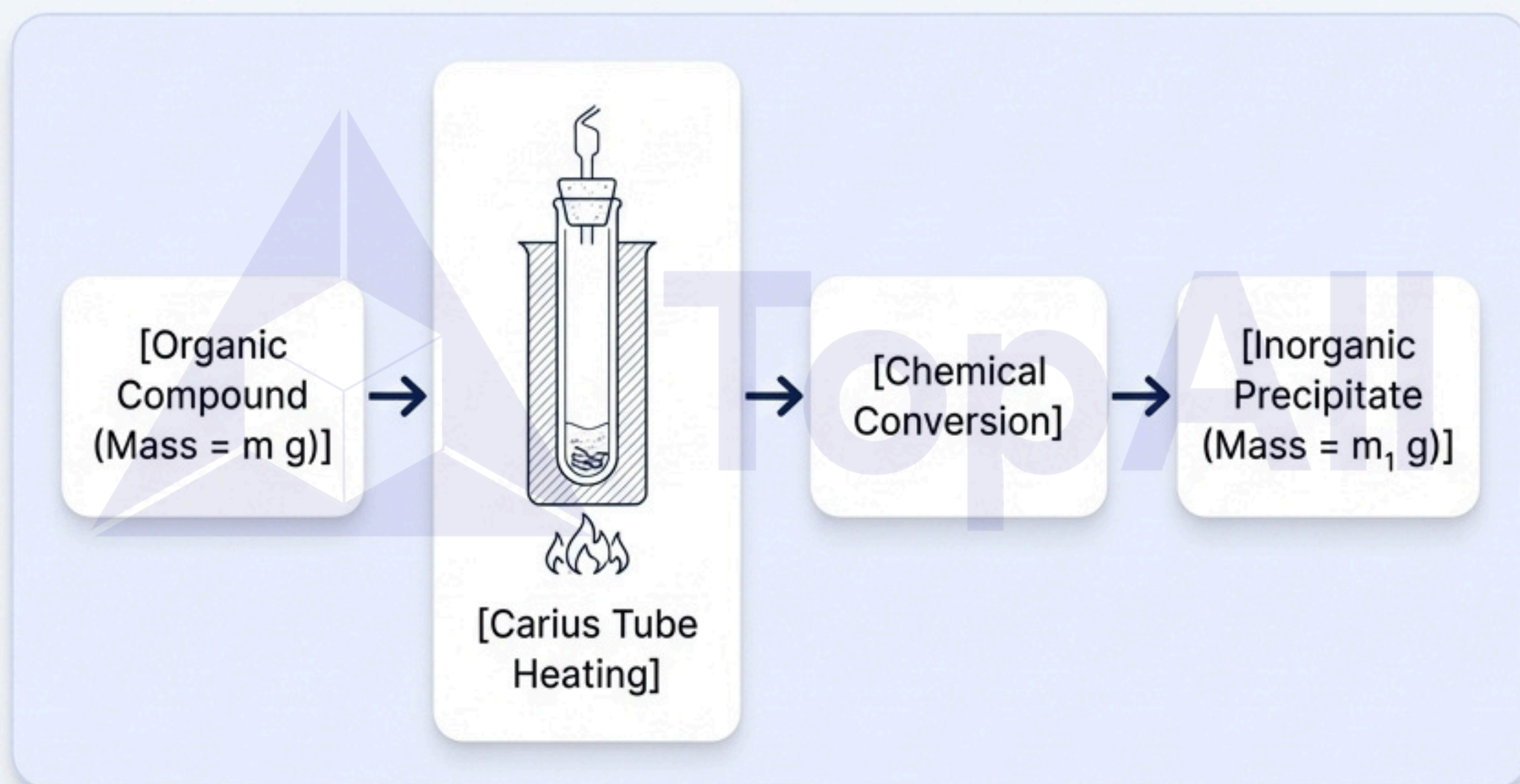


8.10.4 Quantitative Estimation of Sulphur

HIGH WEIGHTAGE

The foundational principle of estimating Sulphur in an organic compound involves converting it into a weighable inorganic precipitate via heating in a Carius tube.

