Unit 7 – Chapter 13: Chemical Equilibrium **Name _____**

Assignment #5: Concentrations, K_{sp} & Solubility **Period _____**

1) The concentration of Ag^+ in a solution saturated with $Ag_2C_2O_{4(s)}$ is 2.2 X 10^{-4} *M*. Calculate K_{sp} for $Ag_2C_2O_4$.

2) Calculate the solubility of each of the following compounds in moles/liter.
   a. PbI_2, K_{sp} = 1.4 X 10^{-8}
   b. $CdCO_3$, K_{sp} = 5.2 X 10^{-12}
   c. $Sr_3(PO_4)_2$, K_{sp} = 1.0 X 10^{-31}

3) Given the K_{sp} and the equilibrium concentration of one ion, calculate the concentration of the other ion.
   a. lithium phosphate: K_{sp} = 3.2 X 10^{-9}; $[PO_4^{3-}]$ = 7.5 X 10^{-4} *M*
   b. silver nitrate: K_{sp} = 6.0 X 10^{-4}; $[Ag^+]$ = 0.025 *M*
   c. tin (II) hydroxide: K_{sp} = 1.4 X 10^{-28}; $[OH^-]$ = 2.2 X 10^{-5} *M*

4) Calculate the molar solubility of $Cd(OH)_2$, K_{sp} = 5.9 X 10^{-11}

5) Cadmium (II) chloride is added to a solution of potassium hydroxide with $[OH^-] = 4.2 \times 10^{-5}$, K_{sp} $Cd(OH)_2 = 2.5 \times 10^{-14}$.
    a. At what concentration of Cd^{2+} does a precipitate first start to form?
    b. Enough cadmium (II) chloride is added to make $[Cd^{2+}] = 0.0013$ *M*. What is the $[OH^-]$ of the resulting solution?
    c. What percentage of the original hydroxide ion is left in solution?

6) Before lead in paint was discontinued, lead (II) chromate was a common pigment in yellow paint. A 1.0 liter solution is prepared by mixing 0.50 mg of lead (II) nitrate with 0.020 mg of potassium chromate.
    a. Will a precipitate form?
    b. What should $[Pb^{2+}]$ be to just start precipitation?

7) A solution is prepared by mixing 35.00 mL of a 0.061 *M* solution of zinc nitrate with 20.0 mL of KOH at 1.0×10^{-5} *M*. Assume the volumes are additive. Will a precipitate form?

8) Will a precipitate form when 100.0 mL of 4.0×10^{-4} *M* $Mg(NO_3)_2$ is added to 100.0 mL of 2.0×10^{-4} *M* NaOH?