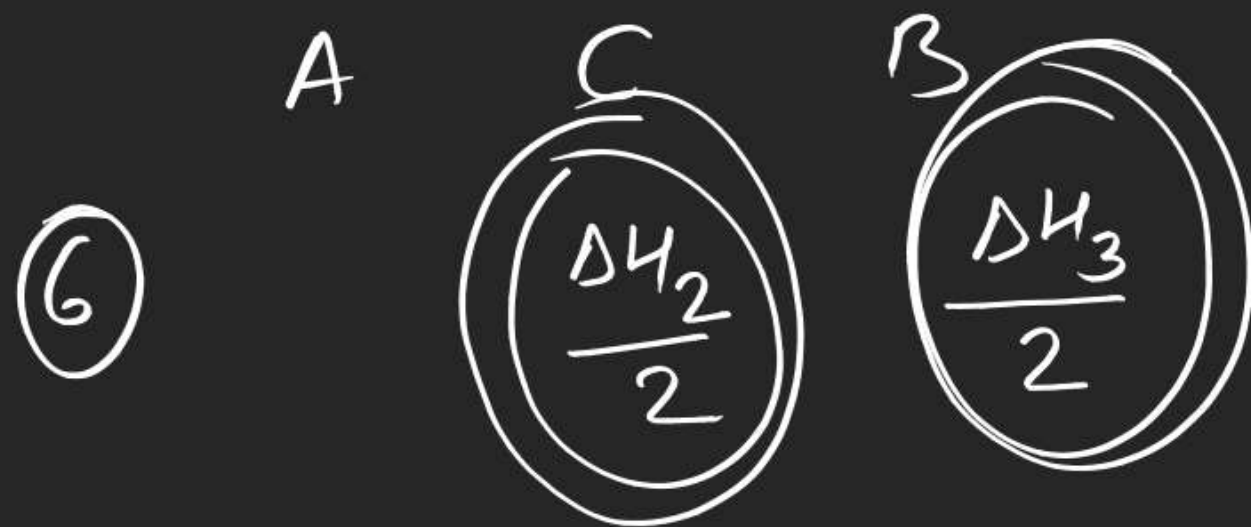


## THERMOCHEMISTRY



$$-\Delta H_1 = \Delta H_f + \frac{3}{2} \frac{\Delta H_3}{2} - \frac{\Delta H_2}{2}$$

S-I

$$\Delta H_f [CO_2(g)] = -393$$

Rxn D

$$-282 = \Delta H_r = -393 - \Delta H_f [CO(g)]$$

(A)

$$492 = 3 \times \Delta H_f (CO) - \Delta H_f (Fe_2O_3)$$

(3)