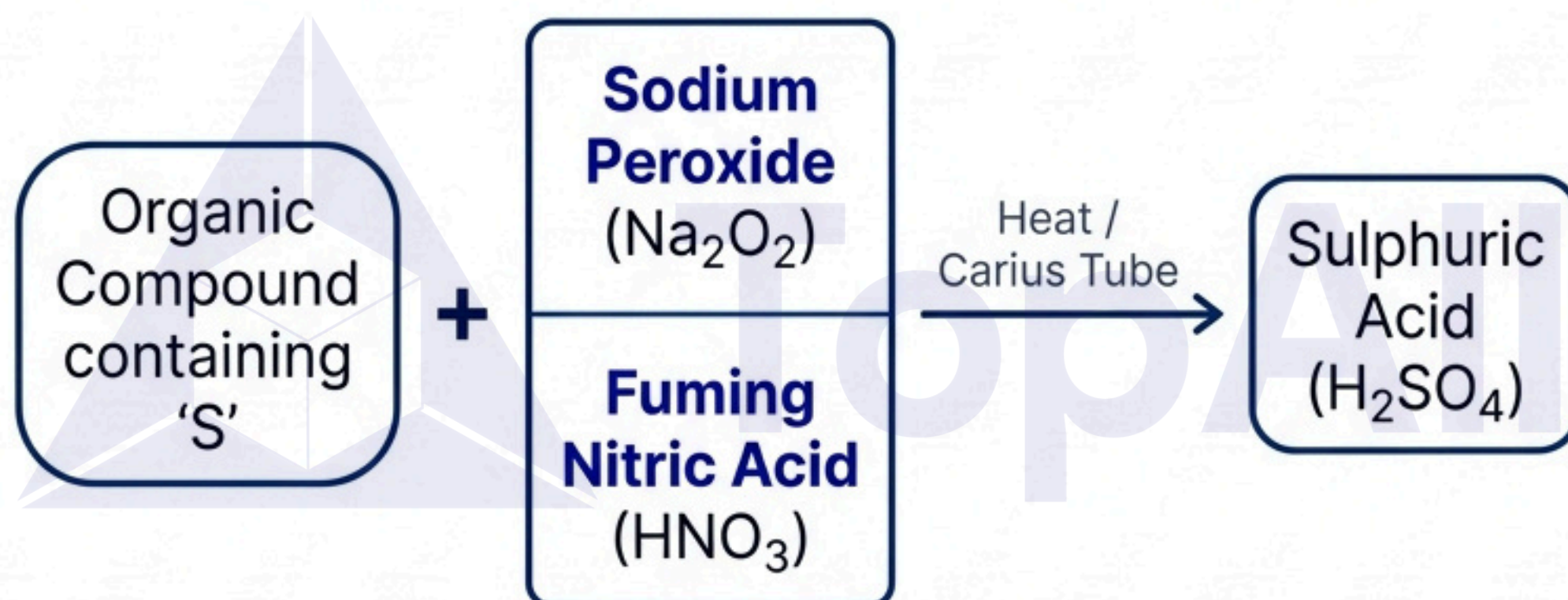


Caution: Do not confuse this with the Dumas or Kjeldahl methods. The Carius tube is specifically used for Halogens and Sulphur.

Takeaway: This is a classic method of gravimetric analysis—estimating an element by weighing a stable, precipitated compound.

Step 1: Oxidation of Sulphur

The organic compound must be heated vigorously with strong oxidising agents to strip the Sulphur from the carbon backbone.



Trap: Exam questions often test the specific reagents. Regular nitric acid is not enough; it must be fuming nitric acid or sodium peroxide.

Takeaway: 100% of the organic sulphur is quantitatively oxidized into the sulphate ion (SO_4^{2-}).



