Ch 13 Equilibrium – More Classroom Equilibrium Practice (Some two stage equilibrium questions)

9) At 2000 \circ C, the K_p for the reaction $2NO(g) \iff N_2(g) + O_2(g)$ is $K_p = 2.4 \times 10^3$

If the initial partial pressure of NO is 37.3-atm, what are the equilibrium partial pressures of NO, N₂, and O₂? What is the total pressure?

10) At 25°C, $K_p = 2.9 \times 10^{-3}$ for the reaction

 $NH_4OCONH_2(s) \le 2NH_3(g) + CO_2(g)$

In an experiment carried out at 25°C, a certain amount of NH₄OCONH₂ is placed in an evacuated 2.0 L rigid container and allowed to come to equilibrium. Calculate the total pressure in the container at equilibrium. Calculate the minimum mass of the solid necessary to reach equilibrium.

11) At 125°C, $K_p = 0.25$ for the reaction 2NaHCO₃(s) <=> Na₂CO₃(s) + CO₂(g) + H₂O(g)

A 1.00-L flask containing 10.0-g NaHCO₃ is evacuated and heated to 125°C.

a) Calculate the partial pressures of CO₂ and H₂O after equilibrium is established

b) Calculate the masses of NaHCO₃ and Na₂CO₃ present at equilibrium

c) What is the total pressure at equilibrium?

12) The partial pressures of an equilibrium mixture of $N_2O_4(g)$ and $NO_2(g)$ are $P_{N2O4} = 0.34$ -atm and $P_{NO2} = 1.20$ -atm at a certain temperature. The volume of the container is doubled. Find the partial pressures of the 2 gases when a new equilibrium is established.

Ex 4) For the following reaction at a certain temperature $H_2(g) + F_2(g) \iff 2HF(g)$ K = 320.

Initially 0.500-mol each of hydrogen gas and fluorine gas are placed in a 5.00-L container and equilibrium occurs. Then 0.200-mol of F_2 is added to this equilibrium mixture.

a) Calculate the concentrations all the species (at established equilibrium) before additional fluorine is added.

b) Calculate the concentrations of all gases once equilibrium is reestablished (after 0.200 mol Fluorine addition).

c) Draw a graph showing what occurred, from start to finish

Ex 7) For the reaction below the $K_c = 5.84 \times 10^{-3}$ at 25°C. N₂O₄(g) <=> 2NO₂(g)

a) Calculate the equilibrium concentrations of both gases $% 10^{-1}$ when 3.50-g N_2O_4 is placed in a 2.00-L flask.

b) What will be the new equilibrium concentrations if the volume of the system is suddenly increased to 3.00-L at $25\circ$ C

Equilibrium Graphs: Read the following descriptions and graph the equilibrium system.

1) Beginning with NO_2 in a container, show the graph that would result with the reaction reaching equilibrium and then show the results of adding some O_2 to the system.

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

2) Beginning with only $SO_3(0.5M)$ and no SO_2 or O_2 . Show the system establishing equilibrium then show how the system adjusts when some O_2 is removed.

 $2SO_{3(g)} \iff 2 SO_{2(g)} + O_{2(g)}$