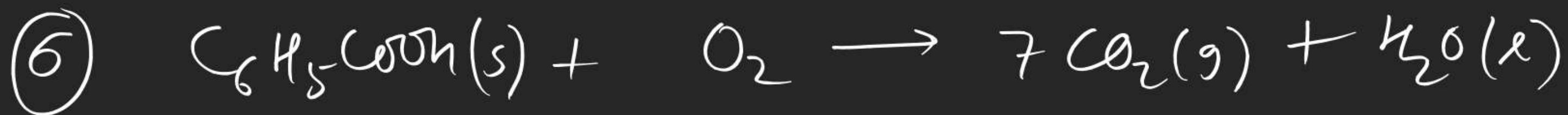


$$\Delta H_r = \cancel{(-1108)} - \cancel{(-393)} - 2\cancel{(-293)}$$

$$= -393 + 2(-293) - (-1108)$$



1 mol Sulphur  $\equiv$  1 mole Sulphur atom



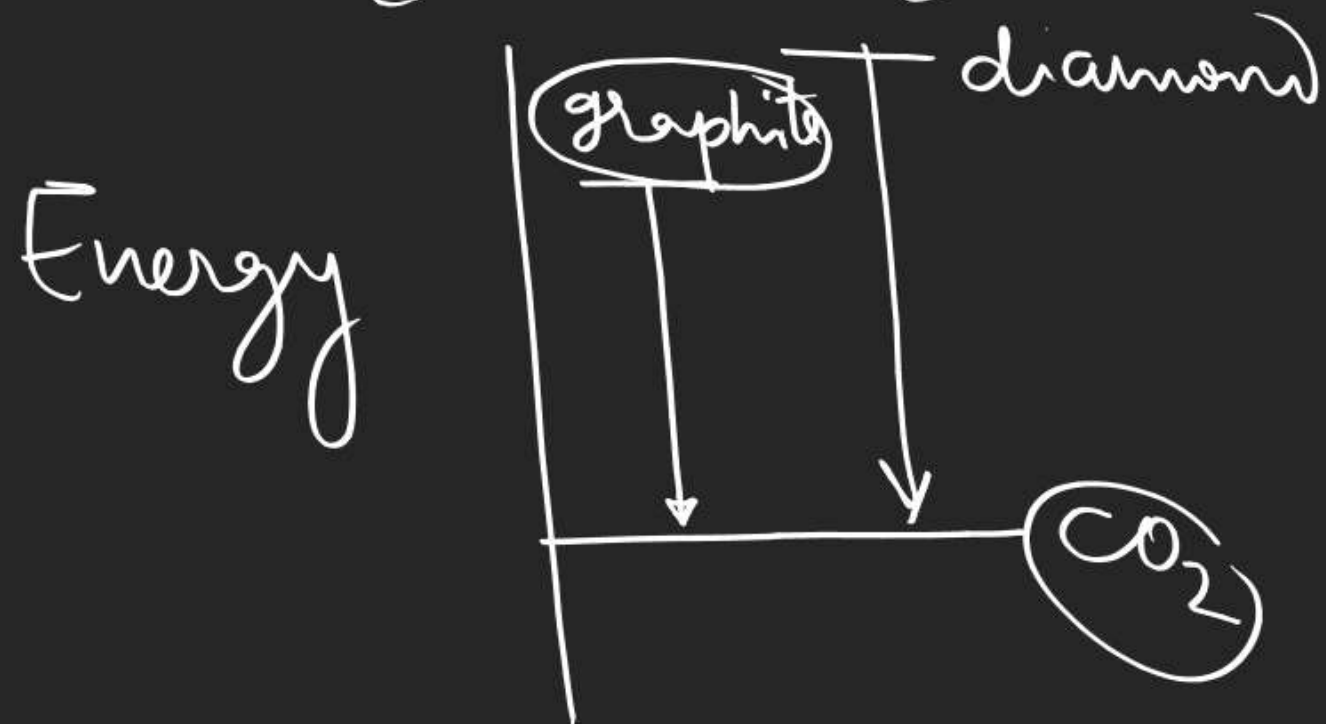
$$\Delta H = \Delta H_f(P) - \Delta H_f(R)$$

**THERMOCHEMISTRY**

①① To compare energy of isomers and allotropes :-

$$\Delta H_{\text{comb}}[\text{C}(\text{graphite})] = -\underline{393} \text{ kJ/mol}$$

$$\Delta H_{\text{comb}}[\text{C}(\text{diamond})] = -395 \text{ kJ/mol}$$



Substance with less magnitude of  $\Delta H_{\text{comb}}$  will be more stable.



