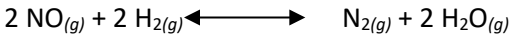
Unit 7 – Chapter 13: Chemical Equilibrium **Name _____**

Assignment #1: Equilibrium K_c and K_p Calculations **Period _____**

1) A mixture of 0.10 moles of NO, 0.050 moles of H_2, and 0.10 moles of H_2O is placed in a 1.0-liter vessel at 300 K. The following equilibrium is established:



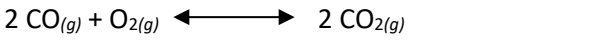
$$2\ NO_{(g)} + 2\ H_{2(g)} \longleftrightarrow N_{2(g)} + 2\ H_2O_{(g)}$$

At equilibrium, [NO] = 0.062 *M*.

a. Calculate the equilibrium concentrations of H_2, N_2, and H_2O.

b. Calculate K_c.

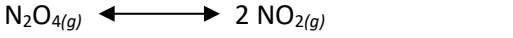
2) From the following equation:



$$2\ CO_{(g)} + O_{2(g)} \longleftrightarrow 2\ CO_{2(g)} \qquad K_c = 1.2 \times 10^{-4}$$

Calculate the concentrations of all the species if 0.30 moles of CO and 0.30 moles of O_2 are reacted in a 1.0-liter container.

3) A flask is charged with 1.50 atm of N_2O_4 and 1.00 atm NO_2 at 25^0C, and the following equilibrium is achieved:



$$N_2O_{4(g)} \longleftrightarrow 2\ NO_{2(g)}$$

After equilibrium is reached, the partial pressure of NO_2 is 0.512 atm.

a. What is the equilibrium partial pressure of N_2O_4?

b. Calculate the value of K_p for the reaction.

4) At 2000^0C, the equilibrium constant for the reaction

$$2\ NO_{(g)} \longleftrightarrow N_{2(g)} + O_{2(g)} \qquad K_c = 2.4 \times 10^3$$

If the initial concentration of NO is 0.200 *M*, what are the equilibrium concentrations on NO, N_2 and O_2?

5) For the equilibrium:

$$Br_{2(g)} + Cl_{2(g)} \longleftrightarrow 2\ BrCl_{(g)}$$

At 400 K, K_c = 7.0. If 0.30 mol of Br_2 and 0.30 mol Cl_2 are introduced into a 1.0 L container at 400 K, what will be the equilibrium concentrations of Br_2, Cl_2, and BrCl?

6) At 218^0C, $K_c = 1.2 \times 10^{-4}$ for the equilibrium:

$$NH_4HS_{(s)} \longleftrightarrow NH_{3(g)} + H_2S_{(g)}$$

Calculate the equilibrium concentrations of NH_3 and H_2S if a sample of solid NH_4HS is placed in a closed vessel and decomposes until equilibrium is reached.