5)
Consider the following equilibrium, for which K_p = 1.4e+83 at 25°C.

$$2\ H_2(g) + O_2(g) \rightleftharpoons 2\ H_2O(l)$$

(a) What is the value of K_p for the reaction $2\ H_2O(l) \rightleftharpoons 2\ H_2(g) + O_2(g)$?

(b) What is the value of K_p for the reaction $H_2(g) + 1/2\ O_2(g) \rightleftharpoons H_2O(l)$?

(c) What is the value of K_c for the reaction $2\ H_2(g) + O_2(g) \rightleftharpoons 2\ H_2O(l)$?

9)

A flask is charged with 1.500 atm of $N_2O_4(g)$ and 1.00 atm $NO_2(g)$ at 25°C. The equilibrium reaction is given in the equation below.

$$N_2O_4(g) \rightleftharpoons 2\ NO_2(g)$$

After equilibrium is reached, the partial pressure of NO_2 is 0.512 atm.
(a) What is the equilibrium partial pressure of N_2O_4?
atm
(b) Calculate the value of K_p for the reaction.

(c) Is there sufficient information to calculate K_c for the reaction?

- Yes, because the partial pressures of all the reactants and products are specified.
- Yes, because the temperature is specified.
- No, because the value of K_c can be determined experimentally only.

If so, evaluate K_c.

13)
(a) At 800 K the equilibrium constant for $I_2(g) \rightleftharpoons 2\ I(g)$ is $K_c = 3.1 \times 10^{-5}$. If an equilibrium mixture in a 10.0 L vessel contains 2.77×10^{-2} g of $I(g)$, how many grams of I_2 are in the mixture?

g
(b) For $2\ SO_2(g) + O_2(g) \rightleftharpoons 2\ SO_3(g)$, $K_p = 3.0 \times 10^4$ at 700 K. In a 2.00 L vessel, the equilibrium mixture contains 1.65 g of SO_3 and 0.138 g of O_2. How many grams of SO_2 are in the vessel?

g

14)

For the equilibrium below at 400 K, K_c = 7.0.

$$Br_2(g) + Cl_2(g) \rightleftharpoons 2\ BrCl(g)$$

If 0.80 mol of Br_2 and 0.80 mol Cl_2 are introduced into a 1.0 L container at 400. K, what will be the equilibrium concentration of BrCl?

M

16)

Consider the following reaction.

$$NH_4HS(s) \rightleftharpoons NH_3(g) + H_2S(g)$$

At 22°C the equilibrium constant K_{eq} = 0.070 for this reaction.

(a) If $NH_4HS(s)$ is placed in a vessel and decomposes at 22°C, what are the equilibrium partial pressures of NH_3 and H_2S?

P_{NH3} = [ ] atm

P_{H2S} = [ ] atm

(b) If the vessel has a volume of 21 L , what is the minimum mass of $NH_4HS(s)$ needed in order for equilibrium to be achieved?

[ ] g

21)

A mixture of CH_4 and H_2O is passed over a nickel catalyst at 1000 K. The emerging gas is collected in a 5.00 L flask and is found to contain 8.62 g of CO, 2.60 g of H_2, 43.0 g of CH_4, and 48.4 g of H_2O. Assuming that equilibrium has been reached, calculate K_c for the reaction.

$$CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3\ H_2(g)$$

[ ]

25)

At 1200 K, the approximate temperature of automobile exhaust gases (Figure 15.17), K_p for the following reaction is about 1×10^{-4}.

$$2\ CO_2(g) \rightleftharpoons 2\ CO(g) + O_2(g)$$

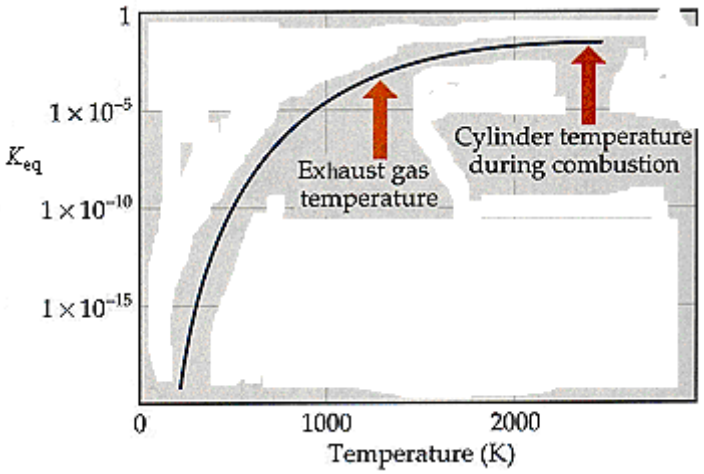

Figure 15.17.

Assuming that the exhaust gas (total pressure 1 atm) contains 0.1 percent CO by volume, 19 percent CO_2, and 4 percent O_2, is the system at equilibrium with respect to the above reaction?

- The system will shift to the left to attain equilibrium.
- The system will shift to the right to attain equilibrium.

Give the value of the reaction quotient Q.

Based on your conclusion, would the CO concentration in the exhaust be lowered or increased by a catalyst that speeds up the reaction above?

- The CO concentration will be raised in the exhaust.
- The CO concentration will be lowered in the exhaust.
- There will be no change to the CO concentration in the exhaust.