**THERMOCHEMISTRY**

(III) To compare calorific value

It is equal to the heat evolved  
by the combustion of 1 gm substance.

$$\underline{\text{C.V.}} = - \frac{\Delta H_{\text{comb}}}{M}$$

[C.V of hydrogen is highest among all the  
conventional fuels]

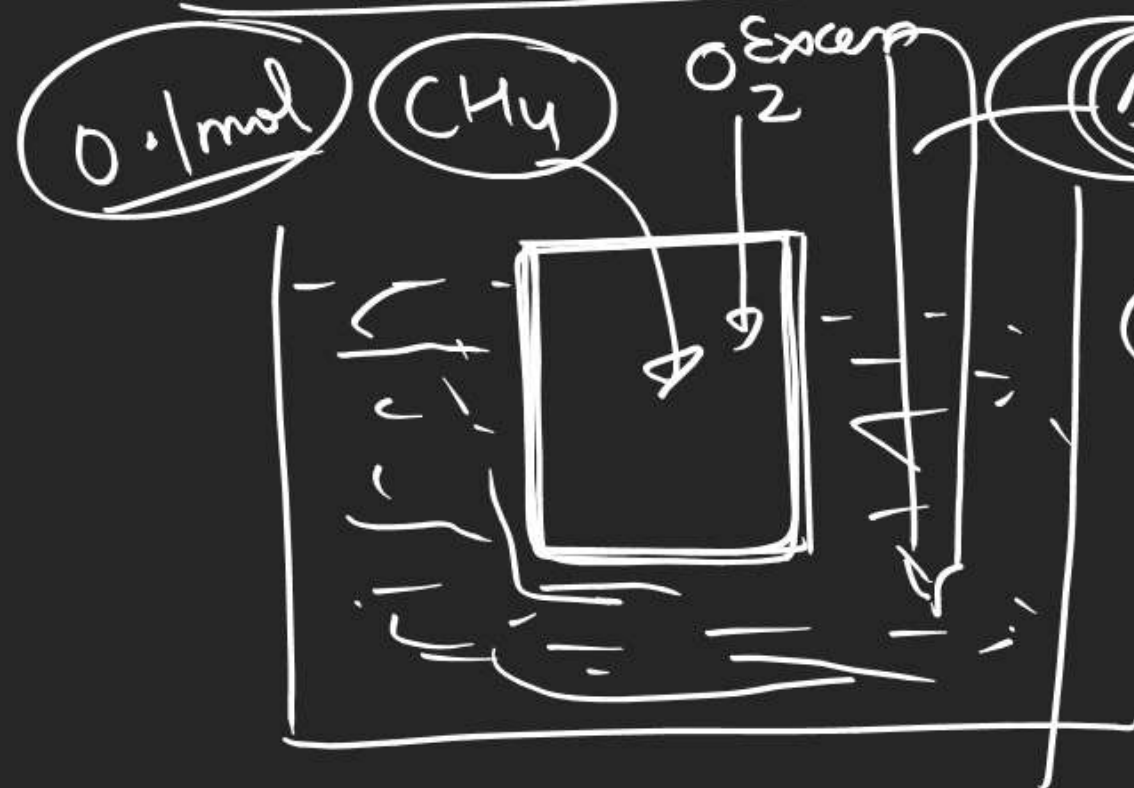
Among H.C.



As  $\nearrow$  H  $\uparrow$  C.V  $\uparrow$  es

# THERMOCHEMISTRY

Exp determination of  $\Delta H_{\text{comb}}$  by Bomb calorimeter



Step-I

$$|Q| = \underbrace{[(ms)_{\text{H}_2\text{O}} + (ms)_{\text{cont}}]}_{\text{heat capacity of syst}} \Delta T$$

