## 19. Oxidation number & balancing of Redox reaction

**Q1:-** $C_2H_5OH + Cr_2O_7^{2-} + H^+ \longrightarrow 2Cr^{3+} + C_2H_4O + H_2O$

-4 +2 +6 -2

Reaction by O.N. $6\times1$

Oxidation in O.N = $2\times3$

$$3C_2H_5OH + Cr_2O_7^{2-} + 8H^+ = 2Cr^{3+} + 3C_2H_4O + 7H_2O$$

**Q(2):-** $Sn(OH)_3^- + Bi(OH)_3 + OH^- = Sn(OH)_6^{2-} + Bi$

+2 +3 +4 0

Oxidation in O.N. = $2\times3$

Reduction in O.N. = $3\times2$

$$2Sn(OH)_3^- + 3Bi(OH)_3 + 3OH^- \longrightarrow 3Sn(OH)_6^{2-} + 2Bi$$

**Q3:-** $IO_3^- + N_2H_4 + HCl \longrightarrow N_2 + ICl_2^- + H_2O$

+5 -4 0 +1

Oxidation = $4\times1$

Reduction in O.N = $4\times1$

$$IO_3^- + N_2H_4 + 2HCl \longrightarrow N_2 + ICl_2^- + 3H_2O$$

**Q4:-** $2NO_2 + OH^- \longrightarrow NO_3^- + NO_2^- + H_2O + H_2O$

+4 $+ 2OH^-$ +5 +3 $+H_2O$

$+ H_2O$

Oxidation in O.N = 1

Reduction in O.N = 1

$$2NO_2 + 2OH^- \longrightarrow NO_3^- + NO_2^- + H_2O$$

**Q5:-** Oxidation by 1

**Sol:-** $Hg_2Cl_2 + 2NH_3 \longrightarrow Hg + HgNH_2Cl + NH_4Cl$

+1 0 +2

Reduction by 1

$$Hg_2Cl_2 + 2NH_3 \longrightarrow Hg + HgNH_2Cl + NH_4Cl$$

**Q6:**

**Sol:-** Oxidation in O.N. = $2\times4$

$Zn + NO_3^- + H^+ \longrightarrow Zn^{2+} + NH_4^+ + H_2O + 2H_2O$

0 +5 +2 -3

Reduction in O.N = $8\times1$

$$4Zn + NO_3^- + 10H^+ \longrightarrow 4Zn + NH_4^+ + 3H_2O$$

**Q7:-**

**Sol:-** Decrease in O.N.=1×10

$I_2 + NO_3^- + H^+ \longrightarrow 2IO_3^- + NO_2 + H_2O$

0 +5 +5 +4

Increase in 0.N = 10×1

$I_2 + 10NO_3^- + H^+ \longrightarrow 2IO_3^- + 10NO_2 + H_2O + 3H_2O$

$+6H^+ + H^+$

$I_2 + 10NO_3^- + 8H^+ \longrightarrow 2IO_3^- + 10NO_2 + 4H_2O$

**Q8:-**

**Sol:-** Increase in O.N. = 4×3

$MnO_4^- + SO_2^{2-} + H_2O \longrightarrow MnO_2 + SO_4^{3-} + OH^-$

+7 +2 +4 +6

Decrease in O.N. = 3×4

$4MnO_4^- + 3SO_2^{2-} + H_2O + 3H_2O + H_2O \longrightarrow 4MnO_2 + 3SO_4^{2-} + OH^- + 6OH^- + OH^-$

$\mathbf{4MnO_4^- + 3SO_2^{2-} + 8H_2O \longrightarrow 4MnO_2 + 3SO_4^{2-} + 8OH}$

**Q 9:**

**Sol** $H_2O_2 + ClO_2 + OH^- \longrightarrow ClO_2^- + O_2 + 2H_2O$

-2 4 -2 -2 5 0

Decrease in O.N. = 2

Increase in O.N.=1×2

$\mathbf{H_2O_2 + 2ClO_2 + 2OH^- \longrightarrow 2ClO_2^- + O_2 + 2H_2O}$

**Q10:-**

**Sol:-** Increase in 0.N. = 3×2

+1

$ClO^- + CrO_2^- + OH^- \longrightarrow Cl^- + CrO_4^{2-} + H_2O$

Decrease in 0.N = 2×3

$3ClO^- + 2CrO_2^- + OH + 2OH^- + H_2O \longrightarrow 3Cl^- + 2CrO_4^{2-} + H_2O + H_2O + OH^-$

