
CBSE Class 12 Chemistry
Important Questions
Chapter 6
Thermodynamics

3 Marks Questions

1. Give the relationship between ΔU and ΔH for gases.

Ans. For gases the volume change is appreciable.

let V_A be the total volume of gaseous reactants, and

V_B be the total volume of gaseous product.

n_A be the number of moles of the reactant and

n_B be the number of moles of the product,

Then at constant pressure and temperature,

$$p V_A = n_A RT$$

$$p V_B = n_B RT$$

$$\text{or } p V_B - p V_A = (n_B - n_A) RT$$

$$\text{or } p \Delta V = (\Delta n)_g RT$$

where $(\Delta n)_g = n_B - n_A$ and is equal to the difference between the number of moles of gaseous products and gaseous reactants.

Substituting the value of $p \Delta V$ we get.

$$\Delta H = \Delta U + (\Delta n)_g RT$$

∴ $\Delta H = q_p$ (heat change under constant pressure)

$\Delta U = q_v$ (heat change under constant volume)

∴ for gaseous system.

$$q_p = q_v + (\Delta n)_{\xi} RT$$

2. It has been found that 221.4J is needed to heat 30g of ethanol from 15⁰C to 18⁰C. calculate (a) specific heat capacity, and (b) molar heat capacity of ethanol.

Ans.(a) Specific heat capacity

$$\frac{\text{Heat absorbed by the substance}}{\text{Mass of the substance} \times \text{Rise in temp.}}$$

$$C = \frac{221.4 \text{ J}}{30 \text{ g} (18^{\circ} \text{C} - 15^{\circ} \text{C})} = \frac{221.4}{30 \times 3} \text{ J g}^{-1} \text{ }^{\circ} \text{C}^{-1}$$
$$= \underline{\underline{2.46 \text{ J g}^{-1} \text{ }^{\circ} \text{C}^{-1}}}$$

Since 1⁰C is equal to 1k, the specific heat capacity of ethanol = 2.46Jg⁻¹ °C⁻¹.

(b) Molar heat capacity, $C_m = \text{specific heat} \times \text{molar mass}$.

Therefore, C_m (ethanol) = 2.46 x 46

$$= 113.2 \text{ J mol}^{-1} \text{ }^{\circ} \text{C}^{-1}$$

The molar heat capacity of ethanol is 113.2 J mol⁻¹ °C⁻¹.
