Homework #3

1. Acid/Base Equilibria II: graphical method

Solve the following problems (A. and B.) graphically. Later in question #4, I will ask you to solve them exactly using MINEQL. Show the graphs and circle your solution point. Then present the approximate concentrations in a table.

A). Construct a log C vs pH diagram for a 0.10 F phosphate (H_3PO_4, $H_2PO_4^-$, HPO_4^{-2}, PO_4^{-3}) system. Using it, calculate the pH and the concentration of all species in the following solutions:

i) 0.10 F NaH$_2$PO$_4$
ii) 0.10 F Na$_2$HPO$_4$
iii) 0.10 F Na$_3$PO$_4$

B) Construct similar log C vs pH diagrams for 0.10 F carbonate system (H_2CO_3, HCO_3^-, CO_3^{-2}) and 0.20 F ammonia system (NH_4^+, NH_3), and use this to calculate pH and composition of the following systems:

i) 0.10 F NaHCO$_3$
ii) 0.10 F NaHCO$_3$ + 0.20 F NH$_4$Cl
iii) 0.10 F (NH$_4$)$_2$CO$_3$
iv) 0.10 F Na$_2$CO$_3$

2. Acid/Base Equilibria III: Acids & Conjugate Bases

A.) Calculate the composition and pH of the following solutions[1]:
i) 0.10 F NaCOOH + 0.40 F HCOOH
ii) 0.20 F NH$_3$ + 0.50 F NH$_4$Cl

B.) A 3.16×10^{-3} F solution of uroic acid (a ficitious monoprotic acid) has a pH of 3.2. What is the pH of an equimolar solution (i.e., 3.16×10^{-3} F) of the Na$^+$ salt of its conjugate base (Na-uroate)?

Assigned: 12 Feb 20
Due:: 19 Feb 20

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[1] The pK$_a$ for formic acid is 3.75