$\mathbf{3ClO^- + 2CrO_2^- + 2OH^- \longrightarrow 3Cl^- + 2CrO_4^{2-} + H_2O}$

**Q11:**

**Sol:-** Decrease in O.N. = 2×5

$I_2 + Cl_2 + H_2O \longrightarrow 2HIO_2 + 2HCl$

0 +5

Increase in 0.N = 10

$I_2 + 5Cl_2 + 6H_2O \longrightarrow 2HIO_3 + 10HCl$

**Q12:**

**Sol:-**

Increase in 0.N =1

$Cl_2 + KOH \longrightarrow KOCl + KCl + H_2O$

0 +1 -1

Decrease in 0.1 N =1

$\therefore Cl_2 + 2KOH \longrightarrow KOCl + KCl + H_2O$

**Q13:-**

**Sol:-**

Decrease in 0.N by 1 × 5

$3Cl_2 + KOH \longrightarrow KClO_3 + 5KCl + H_2O$

+5 -1

Decrease in 0.N. 5

$3Cl_2 + 6KOH \longrightarrow KClO_3 + 5KCl + 3H_2O$

**Q11:**

**Sol:-**

Decrease in 0.N. = 2 × 5

$I_2 + Cl_2 + H_2O \longrightarrow 2HIO_2 + 2HCl$

0 +5

Increase in 0.N = 10

$I_2 + 5Cl_2 + 6H_2O \longrightarrow 2HIO_3 + 10HCl$

**Q12:**

**Sol:-**

Increase in 0.N =1

$Cl_2 + KOH \longrightarrow KOCl + KCl + H_2O$

0 +1 -1

Decrease in 0. N =1

$\therefore Cl_2 + 2KOH \longrightarrow KOCl + KCl + H_2O$

**Q13:-**

**Sol:-**

Decrease in 0.N by 1 × 5

$3Cl_2 + KOH \longrightarrow KClO_3 + 5KCl + H_2O$

+5 -1

Increase in 0.N. 5

$3Cl_2 + 6KOH \longrightarrow KClO_3 + 5KCl + 3H_2O$

**Q14:-**

**Sol:-**

$$\overset{-1\times2}{H_2O_2} + I_2 \longrightarrow \overset{+5}{2HIO_3} + \overset{-2\times2}{2H_2O}$$

$\overset{+0}{\uparrow}$

increase in 0.N = 10 5 is not multiplied because all oxygen doesn't come here

$$5H_2O_2 + I_2 \longrightarrow 2HIO_3 + 4H_2O$$

**Q15Sol:-** Increase in 0.N = 2×3

$$\overset{-1\times2}{H_2O_2} + KMnO_4 \longrightarrow \overset{+4}{MnO_2} + KOH + \overset{0}{O_2} + H_2O$$

$\overset{+3}{\uparrow}$

Decrease in 0.N = 3×2

$$3H_2O_2 + 2KMnO_4 \longrightarrow 2MnO_2 + 2KOH + 3O_2 + 2H_2O$$

**Q16:**

**Sol:-** decrease in 0.N = 5×2

$$\overset{+3}{HNO_2} + \overset{+7}{KMnO_4} + H_2SO_4 \longrightarrow \overset{+5}{HNO_3} + \overset{+2}{MnSO_4} + K_2SO_4 + H_2O$$

Increase in 0.N. = 2×5

Actually question is written wrong here

$$5HNO_2 + 2KMnO_4 + 3H_2SO_4 \longrightarrow 5HNO_3 + 2MnSO_4 + K_2SO_4 + 3H_2O$$

**Q17:**

**Sol:-** Increase in 0.N. = 2

$$\overset{+3}{NaNO_2} + 2NaI + H_2SO_4 \longrightarrow \overset{+2}{NO} + I_2 + Na_2SO_4 + H_2O$$

Decrease in 0.N. = 1×2

$$2NaNO_2 + 2NaI + 2H_2SO_4 \longrightarrow 2NO + I_2 + 2Na_2SO_4 + 2H_2O$$

**Q18:Sol:-** Decrease in 0.N = 1×4

$$\overset{-4}{N_2H_4} + \overset{+1}{AgNO_3} + KOH \longrightarrow \overset{0}{N_2} + \overset{0}{Ag} + KNO_3 + H_2O$$

Increase in 0.N = 4×1

$$N_2H_4 + 4AgNO_3 + 4KOH \longrightarrow N_2 + 4Ag + 4KNO_3 + H_2O$$

**Q19:**

**Sol:-** $\overset{-4}{N_2H_4} + AgNO_3 + KOH \longrightarrow \overset{0}{N_2} + \overset{0}{Ag} + KNO_3 + H_2O$

Decrease in 0.N. - $1 \times 4$

$$N_2H_4 + 4AgNO_3 + 4KOH \longrightarrow N_2 + 4Ag + 4KNO_3 + 4H_2O$$

**Q20:-**

**Sol:-** Increase in 0.N = 2

$$\overset{-2}{Fe} + N_2H_4 + H_2O \longrightarrow \overset{-3}{Fe(OH)_2} + 2NH_3$$

Decrease in 0.N = 2

$$Fe + N_2H_4 + 2H_2O \longrightarrow Fe(OH)_2 + 2NH_3$$

**Q21:**

**Sol:-** Decrease in 0.N = $3 \times 2$

$$\overset{-2}{H_2S} + \overset{+5}{HNO_3} \longrightarrow \overset{+2}{NO} + S + H_2O$$

Increase in 0.N. = $2 \times 3$

$$3H_2S + 2HNO_3 \longrightarrow 2NO + 3S + 4H_2O$$

**Q22:-**

**Sol:-** Increase in 0.N = $5 \times 3$

$$\overset{+5}{P} + HNO_3 \longrightarrow \overset{+5}{HPO_3} + \overset{+2}{NO} + H_2O$$

