Chemistry 52

<div align="center">
<u>**REVIEW QUESTIONS**</u>
Chapter 16
</div>

1. Write equilibrium constant expressions for each reaction below:

   A) $N_2\,(g) + 2\,H_2O\,(g) \rightleftharpoons NO\,(g) + 2\,H_2\,(g)$

   B) $2\,N_2O_5\,(g) \rightleftharpoons 2\,N_2O_4\,(g) + O_2\,(g)$
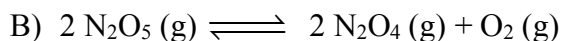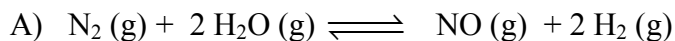
2. At 1500 K the following equilibrium is established:

   $$2\,BrF_5\,(g) \rightleftharpoons Br_2\,(g) + 5\,F_2\,(g)$$
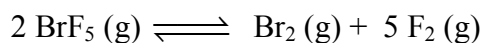
   At equilibrium,
        $[BrF_5] = 0.0064\ M$
        $[Br_2] = 0.0018\ M$
 $[F_2] = 0.0090\ M.$

   Calculate the equilibrium constant for this reaction.

3. For each reaction below, determine whether reactants or products are favored at equilibrium:

   A) $N_2\,(g) + O_2\,(g) \rightleftharpoons 2\,NO\,(g)$ $K_{eq} = 4.5 \times 10^{-31}$

   B) $N_2\,(g) + 3\,H_2\,(g) \rightleftharpoons 2\,NH_3\,(g)$ $K_{eq} = 3.6 \times 10^{8}$

   C) $CH_4\,(g) + Cl_2\,(g) \rightleftharpoons CH_3Cl\,(g) + HCl\,(g)$ $K_{eq} = 1.2 \times 10^{18}$

<div align="center">1</div>
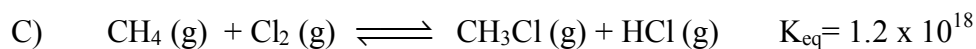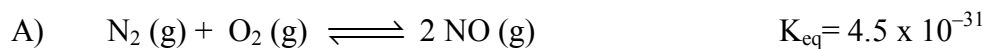
4. In the equilibrium shown below, identify four changes that would increase the concentration of ammonia equilibrium:

$$heat + N_2 (g) + 3 H_2 (g) \rightleftharpoons 2 NH_3 (g)$$
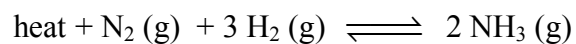
5. For the equilibrium shown below, describe the changes that occur after each action listed:

$$A (g) + 3 B (g) \rightleftharpoons 2 C (g) + 3 D (g) + heat$$
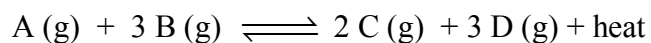
a) Temperature is increased

b) More A is added

c) Some D is removed

d) Volume is decreased

6. 0.100 moles of HI was placed in a 1.0-L flask and allowed to decompose as shown below:

$$2 HI (g) \rightleftharpoons H_2 (g) + I_2 (g)$$
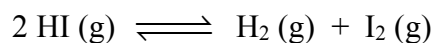
At equilibrium, the 0.011 moles of H_2 was present. Calculate the equilibrium constant for this reaction. (Hint: set up a reaction table)

7. A 0.15 M solution of butanoic acid ($HC_4H_7O_2$) has $[H_3O^+] = 1.51 \times 10^{-3}$ M. Calculate K_a for this acid.

8. A 0.035 M solution of a weak acid (HA) has a pH of 4.88. Calculate the K_a for this acid.

9. In a reaction, 0.15 moles of NH_3 is placed in a 1.5-L flask and allowed to decompose as shown below:

$$2\,NH_3\,(g) \rightleftharpoons N_2\,(g) + 3\,H_2\,(g)$$
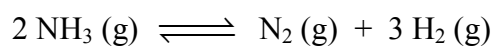
At equilibrium, 0.035 moles of N_2 were present. Determine the percent yield of this reaction.

10. Determine the pH and percent ionization of 1.0 M acetic acid ($K_a = 1.8 \times 10^{-5}$).

11. What is the pH of a buffer solution consisting of 0.55 M acetic acid and 0.68 M sodium acetate? (K_a for acetic acid = 1.8×10^{-5})

12. The K_{sp} value for AgI is 8.5×10^{-17}. What is the molar solubility of AgI?

13. The solubility of CaF_2 is 2.14×10^{-4} M. Calculate the K_{sp} for CaF_2.