Unit 7 – Chapter 13 Conclusion questions: Experiment 20

Name _____

Period _____

1. Calculate K_c at 303 K for:

$SO_{2(g)} + Cl_{2(g)} \longleftrightarrow SO_2Cl_{2(g)}$ $K_p = 34.5$ at this temperature

$K_c = 858$

2. The equilibrium constant for the reaction

$2\ NO_{(g)} + O_{2(g)} \longleftrightarrow 2\ NO_{2(g)}$ $K_p = 1.48 \times 10^4$ at 184^0C

a) Calculate K_p for the reverse reaction $K_p = 6.76 \times 10^{-5}$

b) Does the equilibrium favor the production of NO and O_2 or does it favor NO_2 at this temperature?

→ PRODUCTION OF NO_2

3. A mixture of 1.374 g of H_2 and 70.31 g of Br_2 is heated in a 2.00-liter vessel at 700 K. The substances react as follows:

$H_{2(g)} + Br_{2(g)} \longleftrightarrow 2\ HBr_{(g)}$

At equilibrium the vessel is found to contain 0.566 g of H_2.

a) Calculate the equilibrium concentrations of all the reactants and products

b) Calculate the value of K_c.

a) $H_2 = .141M$

$Br_2 = .020M$

$HBr = .400M$

b) 57

4. At 100°C, K_c for the following reaction is 2.0×10^{-4}

$$2\ CO_{(g)} + O_{2(g)} \longleftrightarrow 2\ CO_{2(g)}$$

Calculate the concentrations of all the species at equilibrium for each of the following original mixtures: 2.0 moles of CO, 2.0 mol of O_2 in a 5-liter container.

$[CO] = .396M$
$[O_2] = .396M$
$[CO_2] = .003M$

5. Using the equilibrium equation in #4, calculate the direction the reaction will go at the following concentrations: [CO] = 1.94 *M*, $[O_2]$ = 0.78 *M*, $[CO_2]$ = 0.007 *M*

$Q = 1.67 \times 10^{-5} < K \quad \therefore \rightarrow$

6. A mixture of 0.36 *M* H_2 and 0.30 *M* Br_2 is heated at 600 K. The equilibrium reaction is:

$$H_{2(g)} + Br_{2(g)} \longleftrightarrow 2\ HBr_{(g)} \qquad K_c = 4.2 \times 10^{-5}$$

Calculate the equilibrium concentrations of all reactants and products.

$[H_2] = .359M$
$[Br_2] = .299M$
$[HBr] = .00212M$

7. A mixture of 0.200 moles of CO_2, 0.100 moles of H_2, and 0.160 moles of H_2O is placed in a 2.00-liter vessel. The following equilibrium is established at 500 K.

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

a) Calculate the initial pressures of CO_2, H_2, and H_2O (Hint: Use pV = nRT)

b) At equilibrium P_{H20} = 3.51 atm, calculate the equilibrium partial pressures of CO_2, H_2, and CO.

c) Calculate K_p for the reaction.

a) $P_{CO_2} = 4.10\ ATM$
$P_{H_2} = 2.05\ ATM$
$P_{H_2O} = 3.28\ ATM$

b) $CO_2 = .387\ ATM$
$H_2 = 1.82\ ATM$
$CO = .23\ ATM$
$H_2O\ (GIVEN) = 3.51\ ATM$

c) $K_p = .11$