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}.

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

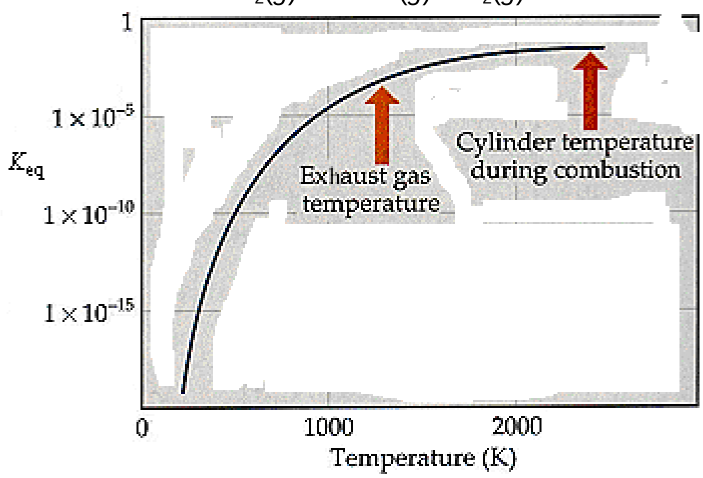

Figure 15.17.

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.