Decrease in 0.N = $3 \times 5$

$$3P + 5HNO_3 \longrightarrow 3HPO_3 + 5NO + H_2O$$

**Q23:-** Increase in 0.N. = $2 \times 3$

$$K_2Cr_2O_7 + 2HCl \longrightarrow KCl + 2CrCl_2 + H_2O + Cl_2$$

Decrease in 0.N = $6 \times 1$

$$K_2Cr_2O_7 + 6HCl \longrightarrow 2KCl + 2CrCl_3 + 7H_2O + 3Cl_2 + 8HCl$$

( To balance $Cl^-$ ion & K)

$$\therefore K_2Cr_2O_7 + 14HCl \longrightarrow 2KCl + 2CrCl_3 + 3Cl_2 + 7H_2O$$

**Q24:-**

**Sol:-** Increase in 0.N = 2×5

$$\overset{+7}{MnO_4^-} + CrO_4^{2-} + H^+ \longrightarrow 2CO_2 + \overset{+2}{Mn^{2+}} + H_2O$$

Decrease in 0.N = 5×2

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow 10CO_2 + 2Mn^{2+} + 8H_2O$$

**Q25:**

**Sol:-** Increase in 0.N = 2×3

$$Cr_2O_7^{2-} + C_2O_4^{2-} + H^+ \longrightarrow 2Cr^{3+} + 2CO_2 + H_2O$$

Decrease in 0.N. = 6

$$Cr_2O_7^{2-} + 3C_2O_4^{2-} + 14H^+ \longrightarrow 2Cr^{3+} + 6CO_2 + 7H_2O$$

**Q26:-**

**Sol:-** Decrease in 0.N = 6

$$\overset{+3}{Cr(OH)_3} + \overset{+5}{IO_3^-} + OH^- \longrightarrow I^- + \overset{+6}{CrO_4^{2-}} + H_2O$$

Increase in 0.N = 3×2

$$2Cr(OH)_3 + IO_3^- + OH^- \longrightarrow I^- + 2CrO_4^{2-} + 2H_2O$$

$$+ 3OH^- \qquad\qquad 3H_2O$$

$$2Cr(OH)_3 + IO_3^- + 4OH^- \longrightarrow I^- + 2CrO_4^{2-} + 5H_2O$$

**Q27:-**

**Sol:-** Decrease in 0.N. = 5×2

$$\overset{-2}{KMnO_4} + H_2S + H_2SO_4 \longrightarrow KHSO_4 + MnSO_4$$

$$+S + H_2O$$

Increase in 0.N =2×5

$$2KMnO_4 + 5H_2S + 4H_2SO_4 \longrightarrow 2KHSO_4 + 2KNSO_4 + 5S + 8H_2O.$$

**Q28:**

**Sol:-** $\overset{+5}{NO_3^-} + 2Cl^- + H^- \longrightarrow \overset{+2}{NO} + Cl_2 + H_2O$

Decrease in 0.N = 3×2

Increase in 0.N = 2×3

$$2NO_3^- + 6Cl^- + 8H^+ \longrightarrow 2NO + 3Cl_2 + 4H_2O$$

**Q29:-**

**Sol:-** Decrease in 0.N = 2×1

$$H_2O_2 + 2I^- + H^+ \longrightarrow I_2 + 2H_2O$$

Increase in 0.N=2×1

$$H_2O_2 + 2I^- + 2H^+ \longrightarrow I_2 + 2H_2O$$

**Q30:-**

**Sol:-** Decrease in 0.N. = 6

$$\overset{+3}{Cr_2O_7} + NO_2^- + H^+ \longrightarrow \overset{+5}{2Cr^{3+}} + NO_3^- + H_2O$$

Increase in 0.N = 2×3

$$\therefore Cr_2O_7^{2-} + 3NO_2^- + 8H^+ \longrightarrow 2Cr^{3+} + 3NO_3^- + 4H_2O$$

**Q31:-**

**Sol:-** Decrease in 0.N = 6

$$\overset{+4}{N_2O_4} + \overset{+5}{BrO_3^-} + H_2O \longrightarrow \overset{+5}{2NO_3^-} + Br^- + H^+$$

Increase in 0.N = 2×3

$$3N_2O_4 + BrO_3^- + 3H_2O \longrightarrow 6NO_3^- + Br^- + 6H^+$$

**Q32:**

**Sol:-** Decrease in 0.N = 6×2

$$\overset{+2}{S_2O_3^{2-}} + \overset{+5}{Sb_2O_5} + H^+ + H_2O \longrightarrow \overset{+2}{2SbO} + \overset{+4}{2H_2SO_3}$$

Increase in 0.N = 4×3

$$3S_2O_3^{2-} + 2Sb_2O_5 + 6H^+ + 3H_2O \longrightarrow 4SbO + 6H_2SO_3$$

**Q33:**

**Sol:-** $Fe_2(SO_4)_3 + Fe \longrightarrow 3FeSO_4$ (balanced already)

**Q34:**

**Sol:-** Decrease in 0.N = 1×2

$$\overset{+2}{Cu(NH_3)_4Cl_2} + KCN + H_2O \longrightarrow \overset{+2}{K_2Cu(CN)_3} + NH_3 + KCNO + NH_4Cl + KCl$$

Increase in 0.N = 2

$$2Cu(NH_3)_4Cl_2 + 7KCN + H_2O \rightarrow 2K_2Cu(CN)_3 + 6NH_3 + KCNO + 2NH_4Cl + 2KCl$$

