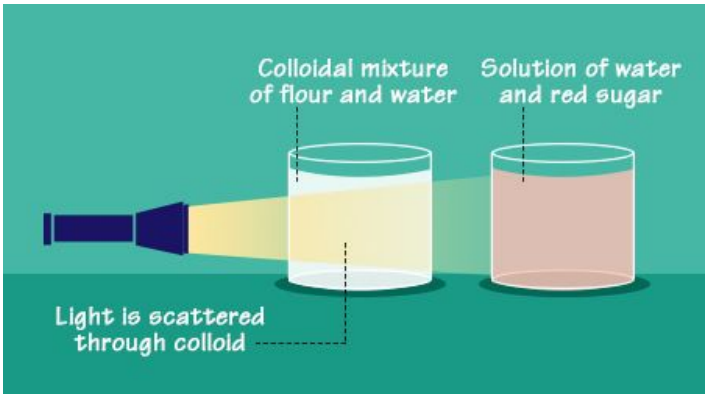
Solutions : A homogeneous mixture of substances in the same physical state. Solutions contain atoms, ions or molecules of one substance spread uniformly throughout a second substance. When salt is stirred into water, the individual ions of the salt separate and uniformly spread throughout the water, forming a solution

Types of Solutions: A solid may be dissolved in another solid. Brass is a mixture of zinc and copper. When metals are mixed to form a solution, the results is called an alloy. Air is an examples of a mixture of gases forming a solution

- The most common type of solution is one in which a solid or a liquid is dissolved in a liquid



- Solute: Substance that is being dissolved, and it is the substance present in the smaller amount.
- Solvent: The substance that dissolves the solute, and is present in greater amounts.
- Water is the most common solvent. Water solutions are called aqueous solutions and the notion (aq) is used in equations to show that the substance is dissolved in water
- Once the salt and water are stirred and the mixture becomes homogeneous, the dissolved particles will not settle. Liquid solutions are clear, and light will pass through a solution without being dispersed.
- Solutions may or may not have color.

Characteristics of liquid solutions

- Solutions are homogeneous mixtures
- Solutions are clear and do not disperse light
- Solutions can have color
- Solutions will not settle on standing
- Solutions will pass through a filter

Solubility Factors

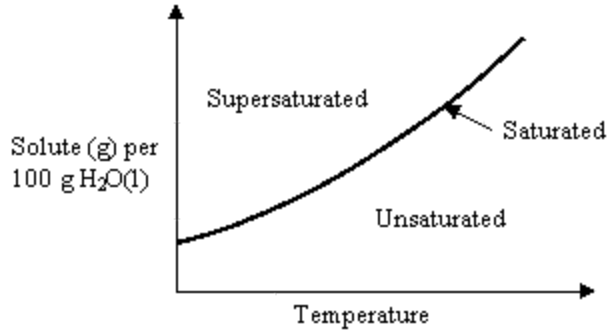
- How much of a solute dissolve in a certain amount of solvent at a certain temperature is known as solubility. Materials with high solubility are said to be soluble; materials with a low solubility are said to be insoluble

Nature of Solute and Solvent.

- When sodium chloride dissolves in water it does so becauses it s positively and negatively charged ions are attracted to the oppositely charged ends of the polar water molecule. The positively charged sodium ions are attracted to the negative pole of the water molecules. The attractive forces between the water molecules and sodium ions are greater than the attractive forces between sodium and chloride ions. In like manner, the negatively charged ions are attracted to the positively end of the water dipole and are dissolved Ionic and polar substances dissolve in polar solvents.

Solubility Summary

Solute Type	Nonpolar Solvent	Polar Solvent
Nonpolar	Soluble	Insoluble
Polar	Insoluble	Soluble
Ionic	Insoluble	Soluble



Temperature: As temperature increases, most solids become more soluble in water. A few exceptions exist. Gases react in the opposite manner. As temperature rises, the solubility of all gases in liquids decreases

Pressure: Pressure has little or no effect on the solubility of solid or liquid solutes. Pressure does affect the solubility of gases in liquids. As pressure increases, the solubility of gases in liquids increases.

Concentration of Solutions: Because solutions are homogeneous mixtures, their compositions can vary. Dilute and concentrated are relative terms and are not precise regarding amount of solute involved

Molarity: The molarity of a solution is the number of moles of solute in 1L of a solution

Molarity = Moles of solute/ liters of solution

Percent By Mass: The mass of an ingredient divided by the total mass, expressed as a percent

Percent Mass = Mass of part/ Mass of whole * 100%

Percent By Volume: The ratio of the volume of an ingredient divided by the total volume and expressed as a percent

Percent By Volume = Volume of solute/ Volume of solution = 100%

Parts per Million: Similar to percent composition as it compares masses. Parts per million (ppm) is the ratio between the mass of a solute and the total mass of the solution.

Preparation of solution of known concentration

1. Add the desired amount of solute to a volumetric flask
2. Add some distilled water and mix until the solute is dissolved and the solution is homogeneous
3. Fill the volumetric flask to the mark on the neck of the flask, stopper and again mix to ensure that the solution is homogeneous

The reason water is added in 2 steps it that it is easier to dissolve the solute if the flask is not full and there is room for the water to be adequately stirred or shaken

Colligative Properties

- 1 mole of any particles will have the same effect on the freezing point
- 1 mole of particles lowers the freezing point of 1000g of water by 1.86 degrees Celsius

Molecular vs Ionic

- When 1 mole of sugar, a molecular substance, is dissolved in water, 1 mole of particles is produced in solution
- When 1 mole of an ionic substance is dissolved in water, the results are different. The ionic substances separate into individual ions
- 1 mole of sodium chloride produces 2 moles of particles and will depress the freezing point of water twice as much as the mole of sugar.
- The greater the number of ions, the greater the effect on the freezing point. CaCl2 contains 3 ions and 1 mole of this salt will depress the freezing point 3 times as much as a mole of sugar
- The situation is similar with the boiling point. 1 mole of particles will elevate the boiling point of 1000g of water by .52 degrees Celsius.
- 1 mole of dissolved sugar will elevate the boiling point of 1000g of water by .52 degrees Celsius
- 1 mole of dissolved sodium chloride contains 2 moles of ions, and will raise the boiling point of water by 1.04 degrees Celsius

Vapor Pressure

- In any sample of a liquid, some of the particles at the surface have sufficient energy to escape from their neighboring molecules and enter the gas phase. When a substance that is normally a solid or a liquid at room temperature enters the gas phase it is called a vapor
- As the temperature of a liquid increases, the particles have more energy and more particles escape from the surface. These vapor particles are gaseous particles and exert pressure in the gaseous phase. The pressure that a vapor exerts is called a vapor pressure.

Boiling Point

- As the temperature of a liquid rises, vapor pressure increases. Then the vapor pressure becomes equal to atmospheric pressure. At this point the gas may vaporize, not only on the surface but at any point in the container.
- When a bubble can occur at any point in a liquid, the process is called boiling. The normal boiling point of a liquid at room temperature at which the vapor pressure of the liquid is 101.3kPa, standard atmospheric pressure are 1 atm, 760 mm Hg, and 760 torr
- The heat required to chang 1 mole of a substance from a liquid at its boiling point to 1 mole of a vapor is the **heat of vaporization**