CHEM 1F92 Assignment 13. Acid-Base Equilibrium

Assignment 13, Version # 34

1.   What are the conjugate acids for the following bases?
      (a) OCN^- (b) HCO_2^-

2.   What are the conjugate bases of the following acids?:
      (a) H_2SO_3 (b) HN_3

3.   In each of the following acid-base reactions, identify the Bronsted acid and base on the left, and their conjugate partners on the right:
      (a) $OBr^- + H_2O \rightarrow HOBr + OH^-$
      (b) $H_2AsO_4^- + CH_3NH_3^+ \rightarrow CH_3NH_2 + H_3AsO_4$
      (c) $HSeO_4^- + SO_3^{2-} \rightarrow HSO_3^- + SeO_4^{2-}$

4.   In a Bronsted acid-base reaction, the stronger acid reacts with the stronger base to produce a weaker acid and a weaker base. Thus, whether a reaction "goes" or "does not go" can be used to determine the relative strength of the Bronsted acids and bases in the reaction. From the data below, determine the order of the strengths of the three Bronsted acids.
      Reaction 1: $HOCl + HO_2^- \rightarrow H_2O_2 + ClO^-$ goes
      Reaction 2: $NH_3OH^+ + HO_2^- \rightarrow H_2O_2 + NH_2OH$ goes
      Reaction 3: $HOCl + NH_2OH \rightarrow NH_3OH^+ + ClO^-$ does not go

5.   Make the following conversions. Report answers to 2 decimal places. In each case, tell whether the solution is acidic or basic.

	pH	$[H_3O^+]$	$[OH^-]$	acidic or basic?
(a)	9.36	_____	_____	_____
(b)	____	6.07×10^{-5}	_____	_____
(c)	____	_____	6.41×10^{-11}	_____

6.   A 0.33 M solution of a weak acid HA is 0.15 % ionized. What are the H^+, A^-, and HA concentrations at equilibrium? What is K_a?

7.   The K_a for propanoic acid, $HC_3H_5O_2$ is 1.4×10^{-5}. What is the pH of a 0.30 M solution of the acid? What is the % ionization of the acid at this concentration?

8.   A 0.17 M solution of a weak base B has a pH of 9.09. The equation for ionization is
              $B (aq) + H_2O \rightarrow BH^+ + OH^-$
What are the BH^+, OH^-, and B concentrations at equilibrium? Calculate K_b for the base.

9.   The base trimethylamine, $(CH_3)_3N$, has a pK_b equal to 4.20. Calculate the hydroxide concentration, the pH, and the % ionization for a 0.34 M solution.