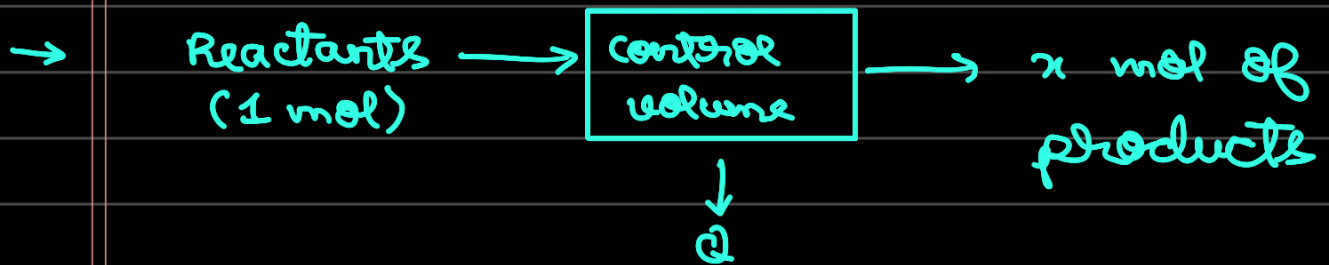


### Day-3



$$Q_{\text{react}} = H_P - H_R$$

$H_P$  = Total enthalpy of products  
 $H_R$  = " " " reactants

If we define P, T at STP (1 atm, 298 K)  
 $Q_{\text{react}}$  → standard enthalpy of react.

$$\begin{aligned} \rightarrow H_P - H_R &= [-877236 - (-74831)] \text{ kJ kmol}^{-1} \\ &= -802405 \text{ kJ kmol}^{-1} \\ &= \frac{-802405}{16} \text{ kJ/kg} \\ &= -50150.3125 \text{ kJ/kg} \end{aligned}$$

→ HHV : water in liq.  
LHV : water in gas.

→ Bomb calorimeter:

$$Q_{\text{react}} = (m_{\text{steel}} C_{\text{steel}} + m_w C_w) \Delta T$$

Here, volume is constant

$$U_P - U_R = Q_{\text{react}, V}$$

$$\Rightarrow \text{HHV} = Q_{\text{react}, V} - \frac{(\sum N_{iP} - \sum N_{iR}) R_u T_0}{N_{\text{fuel}} M_{\text{fuel}}}$$

$$(\because H_P - H_R = U_P + P_P V - (U_R + P_R V))$$

$$\downarrow$$

$$Q_{\text{reac}} = U_P - U_R + (N_P - N_R) R_u T_0$$

$$= U_P - U_R + (\Delta N) R_u T_0$$

→ 1 mol  $H_2$  (+  $O_2$  molecules), measures HHV = 282 kJ. Find error in HHV



$$\Delta N = 0 - (1 + \frac{1}{2}) = -\frac{3}{2}$$

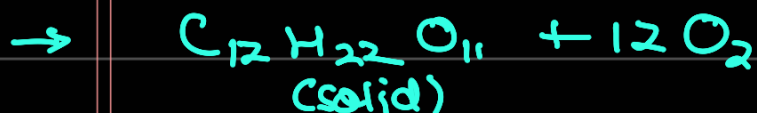
$$\therefore \text{Error} = -\frac{3}{2} \times 8.314 \times 298 \text{ J}$$

$$= -3716.358 \text{ J}$$

$$\approx -3.716 \text{ kJ}$$

$$\% \text{ error} = \frac{3.716}{282} \times 100 \%$$

$$\approx 1.32 \%$$



$$\Delta n = 12 - 12 = 0$$

$$\text{Error} = 0$$

☆ Bomb calorimeter gives HHV only.  $H_2O$  is taken as liquid.