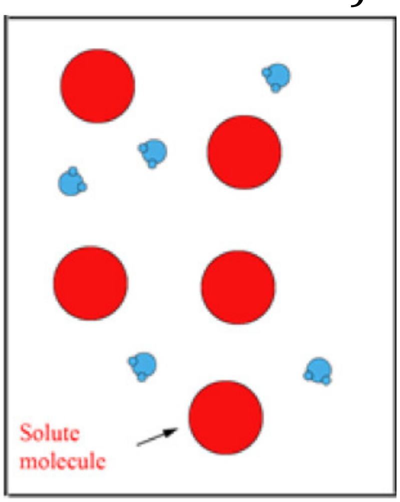


a. Small, nonpolar molecules

b. Dissolved gases (oxygen, carbon dioxide, nitrogen)

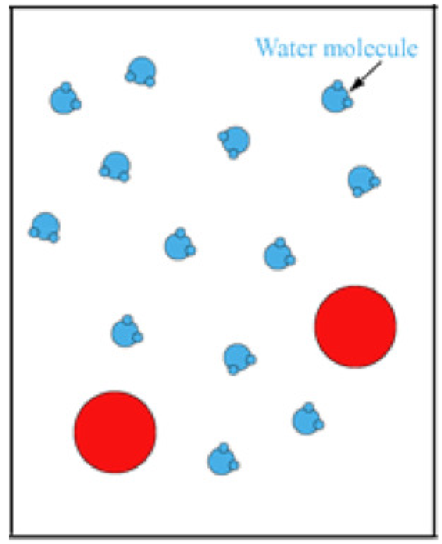
2. Osmosis: diffusion of water through a semipermeable membrane

a) When solute concentration is **high**, the amount of water *relative to the solute* is low. For example, if a salt water solution is 60% salt, the remaining 40% of the solution is water.



solutes more concentrated,
water less concentrated

b) When the solute concentration is **low**, the amount of water *relative to the solute* is low. In the same salt water example, if the solution is only 20% salt then we know that it is 80% water.



solutes less concentrated,
water more concentrated

c) Since we know that particles tend to move from an area of high concentration to an area of low concentration, water molecules will flow from an area of high ***water*** concentration (as in, a dilute solution) to an area of low ***water*** concentration (a concentrated solution).

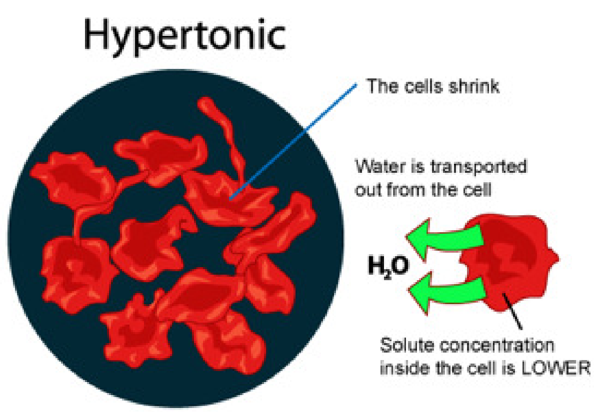
d) Descriptions of solutions

1) Hypertonic: a solution that has a **higher *solute*** concentration than the object (normally a cell) it is being compared to

(a) Water moves from where there is more water/is more dilute (inside the cell) to the area where there is less water/more concentrated in solute (the surrounding solution)

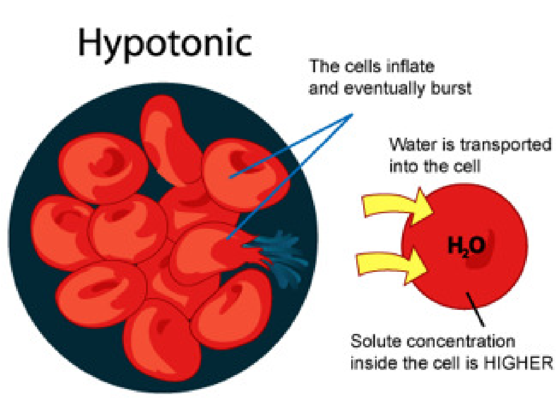
(b) Cell will shrivel

(c) Example: Salt water has more solute than human blood, so it is a hypertonic solution. If you receive an IV with very salty water, it will cause your blood cells to shrivel as water rushes out of them.



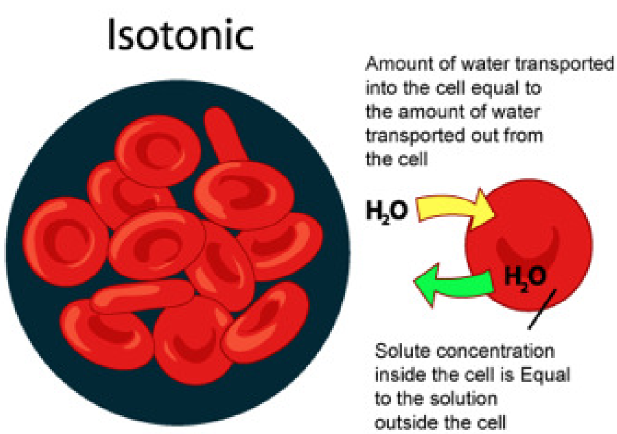
2) Hypotonic: a solution that has a **lower *solute*** concentration than the object (cell) it is being compared to
   (a) Water moves from where there is more water/is more dilute (the solution) to the area where there is less water/more concentrated in solute
   (b) Cell will swell, and perhaps burst

(c) Example: Human blood has some materials dissolved in it and is therefore slightly "saltier" that pure water. If you receive an IV of pure water, it will cause your blood cells to swell up like balloons and eventually burst.



