Acid and Base Equilibrium Worksheet

1. HOCl is a weak acid with $K_a = 3.50 \, x \, 10^{-8}$
   a. What is the pH of a 1.03M solution of HOCl? Justify an approximations.

      3.722

   b. Test and confirm any approximations used in part a.

      Assumed x was 5% or less of initial acid concentration. X turns out to be only 0.018% of initial concentration.

   c. What is a common conceptual error made when making approximations in chemical equilibrium calculations?

      "Make x=0", if the numerator involves multiplication of x, then the entire expression becomes 0

2. How many grams of formic acid, HCOOH, do you need to prepare 1.00L of a pH 3.26 solution? Ka of formic acid = $1.8\,x\,10^{-4}$

   0.10g

3. The percentage protonation of octylamine (an organic base) in a 0.100M aqueous solution is 6.7%.

   a. What is the Kb of octylamine?

      4.8 x 10^-4

   b. What is the pH of the solution?

      11.83

4. An approximation to finding pH of polyprotic solution is to treat each step independently and add [H+] generated at each step.

$H_2CO_3 \leftrightarrow H^+ + HCO_3^-$ $\qquad K_{a1} = 4.3\ x\ 10^{-7}$

$HCO_3^- \leftrightarrow H^+ + CO_3^{2-}$ $\qquad K_{a2} = 5.6\ x\ 10^{-11}$

a. Using the above approximation, find the pH of a 0.0037M solution of H_2CO_3

4.30

b. What is the concentration of CO_3^{2-} ?

5.6 x 10^-11 M