Equilibrium Classwork Name_____Period_____Date_____

1. Answer the following questions about this reaction which takes place at 500 K:

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

a. Write the equilibrium expression for the reaction.

b. Solve for the equilibrium constant, K, given the following equilibrium concentrations:

$[SO_2]_{eq} = 1.50$ $[O_2]_{eq} = 1.25$ $[SO_3]_{eq} = 3.50$

c. What is the value of K_p for this reaction at 500 K?

d. Based on the value of K determined in part b, what can one say about the spontaneity of the reaction?

e. When the temperature of the reaction is lowered to 470 K, 16.5% of the SO_3 is converted to reactants. Calculate the value of the equilibrium constant at 470 K.

2. The reaction between nitrogen and oxygen to form nitric oxide has a value for the equilibrium constant at 2000 K of $\mathbf{K = 4.1x10^{-4}}$. If 0.50 moles of N_2 and 0.86 moles of O_2 are put into a 2.00 L container at 2000 K, what will be the equilibrium concentration of all species?

$$N_{2(g)} + O_{2(g)} \Leftrightarrow 2NO_{(g)}$$

3. Examine the reaction between hydrogen gas and iodine gas.

$$H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$$

If the initial concentrations are as follows, predict the direction that the reaction will shift in order to reach equilibrium. ($K = 7.1 \times 10^2$ at 25 C)

$[H_2] = 0.034\ M$; $[I_2] = 0.035\ M$; $[HI] = 1.50\ M$

4. The value of K for the formation of water from its elements at 175°C is 0.25.

$$H_2(g) + \tfrac{1}{2}\, O_2\,(g) \leftrightarrow H_2O\,(g)$$

What is the value of K for the following reactions:

a. $H_2O(g) \leftrightarrow H_2(g) + \tfrac{1}{2}\, O_2\,(g)$ K = _____

b. $2H_2(g) + O_2\,(g) \leftrightarrow 2H_2O\,(g)$ K = _____

5. Nitric oxide and bromine at initial pressures of 98.4 and 41.3 torr, respectively, were allowed to react at 300 K. At equilibrium the total pressure was 110.5 torr. The reaction is

$$2NO\,(g) + Br_2(g) \leftrightarrow 2NOBr\,(g)$$

Calculate the value of K_p.