***Acid - Base Equilibrium Summary***

**The Arrhenius Theory of acids and bases**

* Acids are substances which produce hydrogen ions in solution.
* Bases are substances which produce hydroxide ions in solution.

**The Bronsted-Lowry Theory of acids and bases**

* An acid is a proton (hydrogen ion) donor.
* A base is a proton (hydrogen ion) acceptor.

**Conjugate Acid/Base Pairs**



Two substances related to each other by donating and accepting of a single hydrogen ion.

For any acid/base pair KaKb=Kw (the stronger the weak acid, the weaker the conjugate base & vice versa)

**Autoionization of water**



water will self-ionize and create equal concentrations of hydronium and hydroxide.

Kw = [H30+][OH-] = 1.0 x 10 -14

**Strong Acid – Base** = 100% ionization or dissociation (k value is ‘very large’). The molar concentration of the H+ or OH- is equal to the concentration of the acid or base. pH and pOH can be determined.

**Weak Acids – Base**  - only undergo partial ionization and create an equilibrium system. The concentration of ions can be solved using Ka and Kb values (ICE table). Many K values are so small that the ‘rule of 100’ will most likely apply.

**Polyprotic Acids** – an acid that possesses more than one ionizable hydrogen, each is assigned their own Ka value. In general Ka1 > Ka2 > Ka3

**pH and pOH** -each is calculated by using the negative log of the ion concentration.

pH = -log[H3O+] pOH = -log[OH-] pH + pOH = 14

**Acid – Base Properties of Salts** - When salts dissolve in water, they dissociate into aqueous solutions of ions that may or may not affect the pH of a solution.

Neutral Salts - cation of a strong base and the anion of a strong acid

Acidic Salts - cation of a weak base and the anion of a strong acid

Basic Salts - cation of a strong base and the anion of a weak acid

Special Cases - The pH of a salt where the cation is the conjugate acid of a weak base and the anion is the conjugate base of the weak acid will depend on the Ka value of the conjugate acid and the Kb value of the conjugate base.

 If Ka> Kb, pH will be acidic

 Ka< Kb, pH will be basic

 Ka= Kb, pH will be neutral