Step-II

$$|Q_m| = \frac{|Q|}{n}$$

Step-III

$$\Delta U = -|Q_m|$$

Step-IV

$$\underline{\Delta H = \Delta U + \Delta n_g RT}$$

$\downarrow$   
 $\text{ms} / \Delta T$

$\text{nc} / \Delta T$   
 $\uparrow$

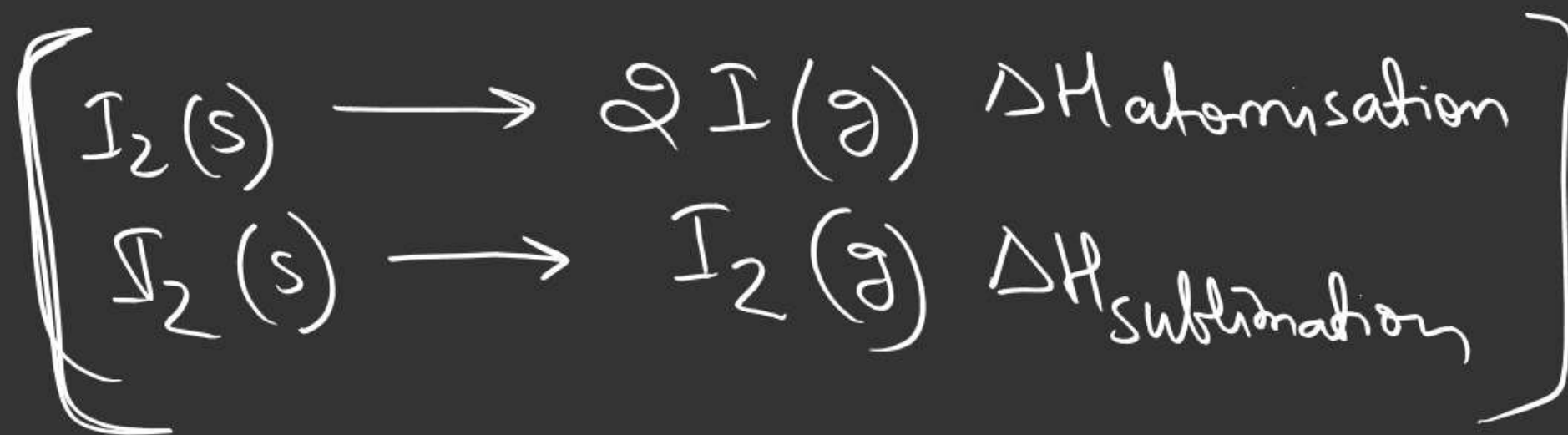


Enthalpy of Sublimation : It is the enthalpy change when 1 mol substance is converted from solid to gas.



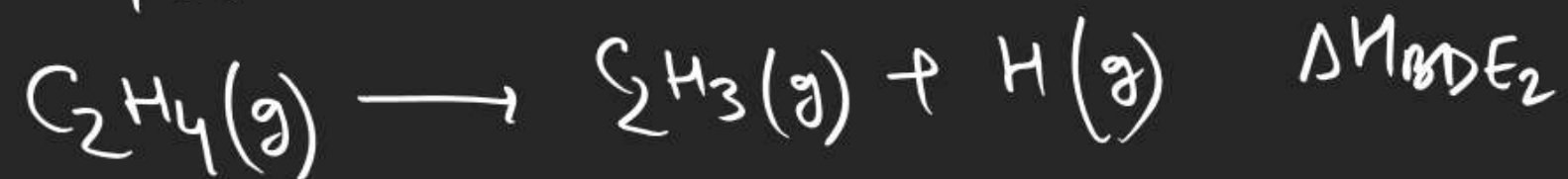
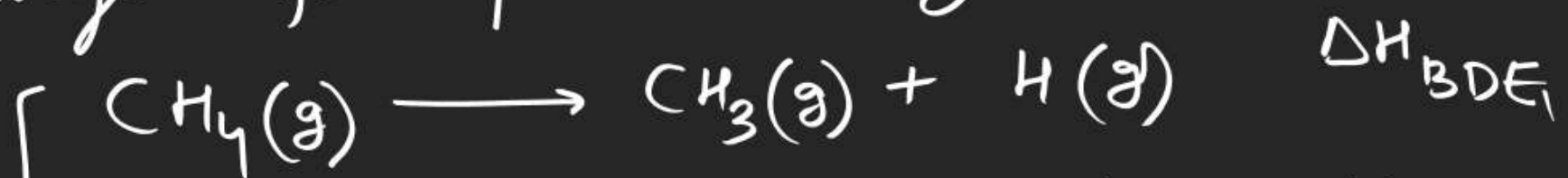
$$\left[ \Delta H_{\text{sub}} = \Delta H_{\text{fusion}} + \Delta H_{\text{vap}} \right]$$

Enthalpy of atomisation :  $\rightarrow$  It is the enthalpy change when 1 mol substance is converted into its constituent gaseous atoms.



