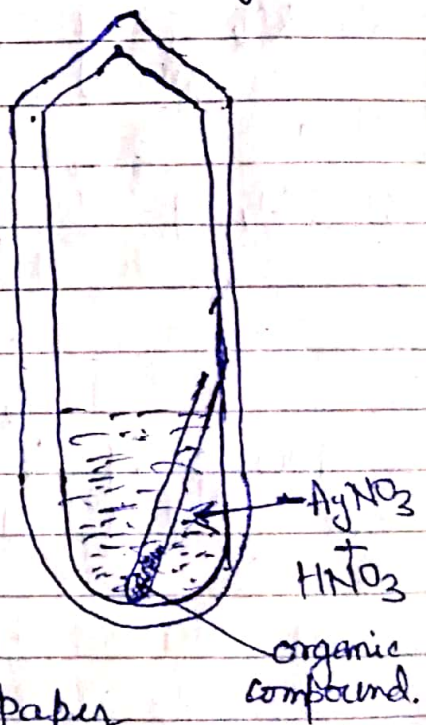
B.Sc. chemistry (H), Part-I, Paper-I(C)

Topic:→ Estimation of halogens in Organic Compound by Carius method:-

A known weight of the organic compound is taken in a capillary tube. It is then carefully introduced along the side into the carius tube keeping the open end of the capillary tube above the contents of the carius tube. The carius tube is 20-25 cm long and it has 2-2.5 cm diameter made of hard glass known as bomb tube also.

About 5ml. fuming HNO_3 & 0.5g of $AgNO_3$ crystals are taken in carius tube. The opend end of the carius tube is drawn out and sealed as shown in figure.



The carius tube is wrapped in asbestos paper and put in Bomb furnace at about 300°C for 5-6 hours. It is taken out and cooled and then the sealed end is heated with Bunsen flame to soft the glass. The pressure of gases inside the carius tube enables them to create hole in the soft glass from which they escape slowly. Then sealed end is cut and contents are dissolved in water. The precipitate is filtered, washed, dried and ignited and then weighed till constant weight.

Let wt. of organic compound = W_1 g

wt. of Ag-halide ppt = W_2 g.

(i) Cl ⟶ AgCl

in organic compound (35.5 g) ; 108 + 35.5 = 143.5 g

∵ 143.5 g of AgCl contains 35.5 g of Cl

∴ W_2 g of AgCl contains $\frac{35.5}{143.5} \times W_2$ g of Cl.

Now

∵ W_1 g of the organic compound contains $\frac{35.5 \times W_2}{143.5}$ g of Cl

∴ 100 g of the organic compound contains $\frac{355 \times W_2 \times 100}{143.5 \times W_1}$ g of Cl

% of Cl in the organic compound $= \frac{35.5 \times 100\, W_2}{143.5\, W_1}$ %

(ii) Br ⟶ AgBr

in organic compound (80 g) ; 108 + 80 = 188 g.

∵ 188 g of AgBr contains 80 g of Br

∴ W_2 g of AgBr contains $\frac{80}{188} W_2$ g Br.

Now,

Since W_1 g of the organic compound Contains $\frac{80W_2}{188}$ g of Br

$\therefore$ 100 g of the organic compound contains

$$\frac{80W_2}{188} \times \frac{100}{W_1} \text{ g of Br}$$

$\therefore$ % of Br in the organic compound

$$\text{in } \frac{80 \times 100 \times W_2}{188 \times W_1} \%$$

(iii) $I \longrightarrow AgI$

In organic compound (127g)

$108 + 127 = 235$ g.

$\therefore$ 235 g of AgI Contains 127 g of I

$\therefore$ W_2 g of AgI Contains $\frac{127}{235} W_2$ g of I

$\therefore$ W_1 g of organic Compound Contains $\frac{127 W_2}{235}$ g of I

$\therefore$ 100 g of organic compound contains $\frac{127 \times W_2}{235} \times \frac{100}{W_1}$ g of I

In general :- % of the element in the organic compound $= \frac{\text{At. wt of the element}}{\text{Mol. wt of the ppt}} \times \frac{100 W_2}{W_1} \%$

where W_1 and W_2 are the weights of the organic Compound and the precipitate respectively.