

Mary Jane  
Moody  
4-4-23

## Chemistry (Math Notes)

### Module #10

#### TERMS

A solute is the substance that is dissolved.

A solvent is the substance that the solute is dissolved in.

A solution is the solute + the solvent.

Solubility refers to the maximum amount of solute that can be dissolved in a given amount of solvent.

A saturated solution is a solution in which the maximum amount of solute has been dissolved.

Precipitation is the process by which a solid solute leaves a solution and turns back into its solid phase.

Exothermic is a process that releases heat.

Endothermic is a process that absorbs heat.

Water is a common solvent because more substances can be dissolved in it than in solids, even gases can be dissolved in water.

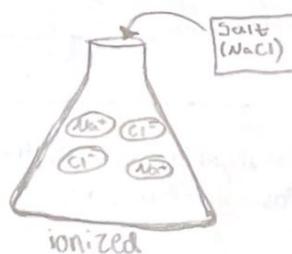
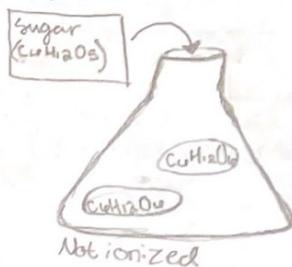
Example:



This is a chemical reaction

Why? Because all ionic compounds dissolve by splitting into ions. Covalent compounds don't break up into ion, but the water molecules surround these compounds.

Example:



Covalent compounds are surrounded by water molecules. They do not split into ions.

Ionic compounds dissolve by splitting into ions.

**RULES OF SOLUBILITY**

1. The solubility of an solute depends both on the identity of the solute and the identity of the solvent. (Be sure to understand and remember the facts in Table 11.1 - p.358)
2. For solid solutes, solubility increases with increasing temperature. (Direct relationship)
3. For liquid solutes, solubility is not affected by temperature. (No relationship)
4. For gas solutes, solubility decreases with increasing temperature. (Inverse relationship)
5. Increasing pressure increases the solubility of gases. (Direct relationship)
6. Pressure does not affect the solubility of solids and liquids. (No relationship)



Direct relationship



inverse relationship

**FORMULAS:**

Molarity (M) =

$$M = \frac{\text{moles of solute}}{\text{liters of solution}}$$

Molality (m) =

$$m = \frac{\text{moles of solute}}{\text{mass of solvent (kg)}}$$

When a solute is dissolved in a solvent, the resulting change in the freezing temperature is determined by the following formula:

$\Delta T_f = iK_f m$   
*i* constants - stands for the freezing point of depression constants  
 Molarity

Define Freezing Point Depression: The change of temperature is equal to the -i.

*i* is the number of molecules or ions the solute will split into when being dissolved

Each solvent has its own unique value

$\Delta T_b = iK_b m$   
 boiling point constants

Define Boiling Point Elevation: When a solute is dissolved in a solvent it

will effect the boiling point of the solution and make it higher than that of the pure solvent  
the temperature at which the solution will boil is now higher than it would be for the solvent.

When a solute is dissolved in a solvent, the resulting change in the boiling point temperature is determined by the following formula: