CHEM1212K Homework Chapter 15 Spring 2013

Name: ID:

1. Consider the following chemical reaction:

CO (g) + 2H2 (g) → CH3OH(g)

At equilibrium in a particular experiment, the concentrations of CO and H2 were 0.15 M and0.36 M,respectively. What is the equilibrium concentration of CH3OH? The value of Keq for this reaction is 14.5 at the temperature of the experiment.

1. For 15-4-5, *Kp* = 4.34 × 10−3 at 300 °C .What is the value of

*Kp* for the reverse reaction?

1. Given that, at 700 K, *Kp* = 54.0 for the reaction 15-5-6and *Kp* = 1.04

× 10−4 for the reaction 15-5-7, determine the value of *Kp* for the

reaction15-5-8 6 HI(*g*) + N2(*g*) at 700 K.

1. An aqueous solution of acetic acid is found to have the following equilibrium concentrations at 25 °C: [CH3COOH] = 1.65 × 10−2 *M*; [H+] = 5.44 × 10−4 *M*; and [CH3COO−] = 5.44 × 10−4 *M*. Calculate the equilibrium constant *Kc* for the ionization of acetic acid at 25 °C. The reaction is

15-8-3

1. Sulfur trioxide decomposes at high temperature in a sealed container:

15-9-5. Initially, the vessel is charged at 1000 K with SO3(*g*) at a partial pressure of 0.500 atm. At equilibrium the SO3 partial pressure is 0.200 atm. Calculate the value of *Kp* at 1000 K.

1. At 1000 K the value of *Kp* for the reaction 15-10-4 is 0.338. Calculate the value for *Qp,* And predict the direction in which the reaction proceeds toward equilibrium if the initial partial pressures are *P*SO3 = 0.16 atm; *P*SO2 = 0.41 atm; *P*O2 = 2.5 atm.
2. At 500 K the reaction 15-11-6has *Kp* = 0.497. In an equilibrium mixture at 500 K, the partial pressure of PCl5 is 0.860 atm and that of PCl3 is 0.350 atm. What is the partial pressure of Cl2 in the equilibrium mixture?
3. For the equilibrium 15-12-7, the equilibrium constant *Kp* is 0.497 at 500 K. A gas cylinder at 500 K is charged with PCl5(*g*) at an initial pressure of 1.66 atm. What are the equilibrium pressures of PCl5, PCl3, and Cl2 at this temperature?
4. Using the thermodynamic data in Appendix C, determine the enthalpy change for the reaction 15-14-2

Use this result to determine how the equilibrium constant for the reaction should change with temperature.

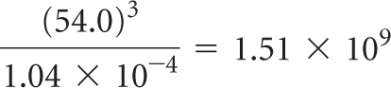
1. The value of Keq for the following reaction is 0.25:

SO2 (g) + NO2 (g)  SO3 (g) + NO (g)

Calculate the value of Keq at the same temperature for the reaction below:

2SO2 (g) + 2NO2 (g)  2SO3 (g) + 2NO (g)

***Answer:***

1. 2.82 × 10-1
2. 2.30 × 102
3. 
4. 1.79 × 10−5
5. 0.338
6. *Qp* = 16; *Qp* > *Kp,* and so the reaction will proceed from right to left, forming more SO3.
7. 1.22 atm
8. *P*PCl5 = 0.967 atm, *P*PCl3 = *P*Cl2 = 0.693 atm
9. Δ*H*° = 508.3 kJ; the equilibrium constant will increase with

increasing temperature

1. 0.0625