K_{sp} Problems (SCH 4U)

1. Calculate the K_{sp} for each of the salts whose solubility is listed below.

   (a) $CaSO_4$ solubility = 5.0 x 10^{-3} mol/L

   (b) MgF_2 solubility = 2.7 x 10^{-3} mol/L

   (c) $AgC_2H_3O_2$ solubility = 10.2 p.p.m.

   (d) SrF_2 solubility = 122 p.p.m.

2. Calculate the solubility in mol/L of each of these salts, determine the concentration of all ions and find the the concentration of each cation in p.p.m. in each of the saturated solutions

   (a) AgCN K_{sp} = 2 X 10^{-12}

   (b) $BaSO_4$ K_{sp} = 1.5 X 10^{-9}

   (c) FeS K_{sp} = 3.7 X 10^{-19}

   (d) $Mg(OH)_2$ K_{sp} = 9 X 10^{-12}

   (e) Ag_2S K_{sp} = 1.6 X 10^{-49}

   (f) CaF_2 K_{sp} = 4.9 X 10^{-11}

3. For each of these substances, calculate the concentration of metallic ion in p.p.m. that can remain at equilibrium in a solution having a $[OH^{-1}]$ = 1.0 X 10^{-4} mol/L

   (a) $Cu(OH)_2$ K_{sp} = 1.6 x 10^{-19}

   (b) $Fe(OH)_3$ K_{sp} = 6.0 x 10^{-38}

   (c) $Mg(OH)_2$ K_{sp} = 9.0 x 10^{-12}

4. Calculate the $[Ag^+]$ in mol/L (M) needed to begin precipitation of each of these anions from solutions containing concentration of 500 p.p.m. for each anion. Please use K_{sp} values from the sheet provided in class.

   (a) Br^{1-}

   (b) S^{2-}

   (c) BrO_3^{1-}

   (d) CrO_4^{2-}

   (e) IO_3^{1-}

5. How many mg of TlI can dissolve in 500 mL of:

   (a) water

   (b) 0.1 mol/L $TlNO_3$

   (c) 0.02 mol/L KI

6. In which of these reactions does a precipitate form? Show a
   sequential proof (question 9 from old sheet).

   (a) 10.0 mL of 0.01 mol/L $AgNO_3$ + 10.0 mL of 0.10 mol/L Na_2SO_4

   (b) 1 mg of $MgCl_2$ + 1 L of 0.01 mol/L $Na_2C_2O_4$

   (c) 1 mL of 0.1 mol/L $Ca(NO_3)_2$ + 1 L of 0.01 mol/L HF

   (d) 1 mL of 0.1 mol/L $Ca(NO_3)_2$ + 1 L of 0.01 mol/L NaF

   (e) 5 mL of 0.004 mol/L $AgNO_3$ + 15 mL of a solution containing
       1.5 mg Br^{1-} ions