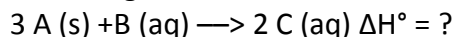


Answer on Question #49936, Chemistry, Inorganic Chemistry

Question 1:

A compound A reacts according to the following hypothetical equation and has a molecular weight of 48.36 g/mol.

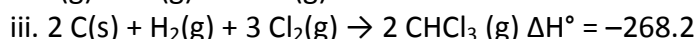
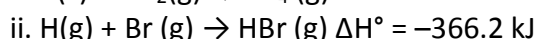
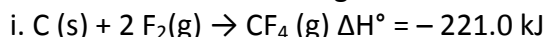


A sample of **A**, weighing 0.152 g reacts in a flask containing 250.00 g of water and the water temperature increases from 24.85 °C to a temperature of 26.26 °C. Calculate ΔH° for the reaction as written in the equation.

Answer: -1408 kJ

Question 2:

For which of the following reactions is $\Delta H^\circ = \Delta H^\circ_f$, the heat of formation?



Could you also explain exactly what Delta H means.

Solution:

Delta H (ΔH) is defined as the amount of heat evolved or absorbed in the reacting species.

Question 1:

Heating of water:

The amount of heat spent on heating of water (**Q**) equal to the amount of heat that was allocated in the chemical reaction (**ΔH**):

$$\Delta H = Q = c_{\text{H}_2\text{O}} \times m_{\text{H}_2\text{O}} \times (T_2 - T_1)$$

$c_{\text{H}_2\text{O}}$ is a constant $4.187 \times 10^3 \text{ J/(kg}\cdot\text{K)}$. So:

$$\Delta H = 4.187 \times 10^3 \times 0.25 \times (299.41 - 298) = 1.476 \times 10^3 = 1.476 \text{ kJ}$$

$$v = \frac{\Delta H}{\Delta H^\circ}$$

$$\Delta H^\circ = \frac{\Delta H}{v}$$

$$v = \frac{v_a}{3} = \frac{m_a}{M_r \times 3}$$

$$\Delta H^\circ = \frac{\Delta H \times M_r \times 3}{m_a} = \frac{1.476 \times 48.36 \times 3}{0.152} = 1408 \text{ kJ/mol}$$

$$\Delta H^\circ = \sum \Delta H_f^\circ (\text{products}) - \sum \Delta H_f^\circ (\text{reagents})$$

ΔH_f° is the standard enthalpy of formation or standard heat of formation of a compound is the change of enthalpy from the formation of 1 mole of the compound from its constituent elements, with all substances in their standard states at 1 atmosphere (1 atm or 101.3 kPa).

If the heat is produced, enthalpy change (ΔH°) would be negative ($\Delta H^\circ < 0$)

Answer:

-1408 kJ

Question 2:

The standard enthalpy of formation or standard heat of formation of a compound is the change of enthalpy from the formation of 1 mole of the compound from its constituent elements, with all substances in their standard states at 1 atmosphere (1 atm or 101.3 kPa).

Standard states are as follows:

- For a gas: the standard state is a pressure of exactly 1 atm
- For a solute present in an ideal solution: a concentration of exactly 1 M at a pressure of 1 atm

- For a pure substance or a solvent in a condensed state (a liquid or a solid): the standard state is the pure liquid or solid under a pressure of 1 atm

For the reaction **iii**, it's not the heat of formation because it's not formed one mole of a substance, and chloroform (CHCl_3) under normal conditions is a liquid but not a gas.

For the reaction **ii**, it's not the heat of formation because all substances aren't in their standard states at 1 atmosphere; should be H_2 and Br_2 .

For the reaction **i**, it's the heat of formation, all conditions are satisfied!

Answer:

