Name: Key
Blk:_____ Date:

Chemistry 12
ACID BASE PART II Lesson # 14
HYDROLYSIS

The HYDROLYSIS OF A SALT is a reaction between WATER and the cation or anion (or both) contained in the salt so as to produce a neutral, acidic or basic solution.

Like STRONG ACIDS and STRONG BASES, all SALTS are said to IONIZE 100% in water (we don't have any saturated solutions)

The generic DISSOCIATION EQUATION for a SALT, YZ, in water:

$YZ \longrightarrow Y^+(aq) + Z^-(aq)$

Example 1. Write the dissociation equation for the following salts in water:

a. $NaCl \longrightarrow Na^+(aq) + Cl^-(aq)$
b. $K_3PO_4 \longrightarrow 3K^+(aq) + PO_4^{3-}(aq)$
c. $(NH_4)_2S \longrightarrow 2NH_4^+(aq) + S^{2-}(aq)$

Recall the term SPECTATOR IONS, in this unit spectator ions ARE THOSE THAT DO NOT REACT WITH WATER. The conjugates of the STRONG ACIDS AND BASES are spectator ions.

SPECTATOR CATIONS- ALKALI + ALKALINE EARTH METALS

SPECTATOR ANIONS- "5" conjugates of the six strong acids ex. ClO_4^-, I^-, Br^-, Cl^- and NO_3^- (HSO_4^- acts like a W.A)

Determining the Behaviour of a salt in water involves FOUR steps:

1. Write out the dissociation eqtn.
2. Discard any SPECTATOR IONS.
3. Remaining ions act as either acid or base if both. (write out net ionic rxn ~ water)
4. The stronger Ka or Kb (larger) will dominate.

For the following Salts, determine if the solution that they produce when they are placed in water is ACIDIC, BASIC or NEUTRAL.

Ex. 2 NaCl

1. $NaCl \longrightarrow Na^+(aq) + Cl^-(aq)$
2. discard both $Na^+ + Cl^-$
3. Solution is NEUTRAL!

Example 3. $K_3PO_4 \longrightarrow 3K^+(aq) + PO_4^{3-}(aq)$

1.
2. discard K^+
3. $PO_4^{3-} + H_2O \rightleftharpoons HPO_4^{2-} + OH^-$

∴ solution will be basic!

Example 4. NH_4Cl

1. $NH_4Cl \longrightarrow NH_4^+ + Cl^-$
2. discard Cl^-
3. $NH_4^+ + H_2O \rightleftharpoons NH_3 + H_3O^+$

∴ solution will be acidic!

Example 5. ~~NaH_2CO_3~~ $NaHC_2O_4$

1. $NaHC_2O_4 \longrightarrow Na^+ + HC_2O_4^-$
2. discard Na^+
3. $HC_2O_4^- + H_2O \rightleftharpoons C_2O_4^{2-} + H_3O^+$; $ka = 6.4 \times 10^{-5}$

   $HC_2O_4^- + H_2O \rightleftharpoons H_2C_2O_4 + OH^-$; $kb = \frac{1.00\times10^{-14}}{5.9\times10^{-2}} = 1.7\times10^{-13}$
4. Bc $ka > kb$ the solution is acidic!

Example 6. NH_4NO_2

1. $NH_4NO_2 \longrightarrow NH_4^+(aq) + NO_2^-(aq)$
2. No ions to discard
3. $NH_4^+ + H_2O \rightleftharpoons NH_3 + H_3O^+$; $ka = 5.6\times10^{-10}$

   $NO_2^- + H_2O \rightleftharpoons HNO_2 + OH^-$; $kb = \frac{1.00\times10^{-14}}{4.6\times10^{-4}} = 2.2\times10^{-11}$
4. Bc $ka > kb$ the solution is acidic!

SEATWORK/HOMEWORK: Exercises 69-73, 88, 92+93
PLO's: N1-N4