Chemistry 350 Spring 2016
30 points Due Wednesday, March 16

Problem Set 6 –Activity and Systematic Approach to Equilibria

Complete all problems on separate paper. Show all work for credit.

1. Write the mass balance expressions for each solution below.
   a. 0.100 M in H_3PO_4
   b. 0.100 M in HNO_2 and 0.0500 M in $NaNO_2$
   c. 0.100 M $Ca(NO_3)_2$ saturated with CaF_2 (s)

2. Use the systematic approach to determine the pH of a solution that is 0.100 M in sodium acetate. (Hint: as you go along, determine if you can make any assumptions about the amounts of OH^- and H^+ that are in solution.) (Ignore activity)

3. Use the systematic approach to calculate the molar solubility of $MgCO_3$ in a solution that has a fixed $[H^+] = 1.0x10^{-6}$ M. (Ignore activity)

4. Calculate the ionic strength of the following solutions:
   (a) 0.20 M in $(NH_4)_2CrO_4$
   (b) 0.10 M in $CuCl_2$ and 0.20 M in NaCl.

5. Find the value of the activity coefficient for Cu^{2+} in 0.010 M $CuCl_2$ using (a) the extended Debye-Huckel equation and (b) by interpolating the data in a table of activity coefficients. (I promise I won't make you do this very often. ☺)

6. Find the pH of a solution that is 0.50 F in benzoic acid and also contains 0.010 M sodium benzoate. (Do not ignore activity.)

7. Calculate the solubility of FeS in the following situations: (a) pure water, (b) a solution that is also 0.0333 M in $MgCl_2$, (c) a solution that is also 0.020 M in K_2S. (Do not ignore activity, but ignore any subsequent acid-base reactions.)