**Q35:-**

**Sol:-**

Decrease in 0.N = 4

$$Ag + KCN + H_2O + O_2 \longrightarrow KAg(CN)_2 + 2KOH.$$

Increase in 0.N = 1×4

$$4Ag + 8KCN + 2H_2O + O_2 \longrightarrow 4KAg(CN)_2 + 2KOH + 2KOH$$

$$4Ag + 8KCN + 2H_2O + O_2 \longrightarrow 4KAg(CN)_2 + 4KOH$$

**Q36:**

**Sol:-**

Decrease in 0.N = 1×2

$$Zn + NO_3^- + H^+ \longrightarrow Zn^{2+} + NO_2 + H_2O$$

Increase in 0.N = 2×1

$$Zn + 2NO_3^- + 4H^+ \longrightarrow Zn^{2+} + 2NO_2 + 2H_2O$$

**Q37:**

**Sol:-**

Decrease in 0.N = 3×2

+2 +4

$$MnO_4^- + CN^- + H_2O \longrightarrow MnO_2 + CNO^- + OH$$

Increase in 0.N =2×3

$$2MnO_4^- + 3CN^- + H_2O \longrightarrow 2MnO_2 + 3CNO^- + \cancel{OH} + 2OH^- + \cancel{H_2O} + \cancel{H_2O} + \cancel{OH^-}$$

$$2MnO_4^- + 3CN^- + H_2O \longrightarrow 2MnO_2 + 3CNO^- + 2OH^-$$

**Q38:**

**Sol:-** +3 +5 +5 -1

$$ASO_3^{3-} + IO_3^- \longrightarrow ASO_4^{3-} + I^-$$

Increase in 0.N. = 2×3

Decrease in 0.N = 6×1

$$3ASO_3^{3-} + IO_3^- \longrightarrow 3ASO_4^{3-} + I^-$$

**Q39:**

**Sol:-**

Increase in total 0.N = 2×3

8/3 +7 +3

$$2Fe_3O_4 + MnO_4 + H_2O \longrightarrow 3Fe_2O_3 + MnO_2 + OH^-$$

Decrease in 0.N = 3×2

$$6Fe_3O_4 + 2MnO_4^- + H_2O \longrightarrow 9Fe_2O_3 + 2MnO_2 + 2OH^-$$

**Q40:-**

**Sol:-** Decrease in 0.N = 6×8

$$8H_2S + Cr_2O_7^{2-} + H^+ \longrightarrow 2Cr^{3+} + S_8 + H_2O$$

Increase in 0.N = 16×3

$$24H_2S + 8Cr_2O_7^{2-} + 64H^+ \longrightarrow 16Cr^3 + 3S_8 + 5H_2O$$

**Q41:**

**Sol:-** Decrease in 0.N = 4×3

$$\overset{-2}{Z}ns + O_2 \longrightarrow ZnO + \overset{+4}{S}O_2$$

Increase in 0.N = 6×2

$$2Zns + 3O_2 \longrightarrow 2ZnO + 2SO_2$$

**Q42:-**

**Sol:-**

$$KNO_3 + 2FeSO_4 + H_2SO_4 \longrightarrow KHSO_4 + Fe_2(SO_4)_3 + NO + H_2O$$

(+2 on $FeSO_4$; +3 on $Fe_2(SO_4)_3$)

Increase in 0.N =2×3

Decrease in 0.N = 3×2

$$2KNO_3 + 6FeSO_4 + 5H_2SO_4 \longrightarrow 2KHSO_4 + 3Fe_2(SO_4)_3 + 2NO + 4H_2O$$

**Q43:**

**Sol:-**

$$H_2S + K_2Cr_2O_7 + H_2SO_4 \longrightarrow KHSO_4 + Cr_2(SO_4)_3 + S + H_2O$$

Increase in 0.N. = 2×3

Decrease in 0.N. = 6

$$3H_2S + K_2Cr_2O_7 + 5H_2SO_4 \longrightarrow 2KHSO_4 + Cr_2(SO_4)_3 + 3S + 7H_2O$$

**Q44:-**

**Sol:-**

$$2KI + H_2SO_4 \longrightarrow KHSO_4 + SO_2 + I_2 + H_2O$$

(+6 on $H_2SO_4$)

Decrease in 0.N = 2×1

Increase in 0.N = 2×1

$$2KI + 3H_2SO_4 \longrightarrow 2KHSO_4 + SO_2 + I_2 + 2H_2O$$

**Q45:**

**Sol:-** Increase in 0.N / mole = 2×3

-2

$$C_2H_5OH + MnO_4^- + OH^- \longrightarrow C_2H_3O^- + MnO_2 + H_2O$$

Decrease in 0.N = 3×2

$$3C_2H_5OH + 2MnO_4^- + OH^- \longrightarrow 3C_2H_3O^- + 2MnO_2 + 5H_2O$$

**Q46:-**

**Sol:-** Increase in 0.N = 6×5

$$2Al + KMnO_4 + H_2SO_4 \longrightarrow KHSO_4 + Al_2(SO_4)_3 + MnSO_4 + H_2O$$

Decrease in 0.N = 5×6

$$10\,Al + 6KMnO_4 + 27H_2SO_4 \longrightarrow 6KHSO_4 + 5Al_2(SO_4)_3 + 6MnSO_4 + 24\,H_2O$$

