**Arrhenius Acid** – A species that gives off

H+ ions in solution.

HCl H+ + Cl-

H2SO4 2H+ + SO4-2

**Arrhenius Base** – A species that gives off

OH- ions in solution.

NaOH Na+  + OH-

Ca(OH)2 Ca+2  + 2OH-

**Bronsted-Lowry Acid** – A proton (H+) donor.

HCl + H2O H3O+ + Cl-

ACID

**Bronsted-Lowry Base** – A proton (H+) accepter.

NH3 + H2O NH4+ + OH-

BASE

**Bronsted-Lowry Acid** – A proton (H+) donor.

HCl + H2O H3O+ + Cl-

ACID BASE ACID BASE

CONJUGATE PAIRS

**Bronsted-Lowry Base** – A proton (H+) accepter.

NH3 + H2O NH4+ + OH-

BASE ACID ACID BASE

CONJUGATE PAIRS

**AMPHOTERISM**- Being both an acid and a base

H2O + H2O H3O+ + OH-

ACID BASE ACID BASE

CONJUGATE PAIRS

**Lewis Acid** – A species that accepts a pair of

electrons from another species in order

to form a bond.

**Lewis Base** – A species that donates its pair of

electrons to another species in order to

form a bond.

:NH3 + H+  NH4+

Equilibrium Constant for the ionization of water, **K***w*

H2O + H2O H3O+ + OH-

K*w =* [H3O+][OH-] = **1.0 x 10-14**

Therefore, both [H3O+] and [OH-] have a concentration of **1.0 x 10-7 M**

K*w =* [**1.0 x 10-7 M**][**1.0 x 10-7 M**] = **1.0 x 10-14**

**What is pH?**

pH = - log [H3O+]

Therefore, if water has an [H3O+] of **1.0 x 10-7 M**

pH = - log [**1.0 x 10-7**] = 7

Now what if we had an HCl(aq) of 0.001M

HCl + H2O H3O+ + Cl-

0.001M

Since HCl is a strong acid, it completely ionizes into H3O+.  Therefore, we will make 0.001 M H3O+.

And the pH will be – log [0.001] = 3

Now what if we had a NaOH(aq) of 0.001M

NaOH Na+ + OH-

0.001M

Since NaOH is a strong base, it completely dissociates into OH-.  Therefore, we will make 0.001 M OH-.

Remember that K*w =* [H3O+][OH-] = **1.0 x 10-14**

So if we solve for [H3O+], we get

[H3O+][0.001] = **1.0 x 10-14**

**and then…**

[H3O+]= **1 x 10-11 M**

And the pH will be – log [**1 x 10-11**] = 11