1125 Review Session

Q center

Exam 5

1. Consider the following reaction: $BF_3(g) + NH_3(g) \rightarrow BF_3NH_3(g)$

   The reaction is first order in BF3 and first order in NH3. Write the rate expression for the reaction:

2. At a certain temperature, 0.860 mol SO3 is placed in a 3.00 L container.

   $$2SO_3(g) \rightleftharpoons 2SO_2(g)+O_2(g)$$

   At equilibrium, 0.140 mol O_2 is present. Calculate Kc.

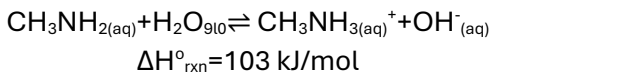
3. Calculate the equilibrium constant for the reaction:

   $$Q_{(g)}+X_{(g)} \rightleftharpoons 2M_{(g)}+N_{(g)}$$

   Given that:

   $$M_{(g)} \rightleftharpoons Z_{(g)} \qquad K=3.33$$
   $$6R_{(g)} \rightleftharpoons 2N_{(g)}+4Z_{(g)} \qquad K=0.463$$
   $$3X_{(g)}+3Q_{(g)} \rightleftharpoons 9R_{(g)} \qquad K=11.7$$

4. Which of the following will increase the concentration of reactants for the following reaction:



$$CH_3NH_{2(aq)} + H_2O_{9l0} \rightleftharpoons CH_3NH_{3(aq)}^{+} + OH^{-}_{(aq)}$$

$$\Delta H^{o}_{rxn} = 103 \text{ kJ/mol}$$

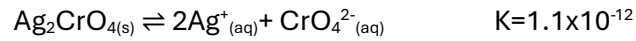
   a. Adding more KOH
   b. Adding KBr
   c. Increasing the temperature
   d. Adding CH_3NH_3Br
   e. Adding HBr

5. Consider this equilibrium reaction:

$$Br_{2(g)} + Cl_{2(g)} \rightleftharpoons 2BrCl_{(g)} \qquad K_c = 7.0$$

   If the composition of the reaction mixture at 400 L is [BrCl]=0.00581 M, $[Br_2]$=0.00216 M, and $[Cl_2]$=0.000396, predict to what side the reaction shifts to get to the equilibrium.

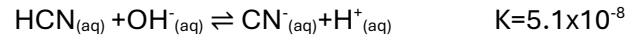
6. For the following reactions determine whether the forward or reverse reaction is favored:

   a. 

$$Ag_2CrO_{4(s)} \rightleftharpoons 2Ag^{+}_{(aq)} + CrO_4^{2-}{}_{(aq)} \qquad K = 1.1 \times 10^{-12}$$

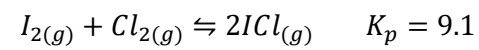
   b.

$$2NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)} \quad K = 2.5 \times 10^{10}$$

   c. 

$$HCN_{(aq)} + OH^{-}_{(aq)} \rightleftharpoons CN^{-}_{(aq)} + H^{+}_{(aq)} \qquad K = 5.1 \times 10^{-8}$$

7. At 25 °C gaseous I_2 and Cl_2 react to form ICl.



$$I_{2(g)} + Cl_{2(g)} \leftrightarrows 2ICl_{(g)} \qquad K_p = 9.1$$

Suppose that a sealed container initially contains 0.250 atm of I_2 and 0.250 M of Cl_2. Calculate the equilibrium partial pressures of I_2, Cl_2 and ICl at this temperature.

8. SOCl2 dissociates into SO2 and Cl2 via the following reaction:

$$SOCl_{2(g)} \leftrightharpoons SO_{2(g)} + Cl_{2(g)} \quad K_p = 1.23x10^{-6}$$

At 500 K.

Calculate K_C for this reaction at 500 K