# Bond dissociation enthalpy & Bond enthalpy: →

It is the enthalpy change when 1 mol of a particular bond present in gaseous compound undergoes homolytic cleavage to form products in gaseous state.



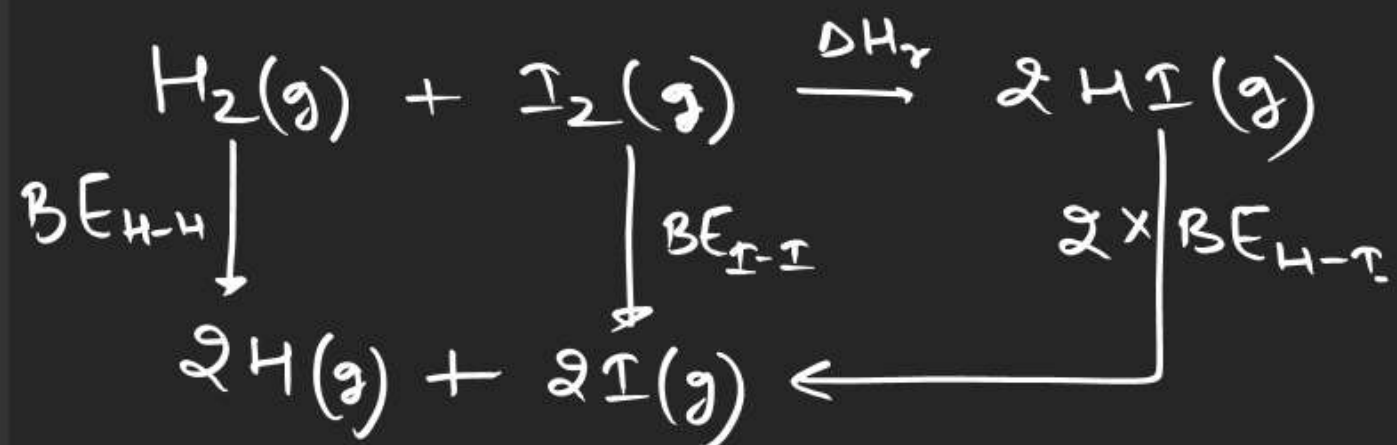
$$= \frac{\text{BDE}_1 + \text{BDE}_2 + \dots + \text{BDE}_N}{N}$$