**Q47:-**

**Sol:-** Decrease in 0.N = 6×2

$$K_2Cr_2O_7 + H_2O + S \longrightarrow SO_2 + KOH + Cr_2O_3$$

Increase in 0.N = 4×3

$$2K_2Cr_2O_7 + 2H_2O + 3S \longrightarrow 3SO_2 + 4KOH + 2Cr_2O_3$$

**Q48:-**

**Sol:-** Decrease in 0.N = 2

+4

$$MnO_2 + 2HCl \longrightarrow MnCl_2 + Cl_2 + H_2O$$

Increase in 0.N = 2

$$MnO_2 + 2HC \longrightarrow lMnCl_2 + Cl_2 + 2H_2O + 2HCl$$

$$MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$$

**Q49:-**

**Sol:-** Increase in 0.N = 2×3

$$MnO_4^- + SO_3^{2-} + H_2O \longrightarrow MnO_2 + SO_4^{2-} + OH^-$$

Decrease in 0.N =3×2

$$2MnO_4^- + 3SO_3^{2-} + H_2O \longrightarrow 2MnO_2 + 3SO_4^{2-} + 2OH^-$$

**Q50:-**

Increase in 0.N. = 2×3

$$Cr_2O_7^{2-} + SO_3^{2-} + H^+ \longrightarrow 2Cr^{3+} + SO_4^{2-} + H_2O$$

Decrease in 0.N. = 6

$$Cr_2O_7^{2-} + 3SO_3^{2-} + 8H^+ \longrightarrow 2Cr^{3+} + 3SO_4^{2-} + 4H_2O$$

**Q51:-**

Increase in 0.N = 2

$$I_2 + SO_2 + H_2O \longrightarrow SO_4^{2-} + 2I^- + H^+$$

Decrease in 0.N = 2

$$I_2 + SO_2 + 2H_2O \longrightarrow SO_4^{2-} + 2I^- + 4H^+$$

**Q52:-**

**Sol:-**

Decrease in 0.N = 1×4

$$Sn + NO_3^- + H^+ \longrightarrow SnO_2 + NO_2 + H_2O$$

Increase in 0.N = 4

$$Sn + 4NO_3^- + 2H^+ \longrightarrow SnO_2 + 4NO_2 + 2H_2O$$

**Q53:**

**Sol:-**

Decrease in 0.N = 5×2

$$MnO_4^- + SO_2 + H_2O \longrightarrow Mn^{2+} + SO_4^{2-} + H^+$$

Increase in 0.N = 2×5

$$2MnO_4^- + 5SO_2 + 2H_2O \longrightarrow MnO_4^{2-} + 5SO_4^{2-} + 4H^+$$

**Q54Sol:-** Decrease in 0.N = 1×2

$$MnO_4^- + SO_3^{2-} + OH^- \longrightarrow MnO_4^{2-} + SO_4^{2-} + H_2O$$

Increase in 0.N. = 2

$$2MnO_4^- + SO_3^{2-} + 2OH^- \longrightarrow 2MnO_4^{2-} + SO_4^{2-} + H_2O$$

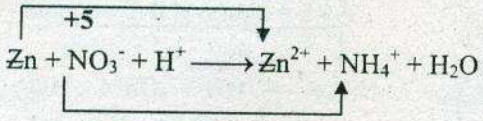
**Q55:-Sol:-** Increase in 0.N = 6

$$ClO^- + Br^- \longrightarrow BrO_3^- + Cl^-$$

Decrease in 0.N. = +2×3

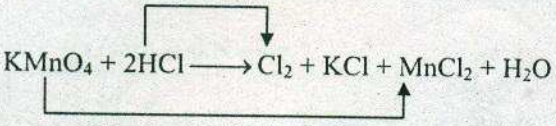
$$3ClO^- + Br^- \longrightarrow BrO_3^- + 3Cl^-$$

**Q56. Sol:-** Increase in 0.N =2×4




$$4Zn + NO_3^- + 10H^- \longrightarrow 4Zn^{2+} + NH_4^+ + 3H_2O$$

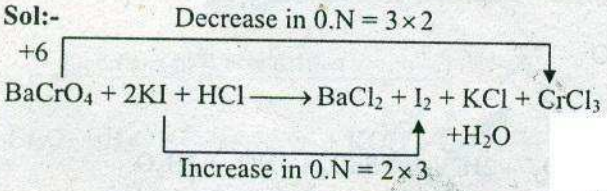
**Q57:-** Increase in 0.N = 2×5




$$2KMnO_4 + 10HCl + 6HCl \rightarrow 5Cl_2 + 2KCl + 2MnCl_2 + 8H_2O$$

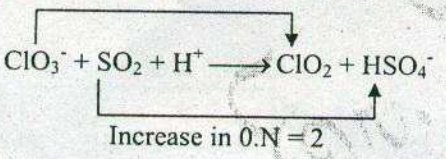
$$2KMnO_4 + 16HCl \rightarrow 5Cl_2 + 2KCl + 2MnCl_2 + 8H_2O + 6HCl$$

