Date ....

Oxidising of Reducing agent.

NH_3 ~~-3+3=0, x=-3~~ Always - Reducing agent

$H\overset{(+3)}{N}O_2$ - Both (R.A, O.A).

$H\overset{(+5)}{N}O_3$ Always - oxidising agent

1) If an element is present in its lowest oxidation no. then it behaves as reducing agent only.

2) If an element is present in b/w lowest and highest oxidation no. then it behaves as oxidising as well as reducing agent.

3) If an element is present in its highest oxidation no. then it behaves as oxidising agent only.

Q. Decide which acts as oxidising agent or reducing agent or both?

1) H_2S (R.A) $2+x=0$ $x=-2$ $(-2), (+6)$
2) SO_2 (Both) $x-4=0$ $x=+4$
3) $HClO_4$ (oxidising) $1+x-8=0$ $(x=+7)$
4) HCl (Reducing agent)
5) H_2SO_4 (O.A) $2+x-8=0$
6) MnO_2 (Both)
7) $K_2Cr_2O_7$ (oxidisin)
8) $KMnO_4$ (oxidi)

Date ....

Note :- In Case of $KMnO_4$

→ In acidic medium $\overset{(+7)}{KMnO_4}$ converted into Mn^{2+}
equivalent weight = m/5

→ In neutral medium $\overset{(+7)}{KMnO_4} \longrightarrow \overset{(+4)}{MnO_4}$ eq. wait = m/3

→ In alkaline medium $\overset{(+7)}{KMnO_4} \longrightarrow \overset{(+6)}{K_2MnO_4}$ eq weight = m/1

In Case of $K_2Cr_2O_7$

(Acidic →) $K_2\overset{(+6)}{Cr_2}O_7 \longrightarrow Cr^{3+}$ eq weight = m/6

Note !- $K_2Cr_2O_7$ does not behave as an oxidising agent in neutral as well as in alkaline but in alkaline medium it shows the colour change (orange to Yellow).

Balancing of equation by n-factor. as valance factor.

→ Inverse of n-factor ratio is the mole ratio.

$$4\overset{(+2)}{Fe}\overset{(-2)}{S_2} + 11\overset{(0)}{O_2} \longrightarrow 4\overset{(+3)}{Fe_2}O_3 + 8\overset{(+4)}{S}O_2$$

(+8)

~~//+//~~

Date ....

Q How many moles of $KMnO_4$ are required to oxidised One mole of FeC_2O_4 in acidic medium.

$$\underset{n.f=5}{\overset{(+7)}{KMnO_4}} + \xrightarrow{\overset{n.f=3}{\overset{(+2)\,(+3)}{FeC_2O_4}}} \overset{(+2)}{Mn^{2+}} + Fe^{3+} + \overset{(+4)}{CO_2}$$

5 mole of FeC_2O_4 ⟶ 3 mole of $KMnO_4$

1 mole ⟶ $\frac{3}{5}$ " "

Q How many moles of $K_2Cr_2O_7$ are required to oxidised one mole of $FeSO_4$ in acidic medium

$$\underset{(n.f=6)}{\overset{(+6)}{K_2Cr_2O_7}} + \underset{(1)}{\overset{(+2)}{FeSO_4}} \longrightarrow Cr^{3+} + Fe^{(+3)} + SO_3$$

Q How many moles of MnO_4^- and MnO_2 are obtained after the disproportion of One mole of MnO_4^{2-}

$$\underset{n.f=\frac{2}{3}}{\overset{(+6)}{MnO_4^{2-}}} \longrightarrow \underset{n.f=1}{\overset{(+7)}{MnO_4^-}} + \underset{n.f=2}{\overset{(+4)}{MnO_2}}$$

$-2e^-$ $+1e^-$

$x - 8 = -1$

x

$$= \frac{m}{1} + \frac{m}{2} =$$

$$= \frac{3m}{2} = \frac{2}{3}$$

$$3MnO_4^{2-} \longrightarrow 2MnO_4^- + MnO_2$$

$$\frac{2}{3} \qquad , \frac{1}{3}$$

Date ....

Q Calculation of n-factor form the balanced equation

$$\overset{(+4)}{MnO_2} + 4HCl \longrightarrow \overset{(+2)}{MnCl_2} + 2H_2O + Cl_2$$

mole ratio 1 : 4

n.f = 4 : 1

$4 \times \frac{1}{2}$: $1 \times \frac{1}{2}$

$\therefore$ n.f of HCl = $0.5 = \frac{1}{2}$

Q

$$\overset{(+2)}{K_2}\overset{(+6)}{Cr_2}O_7 + 14H\overset{(-1)}{Cl} \longrightarrow 2\overset{(+1)}{K}\overset{(-1)}{Cl} + 2\overset{(+3)}{Cr}Cl_3 + 7H_2O + 3\overset{(0)}{Cl_2}$$

Mole ratio 1 : 14

$\cancel{14 \times \frac{6}{14}}$: $1 \times \frac{6}{14}\frac{3}{7}$

$-1 + 6$

$2x + 12$

$x = 6$

Q

$$3\overset{(0)}{Zn} + 8H\overset{(+5)}{N}O_3 \longrightarrow 3\overset{(+2)}{Zn}(NO_3)_2 + 2NO + 4H_2O$$

mole ratio = 3 : 8

n.f = $\frac{2 \times 1}{\cancel{4}}$: $3 \times \frac{1}{4}$

Q

$$3\overset{(0)}{Cl_2} + 6\overset{(+1)}{Na}OH \longrightarrow 5Na\overset{(-1)}{Cl} + Na\overset{(+5)}{Cl}O_3 + 3H_2O$$

0620 mole - 3 : 6

6440

2548

0780

$\frac{m}{2} + \frac{m}{10}$

$= \frac{8m}{5}$ = n.f of Cl = $\frac{5}{3}$

=

$2 \times \frac{5}{6}$: $1 \times \frac{5}{6}$ → N.f of NaOH

Spiral

Date ....

