Chemistry 141 Name

Dr. Cary Willard

Quiz 12a (20 points) December 5, 2012

All work must be shown to receive credit. Give answer to correct number of significant figures.

1. (4 points) Write the appropriate equilibrium constant expression for each of the reactions below:
	1. 2 BrNO(g) ⮀ 2NO(g) + Br2(g)

 Kc = $\frac{\left[NO\right]^{2}\left[Br\_{2}\right]}{\left[BrNO\right]^{2}}$

* 1. 2 KClO3(s) ⮀ 2 KCl(s) + 3 O2(g)

 Kp = $\left(P\_{O\_{2}}\right)^{3}$

1. (6 points) Consider the reaction at equilibrium:

CO(g) + Cl2(g) ⮀ COCl2(g)

Predict whether the reaction will shift left, shift right, or remain unchanged after each disturbance:

* 1. COCl2 is added to the reaction mixture.

The reaction would shift to the left or in the reverse direction.

* 1. Cl2 is added to the reaction mixture.

The reaction would shift to the right or in the forward direction.

* 1. The volume of the container is reduced.

The reaction would favor the products because they contain fewer moles of gas. Therefor the reaction would shift to the right or in the forward direction.

1. (5 points) Consider the reaction:

SO2Cl2(g) ⮀ SO2(g) + Cl2(g)

A reaction mixture is made containing an initial [SO2Cl2] of 0.020 M. At equilibrium, [Cl2] = 1.2 x 10-2 M. Calculate the value of the equilibrium constant (Kc).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SO2Cl2(g)  | ⮀ | SO2(g)  | + | Cl2(g) |
| I | 0.020 M |  | 0 M |  | * 0 M
 |
| Δ | –x |  | + x |  | + x |
| E | 0.020 –x = 0.020 M –0.012 M = 0.008 M |  | x = 1.2 x 10-2 M |  | x = 1.2 x 10-2 M |

$$K\_{c}=\frac{\left[SO\_{2}\right]\left[Cl\_{2}\right]}{\left[SO\_{2}Cl\_{2}\right]}=\frac{\left(0.012 M\right)\left(0.012 M\right)}{\left(0.008M\right)}=0.018 M or 0.02 M$$

1. (5 points) Consider the reaction:

2 H2S(g) ⮀ 2 H2(g) + S2(g) with Kp = 2.4 x 10-4 atm at 1073 K

A reaction mixture contains 0.112 atm of H2, 0.055 atm of S2, and 0.445 atm of H2S. Is the reaction mixture at equilibrium? If not, in what direction will the reaction proceed?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2 H2S(g)  | ⮀ | 2 H2(g) | + | S2(g)  |
| 0.445 atm |  | 0.112 atm |  | 0.055 atm |

$$Q\_{p}=\frac{\left[H\_{2}\right]^{2}\left[S\_{2}\right]}{\left[H\_{2}S\right]^{2}}=\frac{\left(0.112 atm\right)^{2}\left(0.055 atm\right)}{\left(0.445 atm\right)^{2}}=0.00348 atm$$

Kp = 0.00024 atm and is smaller than the value of Q so the reaction will proceed in the reverse direction to reach equilibrium.