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## Chemistry (Math Notes)

### Module #9

#### I. Key Terms/Concepts

Concentration:

The number of Molecules in  $H_2O$

Concentrated:

Lots of Molecules in  $H_2O$ .

Diluted:

A small amount of Molecules in  $H_2O$ .

Strength:

Based on Number of Molecules that do their job  
(weak = a small amount that do their job; strong = many  
that do their job.

Indicator:

A substance that turns one color in the presence of  
Acids and another color in the presence of bases

Acid:

A Molecule that donates  $H^+$  ions (proton donors).

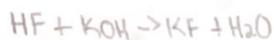
Base:

A Molecule that accepts  $H^+$  ions (proton acceptors).

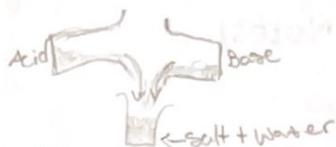
Amphiprotic:

Compound that can act as either an acid or a base,  
depending on the situation

Acid + Base  $\rightarrow$  Salt + Water



These reactions occur with bases that have OH ions.



Acid + Base  $\rightarrow$  Ion + Ion  
These reactions occur with bases that are covered.

Water is amphiprotic.

Example of water as a base:



Example of water as an acid:  
 $\text{NH}_3(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq})$

## II. Chemical Reactions

1. Formation: A reaction that with 2 or more elements and produces a compound.

2. Decomposition: A reaction that changes a compound into its constituent elements.

3. Combustion: (complete) A reaction in which  $\text{O}_2$  is added to a compound containing carbon and hydrogen, producing  $\text{CO}_2$  and  $\text{H}_2\text{O}$ .  
Incomplete A reaction in which  $\text{O}_2$  is added to a compound containing carbon and hydrogen, producing  $\text{CO}$  or  $\text{C}$  and  $\text{H}_2\text{O}$ .

4. Acid-Base A reaction in which an acid reacts with a base by the neutralization of both or by forming 2 ions.

## III. Molarity & Dilution Equation:

Concentration is amount / volume. Examples of concentration units are:

g/ml, g/cm cubed, mole/l

In chemistry we often use molarity to measure concentration.

Molarity (M) is the number of moles / # liters of solution.

Chemists usually keep "stock" solutions, which are then diluted for use.

$$M_1 \times V_1 = M_2 \times V_2$$

$M_1$  is the molarity of the stock solution.

$V_1$  is the molarity of the stock solution.

$M_2$  is the molarity of the New solution that the chemist wants.

$V_2$  is the volume of the New solution that the chemist wants.

$$(\text{molarity}) \times (\# \text{ liters}) = \# \text{ moles}$$

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Remember, a typical stoichiometry problem is set up by giving the information of one substance, but asks for information of another substance.

In these problems, molarity for one substance is given, but molarity or grams of a second substance must be determined.

#### IV. Titration

What is a titration?

It is Stoichiometry. You always begin with a balanced  
chemical equation.

You take a known amount of acid & add a base to it slowly. An indicator will change color, indicating that you have added just enough base to eat up all the acid. This is the

endpoint, allowing you to determine the concentration of the acid. This technique also works in reverse, adding an acid slowly to a known amount of a base.

The Molarity of the Acid  $\times$  the volume of the Acid is equal to the Molarity of the base  $\times$  the volume of the base taking into account the balanced chemical equation.

The endpoint is reached when the indicator changes color and allows you to determine the concentration of the acid (or base)