Chemistry 2212 Sample Quiz 3

1. For the following reaction at equilibrium at 1018 K

   $2NH_3 \leftrightarrows N_2 + 3H_2$

   $[NH_3] = 0.0040$ M, $[N_2] = 0.0100$ M, and $[H_2] = 0.300$ M. Calculate K_c and K_p for the reaction. (R = 0.08206 L atm/mol K)

2. $K_c = 5.0$ for the reaction $CO_{(g)} + H_2O_{(g)} \leftrightarrows CO_2 + H_{2(g)}$

   If the initial concentrations are $[CO] = [H_2O] = 0.500$ M, $[CO_2] = 0.800$ M and $[H_2] = 0.350$ M, calculate Q_c and predict which direction the reaction will proceed to reach equilibrium.

3. $K_c = 0.50$ for the reaction

   $SO_{3(g)} + NO_{(g)} \leftrightarrows SO_{2(g)} + NO_{2(g)}$

   Calculate the equilibrium concentration of all species if the initial concentrations of SO_3 and NO are each 0.150 M.

4. For the following system at equilibrium

   $CO_{(g)} + Cl_{2(g)} \leftrightarrows COCl_{2(g)}$ H = - 108.3 kJ

   what will be the effect (shift to the left, shift to the right, no effect) if
   a) the temperature is increased?
   b) Cl_2 is added?
   c) the pressure is increased by decreasing the volume of the container?
   d) CO is removed?
   e) the pressure is increased by adding argon gas?

5. Complete following acid-base reaction. Identify which reactant is the acid, which reactant is the base, which product is the conjugate base of the acid, and which product is the conjugate acid of the base.

   $H_2O + S^{-2} \leftrightarrows$

6. Calculate the pH and pOH of a 0.310 M $HClO_4$ solution.

7. Calculate the pH of a 1.25 M HCN ($K_a = 7.2 \times 10^{-10}$) solution.

8. Calculate the pH of a 0.150 M NaOCl (K_a for HOCl is 3.0×10^{-8}) solution.

9. Calculate the pH of a buffer solution which is 0.450 M HF ($K_a = 3.5 \times 10^{-4}$) and 0.350 M NaF.

10. 25.00 mL of 0.200 M HNO_2 ($K_a = 4.6 \times 10^{-4}$) is titrated with 0.300 M NaOH. What is the pH after 10.00 mL of base is added?