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$$E=mc^2$$



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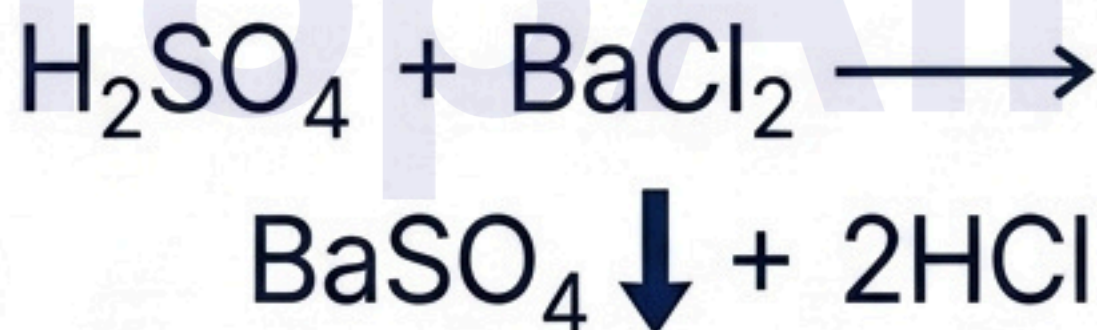
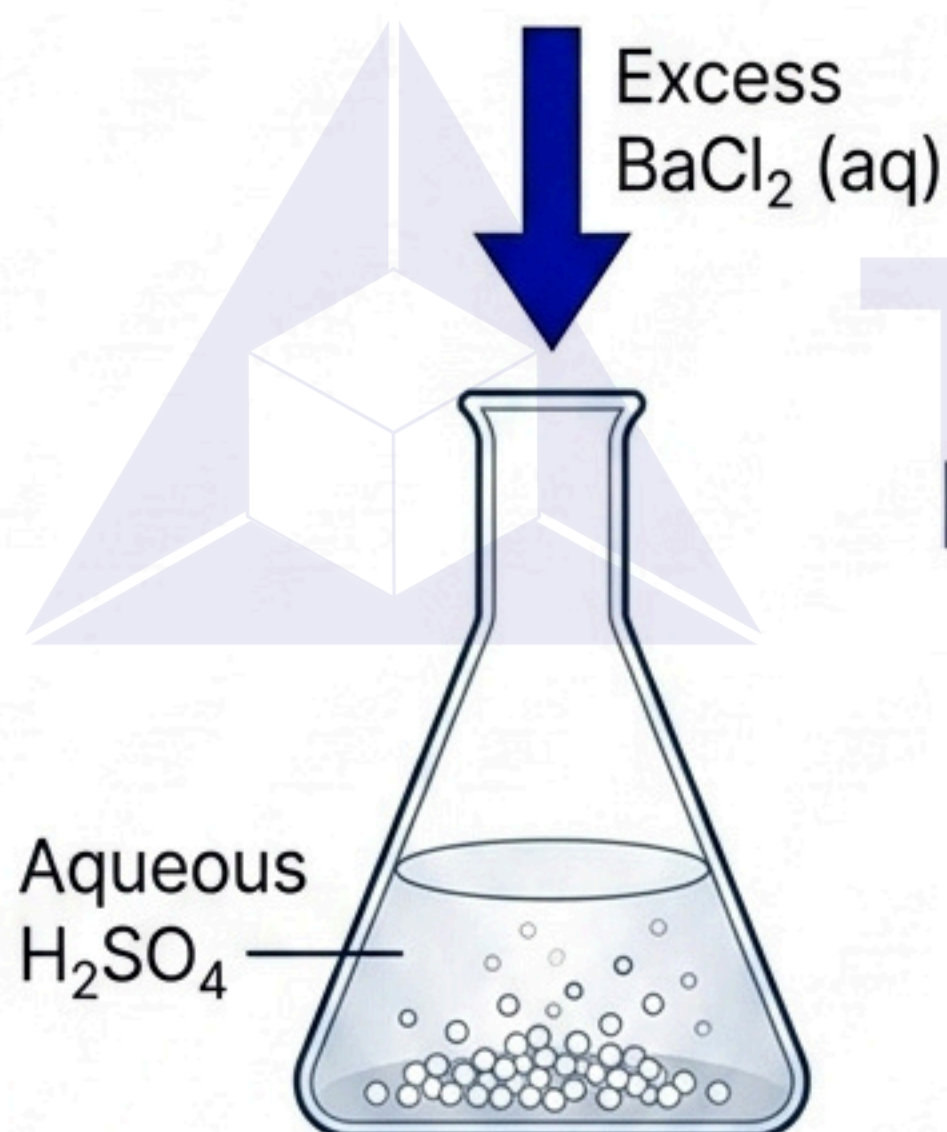
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Step 2: Addition of Barium Chloride

The newly formed Sulphuric Acid cannot be weighed directly. It must be precipitated out of the aqueous solution.



Takeaway: The addition of excess aqueous Barium Chloride ensures that all sulphate ions are driven into the Barium Sulphate precipitate.

Step 3: Isolation of Precipitate

Obtaining the exact mass of the pure inorganic precipitate.



Trap: Failing to account for the 'dry' step in theoretical questions. Any residual moisture in the BaSO_4 will artificially inflate m_1 , leading to an incorrect, higher % of Sulphur.

Takeaway: The final recorded mass (m_1 g) represents pure, dry Barium Sulphate.

Mathematical Derivation: Percentage of Sulphur

Stoichiometric conversion of the mass of Barium Sulphate into the mass of elemental Sulphur.

Molar Fact: 1 mol of $\text{BaSO}_4 = 233 \text{ g}$

Composition: 233 g of BaSO_4 contains exactly 32 g of Sulphur.

Unitary Method: Therefore, m_1 g of BaSO_4 contains $(32 \times \frac{m_1}{233})$ g of Sulphur.

$$\% \text{ S} = \frac{32}{233} \times \frac{m_1}{m} \times 100$$

Where m = mass of organic compound, m_1 = mass of BaSO_4

Takeaway: Always check if the question provides the mass of the precipitate in mg or g. Keep units consistent!

Quick Revision: Sulphur Estimation Master-Sheet

A final, scannable summary matrix for rapid exam recall.

Target Element	Sulphur (S)
Apparatus	Carius Tube
Oxidising Reagents	Na_2O_2 OR Fuming HNO_3
Precipitating Reagent	Aqueous BaCl_2
Weighed Product	Barium Sulphate (BaSO_4)
Stoichiometric Ratio	32 / 233

Takeaway: Screenshot or save this slide. This matrix contains every factual data point tested on this specific topic in JEE Main.



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