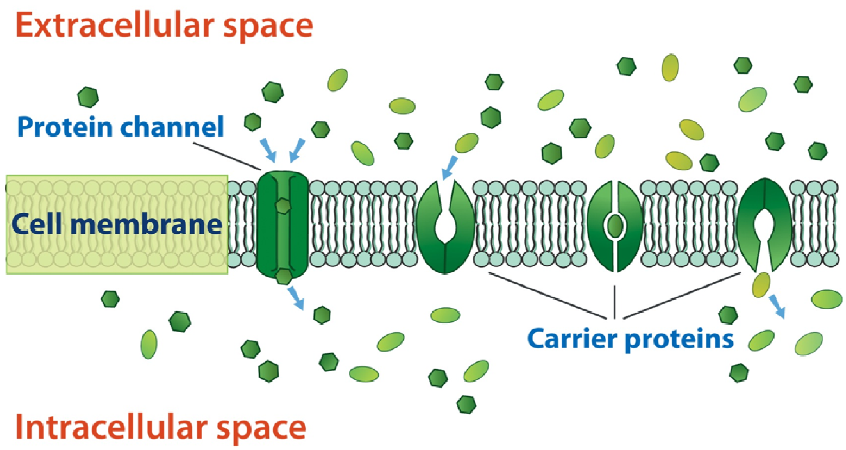
3) Isotonic: a solution that has the **same *solute*** concentration as the object (cell) it is being compared to
   (a) Since an isotonic solution has the same concentration as the cell, there is no net water movement in either direction; water molecules move in and out of the cell at the same rate.
   (b) Cell remains same size/normal shape

(c) Example: If you ever actually need to get an IV, it is "saline solution" or a solution with a slight saltiness in order to make sure your blood cells stay their normal shape and size!

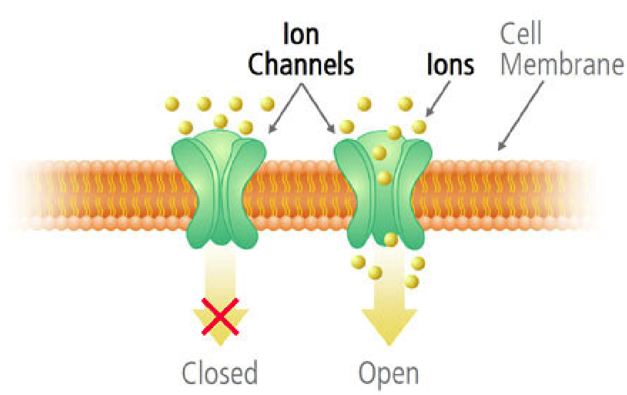


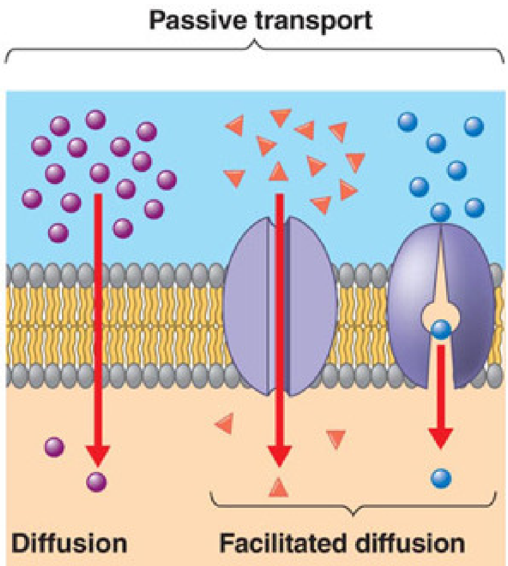
B. Facilitated Diffusion

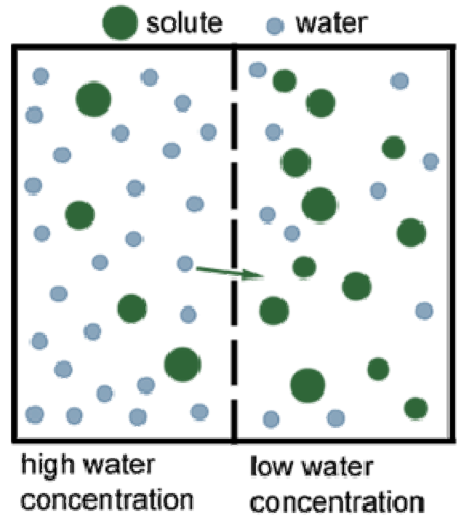
1. Requires the use of a transport protein; can be either a pore or a protein that changes shape (carrier protein)



2. Does **NOT** require energy!
3. Necessary for macromolecules (sugar, starch), polar molecules (water), and ions (sodium, potassium, chloride)




Passive transport
Diffusion
Facilitated diffusion


solute
water
high water concentration
low water concentration