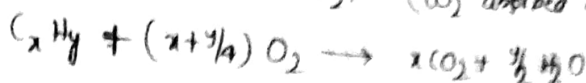


# Quantitative Analysis

⇒ for C & H (Liebig's method)

Org comp. strongly heated with dry  $\text{CuO}$ , (C & H presence of  $\text{CO}_2$  &  $\text{H}_2\text{O}$ ) and passed through anhyd.  $\text{CaCl}_2$ . ( $\text{CO}_2$  absorbed by  $\text{KOH}$ ).



$$\%C = \frac{12}{44} \times \frac{\text{mass of CO}_2}{\text{mass of org. comp.}} \times 100$$

$$\%H = \frac{2}{18} \times \frac{\text{mass of H}_2\text{O}}{\text{mass of org. sub.}} \times 100$$

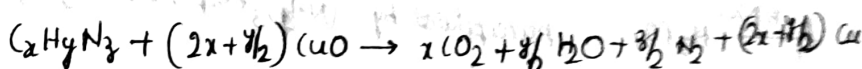
→ Others like N are also removed by bright copper gauge ( $\text{NO}$ ,  $\text{N}_2\text{O}$  are absorbed by  $\text{NaOH}$ )

⇒ for N

→ By Duma's method — better than Kjeldahl's method

i) Nitrogenous compound heated strongly with  $\text{CuO}$  in atm of  $\text{CO}_2$  & mix. passed over a cell of heated bright Cu gauge.

ii)  $\text{H}_2$  collected over  $\text{KOH}$  (all other gases are absorbed)



$$\%N = \frac{28 \times \text{vol. of N}_2 \text{ at S.T.P.} \times 100}{22400 \times \text{wt. of O.C.}}$$

$$= \frac{\text{mass of N}_2}{\text{mass of O.C.}} \times 100$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad P_1 = 1 \text{ atm}, V_1 = ?$$

$$T_2 = 273 \text{ K}$$

→ By Kjeldahl's method

i) Nitrogen containing compound heated with con.  $\text{H}_2\text{SO}_4$ , then heated with excess of  $\text{NaOH}$ , liberated  $\text{NH}_3$  absorbed in excess of  $\text{H}_2\text{SO}_4$ .

$$\%N = \frac{1.4 \times N \times V}{\text{mass of O.C.}} \times 100$$

N = normality of acid, V = vol. of acid

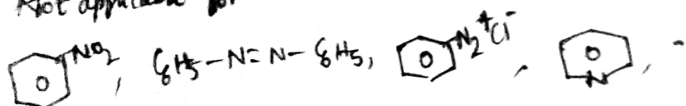
$$N_a V_a = N_b V_b$$

→ Not applicable for (N-O) compounds like nitro, nitroso, azo & N present ring as pyridine

If exact  $\text{H}_2\text{SO}_4$  required  $\%N = \frac{1.4 \times N_a V_a}{\text{wt. of O.C.}} \times 100$

If excess  $\text{H}_2\text{SO}_4$  required  $\%N = \frac{1.4 \times (N_a V_a - N_b V_b)}{\text{wt. of O.C.}} \times 100$

Not applicable for



## % Halogen (Carius method)

Sample heated with fuming  $\text{HNO}_3$  in presence of  $\text{AgNO}_3$  contained in Carius tube, forms  $\text{AgX}$ .

$\text{Ag} - 108, \text{Cl} - 35.5, \text{Br} - 80, \text{I} - 127$

$$\% \text{Cl} = \frac{35.5}{193.5} \times \frac{\text{wt. of AgCl}}{\text{wt. of O.C}} \times 100$$

$$\% \text{Br} = \frac{80}{188} \times \frac{\text{wt. of AgBr}}{\text{wt. of O.C}} \times 100$$

$$\% \text{I} = \frac{127}{235} \times \frac{\text{wt. of AgI}}{\text{wt. of O.C}} \times 100$$

## % Sulphur

Sample heated in Carius tube with  $\text{Na}_2\text{O}_2$  & fuming  $\text{HNO}_3$ .

$\text{Ba} - 137, \text{S} - 32, \text{O} - 16$

$$\% \text{S} = \frac{32}{233} \times \frac{\text{wt. of BaSO}_4}{\text{wt. of O.C}} \times 100$$

## % Phosphorus

$\text{P} \xrightarrow{\text{HNO}_3} \text{H}_3\text{PO}_4$  precipitated by  $(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3$  by adding  $\text{NH}_3$

to  $\text{Mg NH}_4\text{PO}_4$  by adding  $\text{Mg}_2\text{P}_2\text{O}_7$ .

$$\% \text{P} = \frac{31}{187.7} \times \frac{\text{wt. of ammonium phosphomolybdate}}{\text{wt. of O.C}} \times 100$$

$$\% \text{P} = \frac{62}{222} \times \frac{\text{man of Mg}_2\text{P}_2\text{O}_7}{\text{man of O.C}} \times 100$$

## % Oxygen

gaseous product of  $\text{O}_2$  converted into  $\text{CO}_2$ .

Mix. passed through  $\text{I}_2\text{O}_5$  &  $\text{CO} \xrightarrow{\text{O}_2} \text{CO}_2$

$$\% \text{O} = \frac{32}{44} \times \frac{\text{man of CO}_2}{\text{man of O.C}} \times 100$$