**Q58. Sol:-** Decrease in 0.N = 3×2



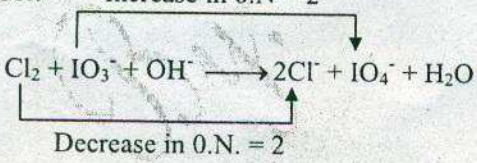

$$2BaCrO_4 + 6KI + 16HCl \longrightarrow 2MnO_4^- + 10HSO_4^- + 6H^+$$

**Q59. Sol:-** Decrease in 0.N. = 1×2



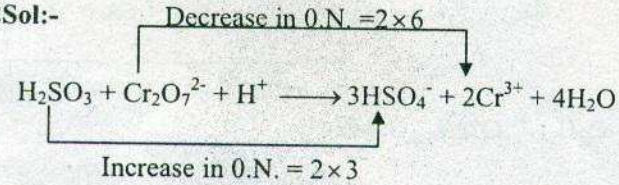

$$2ClO_3^- + SO_2 + H^+ \longrightarrow 2ClO_2 + HSO_4^-$$

**Q61.Sol:-** Increase in 0.N = 2




$$Cl_2 + IO_3^- + 2OH^- \longrightarrow 2Cl^- + IO_4^- + H_2O$$

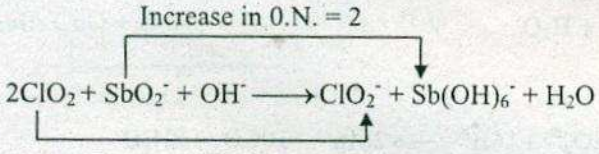
**Q62Sol:-** Decrease in 0.N. =2×6




$$3H_2SO_3 + Cr_2O_7^{2-} + 5H^+ \longrightarrow 3HSO_4^- + 2Cr^{3+} + 4H_2O$$

**Q63:-**

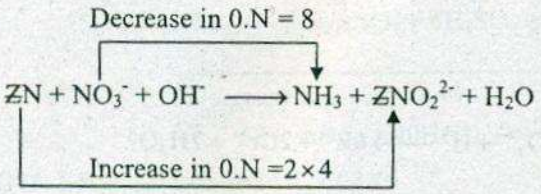
**Sol:-**




$$2ClO_2 + SbO_2^- + 2OH^- \longrightarrow 2ClO_2^- + Sb(OH)_6^- + 2H_2O$$

**Q64:-**

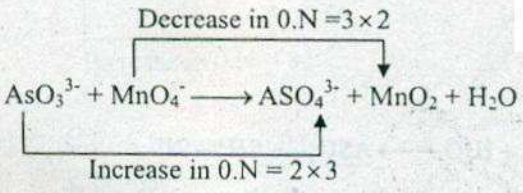
**Sol:-**




$$4Zn + NO_3^- + 7OH^- \longrightarrow NI$$

**Q65:**

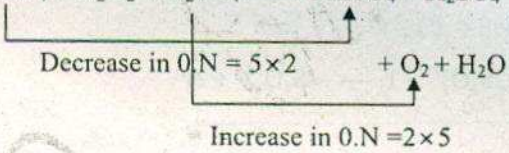
**Sol:-**




$$3AsO_3^{3-} + 2MnO_4^- \longrightarrow 3AsO_4^{3-} + 2MnO_2 + 2H_2O$$

**Q66:**

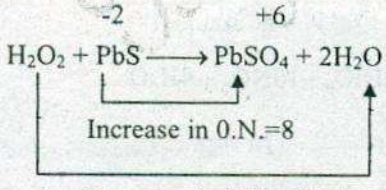
**Sol:-** $KMnO_4 + H_2O_2 + H_2SO_4 \longrightarrow MnSO_4 + K_2SO_4$




$$2KMnO_4 + 5H_2O_2 + 3H_2SO_4 \longrightarrow 2MnSO_4 + K_2SO_4 + 5O_3 + 8H_2O$$

**Q67:**

**Sol:-**




$$4H_2O_2 + PbS \longrightarrow PbSO_4 + 8H_2O$$

**Q68:** Decrease in 0.N. = 5×2

**Sol:-** $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + 2CO_2 + H_2O$

Increase in 0.N. =2×5

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

**Q69:-**

**Sol:-** Decrease in 0.N = 6

$Fe^{2+} + Cr_2O_7^{2-} + H^+ \longrightarrow Fe^{3+} + 2Cr^{3+} + H_2O$

Increase in 0.N = 1×6

$$6Fe^{2+} + Cr_2O_7^{2-} + H^+ \longrightarrow 6F^{3+} + 2Cr^{3+} + 7H_2O$$

**Q70:-**

**Sol:-** Increase in 0.N = 2

$ASO_3^{3-} + I_2 + H_2O \longrightarrow ASO_4^{3-} + H^+ + 2I^-$

Decrease in 0.N = 2

$$ASO_3^{3-} + I_2 + H_2O \longrightarrow ASO_4^{3-} + 2H^+ + 2I^-$$

**Q71:Sol:-** Decease in 0.N = 2

$2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^-$

Increase in 0.N =2

$$2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^-$$

**Q72. Sol:-** Increase in 0.N = 10

+5 +4

$HNO_3 + I_2 \longrightarrow 2HIO_3 + NO_2 + H_2O$

Decrease in 0.N =1×10

$$10HNO_3 + I_2 \longrightarrow 2HIO_3 + 10NO_2 + 4H_2O$$

**73. Sol:-** Decrease in 0.N = 6

$K_2Cr_2O_7 + H_2SO_4 + 2KI \longrightarrow I_2 + K_2SO_4 + Cr_2(SO_4) + H_2O$

In in 0.N =2×3

$$K_2Cr_2O_7 + 7H_2SO_4 + 6KI \longrightarrow 3I_2 + 4K_2SO_4 + Cr_2(SO_4)_3 + 7H_2O$$

