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Class ⇒ B.Sc. Part II Subsidiary
Subject ⇒ Chemistry
Chapter ⇒ 2 Group A
Thermochemistry
Topic ⇒ Heat in chemical reaction

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Thermochemistry

Thermochemistry is the branch of chemistry which deals with the thermal or heat changes caused by chemical reactions.

Enthalpy

The enthalpy of a system is defined as the sum of the internal energy and the products of its pressure and volume.

$$H = E + PV$$

where E = Internal energy
P = Pressure of the system
V = volume of the system.

It is also called Heat content.

Enthalpy is also a function of the state. However, a change in enthalpy (ΔH) accompanying a process can be measured accurately and is given by the expression

$$\Delta H = H_{product} - H_{reactants}$$

or $\Delta H = H_p - H_r$

Exothermic Reactions

Reactions that give out heat, i.e. which are accompanied by evolution of heat are called exothermic reactions.

In such reactions,

$$H_p < H_r$$

So, that ΔH is negative.

e.g. Rusting iron, Burning sugar, formation of snow in clouds, condensation of rain from water vapour.

Endothermic Reactions

Reactions that take heat, i.e. which are accompanied by absorption of heat are called endothermic reactions.

In such reactions,

$$H_p > H_r$$

So, that ΔH is positive.

e.g. Baking bread, conversion of frost to water vapour, evaporation of water, melting ice cubes, producing sugar by photosynthesis.

Sign of ΔH and ΔE

A negative sign of ΔH or ΔE shows that heat is evolved and the reaction is exothermic.

A positive sign of ΔH or ΔE indicates that heat energy is absorbed and the reaction is endothermic.

Heat of Reaction OR Enthalpy of Reaction

The heat of reaction is simply the amount of heat absorbed or evolved in the reaction.

The amount of heat absorbed or evolved in a reaction when the number of moles of reactants as represented by the balance chemical equation change completely into the products are called **Heat of Reaction**.

e.g. $CO + \frac{1}{2}O_2 \rightarrow CO_2 \quad \Delta H = -284.5\ kJ$

This means that 284.5 kJ of heat is evolved during the reaction and is the heat of reaction.

Standard Enthalpy Change. The heat change accompanying a reaction taking place at 298 K and one atmospheric pressure is called the standard heat change or standard enthalpy change. It is denoted by ΔH°.