Q A metallic oxide (MO) contains 20 % oxygen Calculate molecular weight and eq. weight of MO also calculate atomic weight and equivalent of M.

A MO → 20%

100 g MO contain $\frac{1}{5}$ g of O

100 g " " 0.2 g of O

2 MO → 2M + O_2

100 → 98 0.2

(+2) (-2)
MO

80% 20%

64 (4 times of O) 16

64 + 16 = 80 (Molecular weight of MO)

Eq. wt of MO
$= \frac{80}{2} = 40$

At. wt of M = 64

Eq. wt of M = $\frac{\cancel{64}\ 32}{\cancel{2}}$

(+1) (-2)
M_2O

80% 20%

64 16 = 80

Molecular weight of M_2O = 80

Eq. wt of M_2O = 40

At. weight of M_2 = 32

Eq. weight of M_2 = $\frac{32}{1}$ = 32

A M_2O_3

Molecular weight = 240

Eq weight of M_2O_3 = 40

At " " M_2 = 96

Eq wt = 32

Spiral

Date ....

Q2 M_3N_2 (A metallic nitride) contains 40 % Nitrogen then calculate Molecular weight of eq. weight of metallic nitride also calculate atomic weight of equivalent weight of Metal.

Ans

$3x - 3 = 0$

$\overset{(+1)\ (+3)}{M_3N_2}$

60%   40%

14×3 28

42

100 — 40%

60% — $\frac{40}{100} \times 60$ 24%

$\frac{40 \times 60}{24}$

$\frac{14 \times 60}{40}$ 42

$\frac{14}{+21}{35}$

molecular weight of M_3N_2 = 70

Equivalent weight of M_3N_2 = $\frac{70}{6}$

At weight of M_3 = $\frac{42}{3}$

Equivalent ~~Molecular~~ weight of M_3 = $\frac{42}{6}$

12
48
60

80
32
112

Q Equivalent Weight of metallic oxide is 40 Calculate the equivalent weight of its Carbonate and Sulphate

$x - 6 = 0$

$x = +6$

$MoCO_3$ = 32 + 60 = 92   62

$MoSO_4^{2-}$ = 32 + 48 = ~~112~~ 80

☆ Normality

No. of equivalents of solute dissolved in 1 litre of solution is the normality of the solution.

$$N = \frac{\text{weight of solute}}{\text{eq. weight of solute} \times \text{Volume of sol}^n (l)}$$

$$N = \frac{\text{weight of solute (g)} \times n\cdot f}{\text{molecular weight} \times \text{Volume of solution}(l)}$$

$$\boxed{N = M \times n\cdot f}$$

☆ Normality of mixed solution

→ Case I :- If two or more acids or bases are mixed together then normality of mixed solution can be calculated as

$$\boxed{N_1V_1 + N_2V_2 + N_3V_3 - - - - = \underbrace{N}_{\text{Normality resulting solution}} . \underbrace{V}_{\text{volume of resulting solution}}}$$

→ Case II :- If acid & base are mixed together then normality of resulting sol^n can be calculated as

$$\boxed{\underset{(\text{Acid})}{N_1V_1} - \underset{(\text{Base})}{N_2V_2} = \underbrace{N}_{\text{Normality resulting solution}} . \underbrace{V}_{\text{volume resulting solution}}}$$

Date ....

Q2 200 ml $\frac{N}{10}$ HCl is mixed with 150 ml $\frac{N}{10}$ NaOH and resulting solution is made upto 1 l. calculate the normality of resulting solution

$$200 \times \frac{N}{10} - 150 \times \frac{N}{5} = N \times 1000 \text{ ml}$$

$$20N - 30N = N \times 1000$$

$$N(-10) = N_r \times 1000 = 0.01 N \Rightarrow N_r, \text{ Basic}$$

~~Name of ...~~ of ~~...~~ ~~...~~

Centi – $\frac{1}{100}$, femi = $\frac{1}{10^{2}}$, deci = $\frac{1}{10}$

Q2 150 ml $\frac{M}{30}$ H_3PO_4 (3), 200 ml $\frac{M}{10}$ H_2SO_4 (2) & 150 ml $\frac{N}{5}$ HNO_3 are mixed together. Calculate normality of resulting solution.

$$\frac{M}{30} \times 3 \times 150 + \frac{M}{10} \times 2 \times 200 + \frac{N}{5} \times 150 = N \times V$$

$$15N + 40N + 30N = N \times 500$$

$$17\cancel{85} = N \times \cancel{500}\ 100$$

☆ Equivalent Concept

Spiral