Chapter 9 - Lecture Worksheet 2

The equilibrium constant, K_c, for the reaction:

$CO_2(g)$ <----> $CO(g)$ + 1/2 $O_2(g)$ is 6.7×10^{-12} at 1000 K.

1. Calculate K_c for the reaction: **2 $CO(g)$ + $O_2(g)$ <----> 2 $CO_2(g)$**

1. 6.7×10^{-12}
2. 1.3×10^{-11}
3. 2.5×10^{-6}
4. 3.9×10^{5}
5. 1.5×10^{11}
6. 3.0×10^{11}
7. 2.2×10^{22}

2. This reaction is: 1. Reactant favored 2. Product favored at equilibrium.

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3. Consider the nitrogen dioxide equilibrium: 2 **$NO_2(g)$ <------> $N_2O_4(g)$**

Write the equilibrium constant for this reaction in terms of the equilibrium constants, **Ka** and **Kb**, for reactions **a** and **b** below:

a.) **$N_2(g)$ + 2 $O_2(g)$ <----> $N_2O_4(g)$** ..... **Ka**

b.) **1/2 $N_2(g)$ + O_2 (g) <----> $NO_2(g)$** ..... **Kb**

1. $K = K_A K_B$
2. $K = (K_A/K_B)$
3. $K = 2 (K_A/K_B)$
4. $K = 2(K_B/K_A)$
5. $K = (K_A/K_B)^2$
6. $K = K_A /(K_B)^2$
7. $K = (K_B/K_A)^{1/2}$
8. $K = (1/2)(K_A/K_B)^{1/2}$
9. $K = (1/2)(K_A)/(K_B)^2$

4. The formation of ammonia is an extremely important reaction worldwide for the production of fertilizers and explosives. At 25^0C the equilibrium constant, **Kc, is 3.5 x 10^8**.

$N_2(g) + 3H_2(g)$ <------> $2NH_3(g)$

A. If for the NH_3 reaction above at 25^oC, the **reaction quotient is equal to 3.5**, we can say that:

1. More $NH_3(g)$ must form in order to reach equilibrium.
2. More $N_2(g)$ must form in order to reach equilibrium.
3. More $H_2(g)$ must form in order to reach equilibrium.
4. The reaction is at equilibrium.
5. Cannot tell from the information given.

In another experiment the reaction has run for a while and the concentrations are found to be:

Nitrogen **$7x10^{-2}$ M** Hydrogen **$9x10^{-3}$ M** Ammonia **$2x10^{-4}$ M**

B. In order to reach equilibrium the reaction must:

1. Run in the forward direction.
2. Run in the reverse direction
3. The reaction is at equilibrium

C. Why ?

1. Q > K
2. Q = K
3. Q < K

How does ΔG relate to ΔG^0 and Q ?

How does ΔG^0 relate to K ?

What does ΔG tell us about a chemical reaction ?

What does ΔG^0 tell us about a chemical reaction ?