Daily Tutorial Sheet-15	Level-3

159. Meq. of NH_3 formed = Meq. of HCl used

$$= 50 \times 0.15 - 32.10 \times 0.10 = 4.29$$

Here, n-factor of NH_3 is 1(acid-base reaction)

For redox change,

$$\overset{+5}{N}O_3^- \xrightarrow{+8e^-} \overset{-3}{N}H_3 \qquad \text{(n–factor = 8)}$$

∴ Meq. of NH_3 for n-factor 8 = 8 × 4.29

∴ Normality of $NO_3^- = \frac{34.32}{25} = 1.37$

Molarity of $NO_3^- = \frac{1.37}{8} = 0.176$

160. Let, molecular weight of oxalate salt is M

(i) n-factor in acid–base reaction = 2

(ii) n-factor in redox titration = 2 × z

($C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^-$)

∴ Meq. of acid in 30 ml = Meq. of NaOH used

$$30 \times \frac{9.15}{M} \times y = 27 \times 0.12 \qquad \textbf{... (1)}$$

Also, $$30 \times \frac{9.15}{M} \times (2z) = 36 \times 0.12 \qquad \textbf{... (2)}$$

From equations (1) and (2) $\frac{y}{2z} = \frac{27}{36} \Rightarrow \frac{y}{z} = \frac{3}{2}$ **... (3)**

Also, total cationic charge = total anionic charge

∴ $x + y = 2z$ **... (4)**

By equations (3) and (4)

x : y : z :: 1 : 3 : 2

These are in simplest ratio and molecular formula is $KH_3(C_2O_4)_2.nH_2O$

Molecular weight of salt = 39 + 3 + 176 + 18n = 218 + 18n

From equation (1), $M = \frac{30 \times 9.15 \times 3}{27 \times 0.12} = 254.16$

∴ 218 + 18n = 254.15

∴ n = 2

∴ Oxalate salt is $KH_3(C_2O_4)_2 \cdot 2H_2O$

161.(3) Disproportionation reactions are

$$2NO_2 + H_2O \longrightarrow HNO_3 + HNO_2$$

$$2CH_3\dot{C}H_2 \longrightarrow CH_3 - CH_3 + CH_2 = CH_2$$

$$4H_3PO_3 \longrightarrow 3H_3PO_4 + PH_3$$

However, in reaction $C_6H_5COCHO + KOH \longrightarrow C_6H_5CH(OH)COOK$, different carbon atoms are getting oxidized and reduced

162. ClO_3^- is reduced to Cl^- by SO_2 and ClO_3^- is also reduced to Cl by Fe^{2+}, hence AgCl is formed due to total Cl

Meq. of Fe^{2+} initially taken = $30 \times 0.2 = 6$

Meq. of Fe^{2+} unused = $37.5 \times 0.08 = 3$

$\therefore$ Meq. of Fe^{2+} used = $6.0 - 3.0 = 3.0$

Thus, Meq. of ClO_3^- in 25 mL = 3.0

Moles of ClO_3^- in 25 mL = $\dfrac{3.0}{1000 \times 6} = 0.0005$

$$\overset{+5}{ClO_3^-} \longrightarrow \overset{-1}{Cl^-} \text{ (n-factor 6)}$$

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Thus, moles of ClO_3^- in 25 mL solution = 0.0005

ClO_3^- is also reduced to Cl^- by SO_2 in first experiment and precipitated as AgCl.

Thus, Cl^- formed from ClO_3^- = AgCl from ClO_3^- = 0.0005

Total AgCl formed both from actual and Cl^- from ClO_3^- = 0.1435 gm

$= \dfrac{0.1435}{143.5} = 0.0010$ mol

Thus, AgCl formed due to Cl^- only = 0.0010 – 0.0005 = 0.0005 mol

Thus, ClO_3^- and Cl^- are in the molar ratio = 1:1

163. Meq. of $NaHSO_3$ = Meq. of $NaIO_3$ = N × V = $\dfrac{5.8}{198} \times 6 \times 1000$

$I^{5+} + 6e^- \longrightarrow I^-$ (For KIO_3, n-factor = 6)

$\therefore$ Meq. of $NaHSO_3$ = 175.76

$$\frac{W_{NaHSO_3}}{M/2} \times 1000 = 175.76 \quad \Rightarrow \quad W_{NaHSO_3} = \frac{175.75 \times 104}{2 \times 1000} = 9.14 \text{ gm}$$

Also, Meq. of I^- formed using n-factor 6 = 175.76

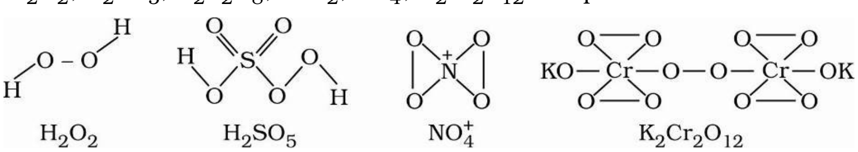
In step 2, n-factor of I^- is 1 and n-factor for IO_3^- is 5

Meq. of I^- formed using n-factor 1 = $\dfrac{175.76}{6}$

Meq. of $NaIO_3$ used in 2nd step = $\dfrac{175.76}{6}$

$$\Rightarrow \quad \frac{5.8}{198} \times 5 \times V = \frac{175.76}{6} \quad \therefore \quad V_{NaIO_3} = 20 \text{ ml}$$

164.(6) H_2O_2, H_2SO_5, $H_2S_2O_8$, BaO_2, NO_4^+, $K_2Cr_2O_{12}$ has peroxide bonds.



H_2O_2 H_2SO_5 NO_4^+ $K_2Cr_2O_{12}$

$H_9O_4^+$ is $H_3O^+(H_2O)_3$, C_3O_2 is O = C = C = C = O $H_7O_4^-$ is $HO^-(H_2O)_3$

$C_{12}O_9$ is