**Equilibrium - chapter 15**

1. For the reaction: 2SO3(g) ⇌ 2SO2(g) + O2(g)

 Write the equilibrium expression for Kc

2. Which of the following is true when the system A + B ⇌ C + D is at equilibrium,

a. the sum of the concentrations of A & B must equal the sum of the concentrations of C & D.

b. the forward reaction has stopped.

c. both the forward and the reverse reactions have stopped.

d. the reverse reaction has stopped.

e. neither the forward nor the reverse reaction has stopped.

3.Consider the equilibrium system: 2 ICl(s) ⇌ I2(s) + Cl2(g)

Which of the following changes will increase the amount of Cl2 produced?

a. adding some of the I2(s)

b. adding more ICl(s)

c. removing the ICl(s)

d. increasing the pressure of the container

e. all of the above

4.For a specific reaction, which of the following statements can be made about K, the equilibrium constant?

a. It increases if the concentration of one of the products is increased.

b. It changes with changes in the temperature.

c. It increases if the concentration of one of the reactants is increased.

d. It may be changed by the addition of a catalyst.

5. The reaction between sulfur dioxide and oxygen is:

2SO2(g) + O2(g) ⇌ 2SO3(g)

A mixture of SO2 and O2 is reacted until equilibrium is reached. The equilibrium cocentrations are found to be:

[SO3] = 5.0 × 10−2 M

[O2] = 3.5 × 10−3 M

[SO2] = 3.0 × 10−3 M

Calculate the equilibrium constant using molarities.

6. Which of the following is true for a chemical system at equilibrium?

a. the concentrations of reactant and products are equal

b. the rate constants for the forward and reverse reactions are equal

c. the time that a particular atom or molecule spends as a reactant and product are equal

d. the rate of the forward and reverse reaction is equal

7. If an equilibrium is established by initially adding 0.10 mol each of A and B to a 1L container (so their molarities will each be 1.0 M), then which of the following must be true once the mixture achieves equilibrium?

Equation: A + 2B ⇌ 2C K = 320

a. [A]eq = [B]eq

b. [A]eq = [B]eq = [C]eq

c. [B]eq = 2[C]eq

d. [A]eq > [B]eq

e. [A]eq < [B]eq

8a. Write the equilibrium expression (using molarities) for: HF ⇌ H+ + F-

b. Find final equilibrium concentrations for HF, H+, and F- for the same reaction

HF ⇌ H+ + F- Given Kc = 2.0 x 10-5

and the initial concentration of [HF]i = 0.60 M.

**Questions 9 & 10 refer the following reaction at equilibrium:**

 H2 (g) + Br2 (g) ⇌ 2 HBr (g) ΔH = - 104 kJ

**9. Which of the following changes will shift the position of equilibrium to favor more product formation?**

 a. decrease the total pressure by decreasing the volume b. add more HBr

c. remove Br2 d. decrease the temperature

**10. Which of the following changes would cause the equilibrium to shift to the left?**

a. decrease the container volume b. add some HBr

c. decrease the temperature d. add more H2