* Enthalpy of Combustion

The enthalpy change (ΔH) accompanying complete combustion of one mole of the substance at 298 K & 1 atm pressure, is called enthalpy of combustion.

for examples :-

(1) Combustion of Methane :

$$CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l)$$

$$\Delta H^\circ_{comb} = -890.3 \text{ KJ mol}^{-1}.$$

(2) Combustion of Hydrogen :

$$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(l)$$

$$\Delta H^\circ_{comb} = -285.29 \text{ KJ mol}^{-1}.$$

* Enthalpy of Neutralisation :-

The enthalpy change when one mole of an acid such as HCl, H_2SO_4, HNO_3 etc is neutralised by one mole of a base such as NaOH, KOH etc in dilute sols at 25°C and 1 atm pressure, is called enthalpy of Neutralisation.

for example

(1) The neutralisation of HCl by NaOH in dilute sols is shown as.

$$H^+ + Cl^- + Na^+ + OH^- \longrightarrow Na^+ + Cl^- + H_2O(l)$$

or

$$H^+ + OH^- \longrightarrow H_2O(l)$$

$$\Delta H^\circ_{neu} = -57.32 \text{ KJ mol}^{-1}.$$

(2) The neutralisation of Acetic acid with NaOH is shown as –

$$CH_3COO^- + H^+ + Na^+ + OH^- \rightleftharpoons CH_3COO^- + Na^+ + H_2O(l)$$

or $$H^+ + OH^- \rightarrow H_2O(l)$$

$$\Delta H^\circ_{neu} = -55.23\ KJ\ mol^{-1}.$$

(3) The neutralisation of HCl and NH_4OH is shown as –

$$H^+ + Cl^- + NH_4^+ + OH^- \rightarrow NH_4^+ + Cl^- + H_2O(l)$$

or $$H^+ + OH^- \rightarrow H_2O(l)$$

$$\Delta H^\circ_{neu} = -51.34\ KJ\ mol^{-1}.$$

*. **Enthalpy of Ionisation :-**

The minimum amount of energy required to remove the most loosely bound electron from an isolated gaseous atom to form gaseous cation is called its ionisation enthalpy.

for example –

(1) $Li(g) \rightarrow Li^+(g) + 1e^-$
(2,1) (2)

$$\Delta H^\circ_{ion} = 520\ KJ\ mol^{-1}.$$

(2) $Be(g) \rightarrow Be^+(g) + 1e^-$
(2,2) (2,1)

$$\Delta H^\circ_{ion} = 899\ KJ\ mol^{-1}.$$

called first Ionisation enthalpy

$Be^+(g) \rightarrow Be^{++}(g) + 1e^-$
(2,1) (2,0)

$$\Delta H^\circ_{ion2} = 1757\ KJ\ mol^{-1}.$$

Called 2nd Ionisation enthalpy.

After removal of one electron in 'Be', a cation (Be^+) is formed. This cation has one electron less than it protons. Thus its effective nuclear charge (Z_{eff}) is increased. Electrons are attracted towards its nucleus by greater force. It becomes difficult to remove its electron from its cation (Be^+). Therefore, ionisation energy (enthalpy) required to remove another electron from (Be^+) is much higher.

* **Factors on which ionisation enthalpy depends:-**

It depends upon following factors:—

1. Size of the atom
2. Magnitude of nuclear charge
3. Screening or shielding effect
4. Penitrating effect.
5. Electronic configuration