Chem 1515
Problem Set #8
Fall 2001

Name____________________________

TA Name ________________________

Lab Section #______

ALL work must be shown to receive full credit. **Due at the beginning of lecture on Wednesday, October 31, 2001.**

PS8.1. A 1.00 liter container initially holds 0.257 moles of NOBr at a given temperature. The reaction which occurs is:

$$2NOBr(g) \rightleftarrows 2NO(g) + Br_2(g)$$

At equilibrium analysis shows 0.240 moles of NO and 0.120 moles of Br_2.

a) Which direction did the reaction proceed to establish (reach) equilibrium?

b) How many moles of NOBr reacted in order to form 0.240 moles of NO and 0.120 moles of Br_2?

c) How many moles of NOBr remain after equilibrium was established?

d) What is the magnitude of K_c?

PS8.2. In a container, the partial pressure of NOCl is initially 0.340 atm at a given temperature. The chemical equation which describes the reaction is:

$$2NO(g) + Cl_2(g) \rightleftarrows 2NOCl(g)$$

At equilibrium analysis shows the partial pressure of NO is 0.0916 atm.

a) Which direction did the reaction proceed to establish (reach) equilibrium?

b) What is the partial pressure of NOCl which reacted in order for the partial pressure of NO to be 0.0916 atm?

c) What is the partial pressure of Cl_2 at equilibrium?

d) What is the partial pressure of NOCl at equilibrium?

b) What is the magnitude of K_p for the equation above?

PS8.3. A 1.00 liter container holds 1.06 moles of H_2 and 1.57 moles of CO at a temperature of 162 ˚C. At this temperature, the following reaction occurs,

$$2H_2(g) + CO(g) \rightleftarrows CH_3OH(g)$$

After equilibrium is established, analysis shows 0.200 moles of CH_3OH in the container. Calculate the $[CO]_{eq}$, $[H_2]_{eq}$ and K_c.

PS8.4. The following reaction,

$$2HI(g) \rightleftarrows I_2(g) + H_2(g)$$

occurs at 298K. If 2.00 mol of HI are placed into a 1.00 liter container and permitted to react, at equilibrium it is found that 20.0 % of the HI has decomposed. Calculate K_c and K_p.

PS8.5. A 0.622 gram quantity of $COBr_2$ is sealed in a glass bulb of 0.100 L volume and heated to a temperature of 73 ˚C. At 73 ˚C the $COBr_2$ partially decomposes according to the equation

$$COBr_2(g) \rightleftarrows CO(g) + Br_2(g)$$

for which $K_c = 0.190$. Calculate the concentration of each species at 73 ˚C.

PS8.6. The equilibrium constant, K_p, for the reaction

$$H_2O(g) + CO(g) \rightleftarrows CO_2(g) + H_2(g)$$

is 7.31. Calculate the partial pressure of all species at equilibrium for each of the following original mixtures:

a) 1.0 atm of CO and 1.0 atm of H_2O.

PS8.6. (CONTINUED)

b) 1.0 atm of CO, 1.0 atm of H_2O and 1.00 atm of H_2.

c) 1.0 atm of H_2 and 1.0 atm of CO_2.

PS8.7. At 1000 K the equilibrium constant, K_c, for the reaction

$$2NO(g) + O_2(g) \rightleftarrows 2NO_2(g)$$

is 0.833. Calculate the concentrations of all species at equilibrium when 0.200 moles of NO_2 are placed in a 2.00 L container at 1000 K.

PS8.8. The equilibrium constant, K_p, for the reaction

$$2NOBr(g) \rightleftarrows 2NO(g) + Br_2(g)$$

is 6.25 at 25 ˚C and ΔH° = 34.4 kJ. Calculate the magnitude of the equilibrium constant at 50 ˚C.

PS8.9. Given the reaction

$$XeF_4(g) \rightleftarrows Xe(g) + 2F_2(g)$$

A 10.0 liter vessel at 298 K initially contains a sample of XeF_4 at 0.750 atm. After the reaction achieves equilibrium, the total pressure in the vessel is 1.95 atm. Calculate K_p from this data.

PS8.10. The equilibrium constant, K_c, for the reaction

$$N_2(g) + O_2(g) \rightleftarrows 2NO(g)$$

is 2.50×10^{-6} at a particular temperature. If the $[N_2]_o = 2.00$ M, the $[O_2]_o = 1.00$ M and the $[NO]_o = 0$ M, calculate the equilibrium concentration of all species.