**Q74:-** Increase in O.N =6

**Sol:-** $CuO + 2NH_3 \longrightarrow Cu + N_2 + H_2O$

Decrease in 0.N =2×3

$$3CuO + 2NH_3 \longrightarrow 3Cu + N_2 + 3H_2O$$

**Q75:**

**Sol:-** Increase in 0.N = 8×5 = 40

$AS_2S_5 + HNO_3 \longrightarrow H_3ASO_4 + 5H_2SO_4 + NO_2 + H_2O$

Decrease in 0.N = 1×40

$$AS_2S_5 + 40HNO_3 \longrightarrow 2H_3ASO_4 + 5H_2SO_4 + 40NO_2 + 12\,H_2O$$

**Q76. Sol:-** Decrease in 0.N =2×4

$PbS + O_3 \longrightarrow PbSO_4 + O_2$

Increase in 0.N = 8

$$PbS + 4O_3 \longrightarrow PbSO_4 + 4O_2$$

**Q77. Sol:-** Increase in 0.N. = 2

$Cl_2 + SeO_3^{2-} + H_2O \longrightarrow SeSO_4^{2-} + 2Cl^- + H^+$

Decrease in 0.N = 2

$$Cl_2 + SeO_3^{2-} + H_2O \longrightarrow SeO_4 + 2Cl + 2H^+$$

**Q78. Sol:-** Decrease in 0.N. = 6×11

$Cu_3P + H^+ + Cr_2O_7^{2-} \longrightarrow 2Cu^{2+} + H_3PO_4 + 2Cr^{3+} + H_2O$

Increase in 0.N =3×1+ 8=11×6

$$6Cu_3P + 124H^+ + 11Cr_2O_7^{2-} \longrightarrow 18Cu^{2+} + 6H_3PO_4 + 22Cr^{3+} + 53H_2O$$

**Q79:-**

**Sol:-** $Na_2SnO_2 + Bi(OH)_3 \longrightarrow Bi + Na_2SnO_3 + H_2O$

Decrease in 0.N = 3×2

Increase in 0.N. =2×3

$$3Na_2SnO_2 + 2Bi(OH)_3 \longrightarrow 2Bi + 3Na_2SnO_3 + 3H_2O$$

**Q80:**

**Sol:-** $H_2O + SbCl_3 \longrightarrow SbOCl + 2H_2O$

Decrease in 0.N = 7

$H_2O + SbCl_3 \longrightarrow SbOCl + 2HCl$ (balanced)

**Q81:**

**Sol:-** Increase in 0.N == 1+ 6×8+6×2 = 61

$KuFe(CN)_6 + Ce(NO_3)_4 + KOH \longrightarrow Ce(OH)_3 + Fe(OH)_3$

$+ H_2O + K_2CO_3 + KNO_3$

Decrease in 0.N = 1×61

$\therefore KeFe(CN)_6 + 61Ce(NO_3)_4 + 258KOH$

$\longrightarrow 61Ce(OH)_3 + Fe(OH)_3 + 36H_2O + 6K_2CO_3 + 259KNO_3$

**Q82:-**

**Sol:-** Increase in 0.N. = 4

$2S + OH^- \longrightarrow S^{2-} + S_2O_3 + H_2O$

Decrease in 0.N = 2×2

$4S + OH^- \longrightarrow 2S^{2-} + S_2O_3^{2-} + H_2O + 3H_2O$

$+6OH^- + 2H_2O \qquad +2OH^-$

$4S + 5OH^- \longrightarrow 2S^{2-} + S_2O_3^{2-} + 2H_2O$

**Q83:**

**Sol:-** Decrease in 0.N. = 7

$IO_4^- + I^- + H^+ \longrightarrow I_2 + H_2O$

Increase in 0.N = 1×7

$IO_4^- + 7I^- + 8H^+ \longrightarrow 4I_2 + 4H_2O$

**Q84:**

**Sol:-** Increase in 0.N. = 4

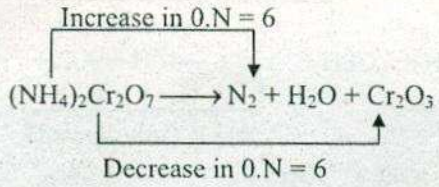
$KMnO_4 \longrightarrow K_2MnO_4 + MnO_2 + O_2$

