PHYSICS WALLAH

Qualitative Analysis of Organic Compound

01 Detection of C & H

O. C. + CuO $\xrightarrow{\Delta}$ C + 2CuO → 2Cu + CO_2
2H + CuO → Cu + H_2O

→ $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 \downarrow + H_2O$
White turbidity

→ $CuSO_4 + 5H_2O \rightarrow CuSO_4 . 5H_2O$
Blue

02 Detection of N, S,P & X

O.C. $\xrightarrow[\text{boil with distilled water}]{\text{Fuse with sodium}}$ Sodium fusion extract (Lassaigne extract)

$Na + X \rightarrow NaX$
$2Na + S \rightarrow Na_2S$
$Na + C + N \rightarrow NaCN$
$Na + C + N + S \rightarrow NaSCN$

2a Detection of Halogen:-

Lassaigne extract + $AgNO_3 \rightarrow$ ppt

$Ag^+ + Cl^- \rightarrow AgCl$
(While ppt soluble in NH_4OH.)

$Ag^+ + Br^- \rightarrow AgBr$
(Light yellow ppt sparingly soluble in NH_4OH.)

$Ag^+ + I^- \rightarrow AgI$
(yellow ppt-insoluble in NH_4OH)

2b Detection of Nitrogen

→ Lassaigne extract + $FeSO_4$ (Freshly prepared) +drops of conc. H_2SO_4 gives blue color

→ $FeSO_4$ + conc. $H_2SO_4 \rightarrow Fe_2(SO_4)_3$

$Na + C + N \rightarrow NaCN$

$6CN^- + Fe^{2+} \rightarrow [Fe(CN)_6]^{4-}$

$3[Fe(CN_6)]^{4-} + 4Fe^{3+} \rightarrow Fe_4[Fe(CN)_6]_3$
[Iron (III) hexacyanoferrate (II)]
Prussian blue

2c Detection of Sulphur

→ Lassaigne extract + Sodium nitroprusside gives violet color

$S^{-2} + [Fe(CN)_5 NO]^{-2} \rightarrow [Fe(CN)_5 NOS]^{-4}$
violet

If both N & S are present: $Na + C + N + S \rightarrow NaSCN$

→ Lassaigne extract + ferric chloride gives blood red color

$SCN^- + Fe^{3+} \rightarrow [Fe(SCN)]^{2+}$

2d Detection of Phosphorous

O.C. + Na_2O_2 gives H_3PO_4 which gives yellow ppt with ammonium molybdate

$H_3PO_4 + 12(NH_4)_2.MoO_4 + 21HNO_3 \longrightarrow$
Ammonium molybdate

$(NH_4)_3PO_4 . 12MoO_3 + 21NH_4NO_3 + 12H_2O$
Ammonium phospho - molybdate (yellow) (APM)

Quantitative Analysis

01 Liebig's method

$$\% \text{ of carbon} = \frac{12}{44} \times \frac{M_{co_2}}{M_{oc}} \times 100$$

Carbon ⇒ CO_2 (12) → 44 Hydrogen ⇒ H_2O (2) → 18

$$\% \text{ of hydrogen} = \frac{2}{18} \times \frac{M_{H_2O}}{M_{oc}} \times 100$$

02 Estimation of Nitrogen

(2a) Duma's method

$$\frac{P_1V_1}{T_1} = \frac{760 \times V_{STP}}{273} \qquad \%(N) = \frac{V_{STP}}{22400} \times \frac{28}{m_{oc}} \times 100$$

Volume of nitrogen collected = V_1 mL ,Temperature = T_1 K

p_1= Atmospheric pressure – Aqueous tension

(2b) Kjeldahl method

$O.C + H_2SO_4 \xrightarrow{\Delta} (NH_4)_2SO_4 \xrightarrow{NaOH, \Delta} NH_3$

$2NH_4 + H_2SO_4 \longrightarrow (NH_4)_2SO_4$

$$\% \text{ of } N = \frac{1.4 \times N \times V_{ml}}{M_{oc}}$$

Kjeldahl' s method is not used for
- Nitro
- Azo compounds 

03 Estimation of X, S, P

Carius method

$$\% X = \frac{M_x \times W_{AgX} \times 100}{M_{Ag} \times W_{OC}} \qquad \% S = \frac{32 \times w_{BaSO_4} \times 100}{233 \times W_{OC}}$$

$$\% P = \frac{31 \times w_{APM} \times 100}{1877 \times W_{OC}} \qquad \% P = \frac{62 \times w_{Mg_2P_2O_7} \times 100}{222 \times W_{OC}}$$

Q. During estimation of nitrogen present in an organic compound by Kjeldahl's method, the ammonia evolved from 0.5 g of the compound in Kjeldahl's estimation of nitrogen neutralized 10 mL of 1M H_2SO_4. The percentage of nitrogen in the compound is :

(a) 56% (c) 50%
(b) 45% (d) 40%

Q. On complete combustion, 0.246 g of an O.C gave 0.198 g of carbon dioxide & 0.1014 g of water. Determine % composition of carbon & hydrogen in the compound.

(a) 4.58,21.95 (c) 45.8, 21.95
(b) 21.95,4.58 (d) 2.195,45.8

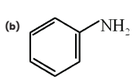
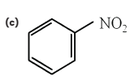
Q. In Dumas' method for estimation of nitrogen, 0.3g of an organic compound gave 50mL of nitrogen collected at 300 K temperature and 715 mm pressure. Calculate the percentage composition of nitrogen in the compound. (Aqueous tension at 300 K=15 mm)

(a) 17.5% (c) 6.25%
(b) 28% (d) 31%

Q. In Carius method of estimation of halogen, 0.15 g of an organic compound gave 0.12 g of AgBr. What is the percentage of bromine in the compound?

(a) 68.08% (c) 42.1%
(b) 45% (d) 50%

Q. Which of the following compounds will be suitable for Kjeldahl's method for nitrogen estimation?

(a)  (b)  (c)  (d)