Chemistry 146 – Van Bramer
Spring 2017 Homework – Chapter 14

Textbook Questions: 4, 15, 31, 75

Additional Questions:

1. Write an equilibrium expression for each of the following chemical reactions:
   a. $3\ O_2\ (g) \leftrightarrow 2\ O_3\ (g)$
   b. $H_2\ (g) + I_2\ (g) \leftrightarrow 2\ HI\ (g)$
   c. $2\ HI\ (g) \leftrightarrow H_2\ (g) + I_2\ (g)$
   d. $4\ NH_3\ (g) + 3\ O_2\ (g) \leftrightarrow 6\ H_2O\ (g) + 2\ N_2\ (g)$
   e. $2\ H_2S\ (g) + 3\ O_2\ (g) \leftrightarrow 2\ H_2O\ (g) + 2\ SO_2\ (g)$
   f. $CaCO_3\ (s) + CO_2\ (g) + H_2O\ (l) \leftrightarrow Ca^{2+}\ (aq) + 2\ HCO_3^{1-}\ (aq)$

2. 10 grams of PCl_5 is added to a 3.0 liter flask at 250 ºC. After the system comes to equlibrium the pressure in the flask is 1.136×10^5Pa.

   $$PCl_5\ (g) \leftrightarrow PCl_3\ (g) + Cl_2\ (g)$$

   a. What is the equilibrium concentration of each species?
   b. What is the partial pressure of each species?
   c. What is K_c for this system?
   d. What is K_p for this system?

3. Using the equilibrium constant for PCl_5 from the previous problem, calculate the equlibrium pressure of each species under the following conditions:
   a. 5 grams of PCl_5 is added to a 3.0 liter flask at 250 ºC.
   b. 25 grams of PCl_5 is added to a 6.0 liter flask at 250 ºC.
   c. 5 grams of PCl_3 and 5 grams of Cl_2 is added to a 3.0 liter flask at 250 ºC.

4. The equilibrium constant (K_c) for the reaction $SO_2\ (g) + NO_2\ (g) \leftrightarrow SO_3\ (g) + NO\ (g)$ is 9.00 at 973 K. What is the final concentration of all four compounds when:
   a. 1.00 mole of SO_2 and 1.00 mole of NO_2 are injected in a 1.00 liter container at 973 K.
   b. 1.00 mole of SO_2 and 1.00 mole of NO_2 are injected in a 2.00 liter container at 973 K.
   c. 1.00 mole of SO_3 and 1.00 mole of NO are injected in a 1.00 liter container at 973 K.