Bond Enthalpy is average of all BDE of a particular bond

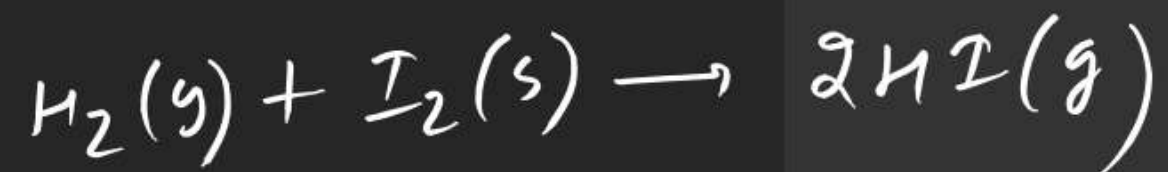
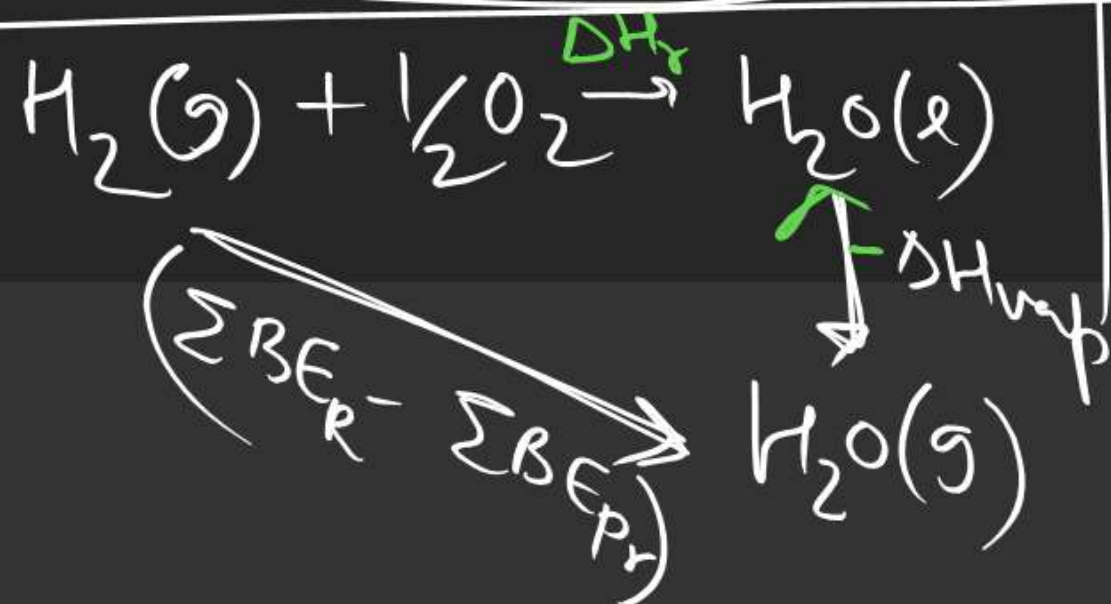
Bond Enthalpy



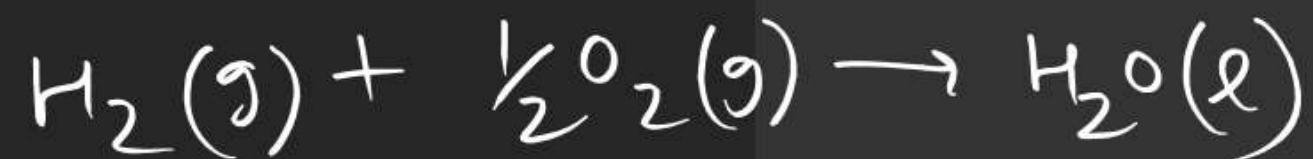
## THERMOCHEMISTRY



$$\begin{aligned}
 \Delta H_r &= \text{BE}_{\text{H-H}} + \text{BE}_{\text{I-I}} - 2 \text{BE}_{\text{H-I}} \\
 &= \underline{\underline{\sum \text{BE}(\text{R}) - \sum \text{BE}(\text{Pr})}}
 \end{aligned}$$



$$\Delta H_r = \Delta H_{\text{sub}} + \sum \text{BE}(\text{R}) - \sum \text{BE}(\text{Pr})$$



$$= \sum \text{BE}(\text{R}) - \sum \text{BE}(\text{Pr}) - \Delta H_{\text{vap}}$$

## THERMOCHEMISTRY

(2)

$$\Delta S = \underbrace{n C_v \ln \frac{T_2}{T_1}}_{\text{+ive}} + \underbrace{n R \ln \frac{V_2}{V_1}}_{\text{+ive}}$$

+ive

0

-ive





$$\Delta G^\circ = -RT \ln K_p$$

$$K_p = \text{vap } p^\circ \text{ of Hg}(l) = P_{\text{ext}}$$

(7)

Adiabatic

 $T \downarrow$  $V \uparrow$ 

(14)

$$(\Delta G_{sys})_{T,P} = 0$$

(c)

 $\Delta G^\circ$