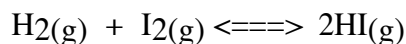


EQUILIBRIUM PROBLEMS II

Once the value of the equilibrium constant is known, the equilibrium constant expression can be used to calculate concentrations of reactants or products at equilibrium.

EXAMPLE:

Given the reaction:



Suppose a system in equilibrium at 25°C is found to contain 0.81 mol/L $\text{H}_2(\text{g})$ and 0.035 mol/L $\text{I}_2(\text{g})$. The value of K_{eq} for this reaction is 7.1×10^2 found in a table of equilibrium constants. What must be the concentration of $\text{HI}(\text{g})$ for this system?

SOLUTION:

The expression for K_{eq} is:

$$K_{\text{eq}} = \frac{[\text{HI}]^2}{[\text{H}_2][\text{I}_2]}$$

Solving for $[\text{HI}]$ gives:

$$[\text{HI}] = \sqrt{K_{\text{eq}}[\text{H}_2][\text{I}_2]}$$

Substituting the values gives:

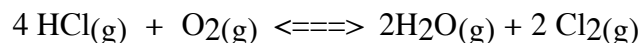
$$[\text{HI}] = \sqrt{7.1 \times 10^2 [0.81][0.035]}$$

Solving gives:

$$[\text{HI}] = 4.49$$

STUDENT PRACTICE

1. An equilibrium mixture at a specific temperature is found to consist of 1.2×10^{-3} mol/L HCl , 3.8×10^{-4} mol/L O_2 , 5.8×10^{-2} mol/L H_2O , and 5.8×10^{-2} mol/L Cl_2 according to the following reaction:



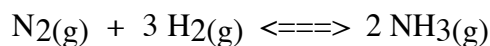
Determine the value of the equilibrium constant for this reaction.

2. At 450°C the value of the equilibrium constant for the following system is 6.59×10^{-3} . If

$$[\text{NH}_3] = 1.23 \times 10^{-4} \text{ mol/L}$$

$$[\text{H}_2] = 2.75 \times 10^{-6} \text{ mol/L}$$

at equilibrium, determine the concentration of N_2 at that point. The reaction is:



CHEMISTRY

EQUILIBRIUM PROBLEMS II

Ans:

1. 1.4×10^{10}

2. 1.10×10^{11} mol/L