Decrease in 0.N = 4

$2MnO_4 \longrightarrow K_2MnO_4 + MnO_2 + O_2$

**Q85:**

**Sol:-**




$$\therefore (NH_4)_2Cr_2O_7 \longrightarrow N_2 + 4H_2O + Cr_2O_3$$

**Q86:-**

**Sol:-** $MnO_4^{2-} + H^+ \longrightarrow MnO_4^- + MnO_2 + 7H_2O$

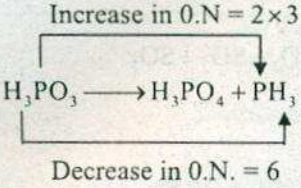
Increase in 0.N =1×2

Decrease in 0.N. = 2

$$3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO_4^- + MnO_2 + 2H_2O$$

**Q87:**

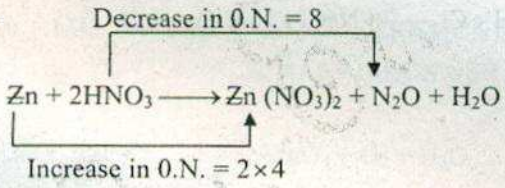
**Sol:-**




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

**88:-**

**Sol:-**

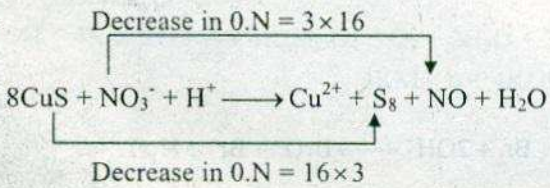



$$4Zn + 2HNO_3 \longrightarrow 4Zn(NO_3)_2 + N_2O + 5H_2O + 8HNO_3$$

$$4Zn + 10HNO_3 \longrightarrow 4Z(NO_3)_2 + N_2O + 5H_2O$$

**Q89:-**

**Sol:-**




$$24CuS + 16NO_3^- + 64H^+ \longrightarrow 24CO_2 + 3S_8 + 16NO + 32H_2O$$

**Q90:**

**Sol:-**

Decrease in 0.N. = 2

$$2CuSO_4 + 2KI \longrightarrow Cu_2I_2 + I_2 + K_2SO_4.$$

Increase in 0.N. = 2

$$2CuSO_4 + 2KI \longrightarrow Cu_2I_2 + I_2 + 2K_2SO_4$$

$+2KI$

$$2CuSO_4 + 4KI \longrightarrow Cu_2I_2 + I_2 + 2K_2SO_4$$

**Q91:**

**Sol:-**

Decrease in 0.N = 14

-2

$$2FeSO_4 \longrightarrow Fe_2O_3 + SO_2 + SO_3$$

Increase in 0.N $=2\times7$

$$14FeSO_4 \longrightarrow 4Fe_2O_3 + 4SO_2 + 4SO_3$$

$$2FeSO_4 \longrightarrow Fe_2O_3 + SO_2 + SO_3$$

**Q92:**

**Sol:-** $NaOH + Cl_2 \longrightarrow NaCl + NaClO + H_2O$

Decrease in 0.N =1

Increase in 0.N = 1

$$2NaOH + Cl_2 \longrightarrow NaCl + NaClO + H_2O$$

**Q93:**

**Sol:-** $NH_3 + Hg_2Cl_2 \longrightarrow Hg + Hg(NH_2)Cl + HCl$

**Dec-1**

Inc-1

$$NH_3 + Hg_2Cl_2 \longrightarrow Hg + Hg(NH_2)Cl + HCl$$

**Q94:-**

**Sol:-** $B3r_2 + OH^- \longrightarrow BrO^- + Br^- + H_2O$

Increase in 0.N=1

Decrease in 0.N =1

$$Br_2 + 2OH^- \longrightarrow BrO^- + Br^- + H_2O$$

**Q95:-**

**Sol:-**

Same as 75th .

**Q96:-**

**Sol:-**

Increase in 0.N = 2×2

$$Cr_2O_7^{2-} + SO_2 + H^+ \longrightarrow 2Cr^{+1} + HSO_4^- + H_2O$$

Decrease in 0.N = 6

$$Cr_2O_7^{2-} + 3SO_2 + 5H^+ \longrightarrow 2Cr^{3+} + 3HSO_4^- + H_2O$$

**Q97:-**

**Sol:-**

$$HCl + 2WO_3 + SnCl_2 \longrightarrow H_2SnCl_6 + W_8O_8 + H_2O$$

Increase in 0.N = 2

Decrease in 0.N = 2

$$4HCl + 3WO_3 + SnCl_2 \longrightarrow H_2SnCl_6 + W_3O_8 + H_2O$$

**Q98:**

~~Decrease in O.N. = 1~~

**Sol:-**

$$HCl + FeCl_2 + V(OH)_4Cl \longrightarrow VOCl_2 + H_2O + FeCl_3$$

Increase in 0.N = 1

$$HCl + FeCl_2 + V(OH)_4Cl \longrightarrow VOCl_2 + 3H_2O + FeCl_3$$

**Q99:**

**Sol:-**

Decrease in 0.N. = 4×3

$$Au + KCN + H_2O + O_2 \longrightarrow KAu(CN)_4 + 2KOH$$

Increase in 0.N = 3×4

$$4Au + 16KCN + 6H_2O + 3O_2 \longrightarrow 4KAu(CN)_4 + 6\,KOH + 6\,KOH$$

$$4Au + 16KCN + 6H_2O + 3O_2 \longrightarrow 4KAu(CN)_4 + 12KCN$$

**Q100:-**

**Sol:-**

$$2KOH + KMnO_4 \longrightarrow K_2MnO_4 + O_2 + H_2O$$

Decrease in 0.N = 1×4

Increase in 0.N = 4

$$2KOH + 4KMnO_4 \longrightarrow 4K_3MnO_4 + O_2 + 2H_2O + 2KOH$$

$$4KMnO_4 + 4KOH \longrightarrow 4K_2MnO_4 + O_2 + 2H_2O$$