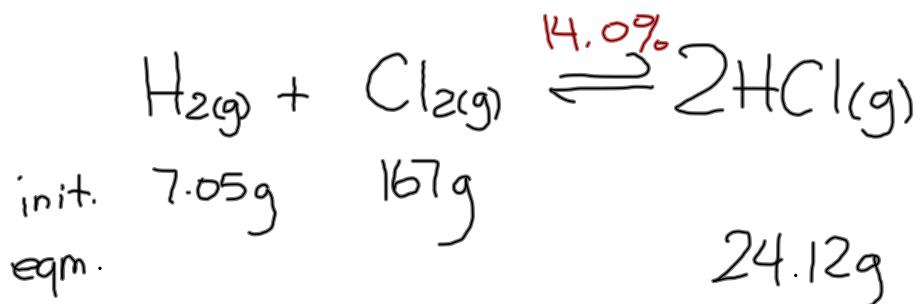


Unit 4 - Equilibrium

- What is an equilibrium?
- Rate of reaction
 - Transition state, Activation energy
- Factors affecting Reaction Rate
- Percent Reaction / Percent Yield
- Equilibrium Law
- Le Chatelier's Principle

7.05 g of hydrogen reacts with 167 g of chlorine to produce 24.12 g of hydrogen chloride at equilibrium. Determine the percent reaction and write the equilibrium expression.



If H₂ is L.R.

$$7.05\text{g H}_2 \times \frac{1\text{ mol H}_2}{2.02\text{g H}_2} \times \frac{2\text{ mol HCl}}{1\text{ mol H}_2} \times \frac{36.46\text{g HCl}}{1\text{ mol HCl}} = 254.50\text{g HCl}$$

If Cl₂ is L.R.

$$167\text{g Cl}_2 \times \frac{1\text{ mol Cl}_2}{70.90\text{g Cl}_2} \times \frac{2\text{ mol HCl}}{1\text{ mol Cl}_2} \times \frac{36.46\text{g HCl}}{1\text{ mol HCl}} = 171.76\text{g HCl}$$

∴ Cl₂ is L.R.

$$\% \text{ rxn} = \frac{\text{exp.}}{\text{theor.}} \times 100\%$$

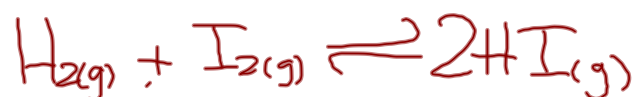
$$= \frac{24.12\text{g}}{171.76\text{g}} \times 100\%$$

$$= 14.0\%$$

$$\boxed{= 14.0\%}$$

Equilibrium Law

A mixture of H_2 and I_2 is allowed to react at 448°C . When the equilibrium is established the concentrations of the participants are found to be $[\text{H}_2] = 0.46 \text{ mol/L}$, $[\text{I}_2] = 0.39 \text{ mol/L}$, and $[\text{HI}] = 3.0 \text{ mol/L}$. Calculate the value of K at 448°C from these data.



$$K = \frac{[\text{HI}_{(g)}]^2}{[\text{H}_{2(g)}][\text{I}_{2(g)}]}$$

Le Chatelier's Principle



⇒ remove $\text{SO}_{3(g)}$ 

⇒ heat system 

⇒ decrease volume (increase pressure) 