Chem 104
Test 3 Practice Problems

1. Complete the following table by calculating the missing entries and indicating whether the solution is acidic or basic.

$[H_3O^+]$	$[OH^-]$	pH	pOH	acidic or basic?
			6.70	

2. Using the Table of Conjugate Acid-Base Pairs, decide whether each of the following equilibria lies to the left or right.

   $H_2C_2O_4(aq) + SO_4^{2-}(aq) \rightleftharpoons HC_2O_4^-(aq) + HSO_4^-(aq)$ _____

   $HC_2O_4^-(aq) + SO_4^{2-}(aq) \rightleftharpoons C_2O_4^{2-}(aq) + HSO_4^-(aq)$ _____

   $HC_2O_4^-(aq) + OCl^-(aq) \rightleftharpoons C_2O_4^{2-}(aq) + HOCl(aq)$ _____

   $HOBr(aq) + OCl^-(aq) \rightleftharpoons OBr^-(aq) + HOCl(aq)$ _____

3. Using the Table of Conjugate Acid-Base Pairs, decide whether a solution of $NaHC_2O_4(aq)$ is acidic or basic.

4. Vitamin C is ascorbic acid, a diprotic acid for which $K_1 = 8.0 \times 10^{-5}$ and $K_2 = 1.6 \times 10^{-12}$.
   (a) Using the abbreviation H_2Asc for ascorbic acid, write the hydrolysis equilibria that correspond to K_1 and K_2.
   (b) Consider a 0.10 M solution of ascorbic acid. Calculate $[H_3O^+]$, pH, and the percent dissociation of the acid in this solution.
   (c) What is the concentration of ascorbate ion, $[Asc^{2-}]$, in a 0.10 M ascorbic acid solution?

5. Consider the titration of 25.0 mL of 0.120 M acetic acid (CH_3CO_2H, $K_a = 1.76 \times 10^{-5}$) with 0.100 M NaOH(*aq*).
   (a) How much 0.100 M NaOH(*aq*) must be added to reach the equivalence point?
   (b) How many millimoles of CH_3CO_2H are present in the initial sample?
   (c) What is the initial pH of the sample solution?
   (d) What is the pH of the solution after adding 5.00 mL of 0.100 M NaOH(*aq*)?
   (e) What is the pH of the solution after adding 15.0 mL of 0.100 M NaOH(*aq*)?
   (f) What is the pH at the equivalence point?
   (g) What is the pH when 5.00 mL of 0.100 M NaOH(*aq*) has been added beyond the equivalence point?