2024 Higher Chemistry Paper 2 – Q2

Section: Chemistry in Society
Topic: Chemical Analysis (Air Bags and Sodium Azide)

Question summary (Q2):
Airbags in cars use sodium azide (NaN_3) which decomposes into sodium and nitrogen gas.
(a) (i) State the name for the minimum kinetic energy required for a reaction.
(a) (ii) Calculate the energy released when 80 g of sodium azide decomposes ($\Delta H = -42.6$ kJ mol^{-1}, GFM = 65.0 g).
(a) (iii) State the charge on the azide group ion.

Worked Solution:
(a) (i) The minimum kinetic energy required for a reaction = activation energy.

(a) (ii) • Moles of NaN_3 = mass ÷ GFM = 80 ÷ 65.0 = 1.23 mol.
• Energy released = moles × ΔH = 1.23 × (−42.6) = −52.4 kJ.
• Negative sign indicates energy is released (exothermic).

(a) (iii) The azide ion is N_3^-, so the charge is −1.

Final Answer:
(a) (i) Activation energy
(a) (ii) −52.4 kJ
(a) (iii) −1

Revision Tips:
• Activation energy = minimum energy needed for a successful collision.
• Always check units when calculating enthalpy change (convert grams → moles).
• Negative ΔH values indicate exothermic reactions.
• Common ions to memorise: hydroxide (OH^-), carbonate

(CO_3^{2-}), nitrate (NO_3^{-}), azide (N_3^{-}).