Daily Tutorial Sheet-1	JEE Main (Archive)

1.(C) $\overset{+7}{KMnO_4} + e^- \longrightarrow \overset{+6}{MnO_4^{2+}}$

$\overset{+7}{KMnO_4} + 3e^- \longrightarrow \overset{+4}{MnO_2}$

$\overset{+7}{KMnO_4} + 4e^- \longrightarrow 1/2\ \overset{+3}{Mn_2O_3}$

$KMnO_4 + 5e^- \longrightarrow \overset{+2}{Mn^{2+}}$

2.(D) $Zn \longrightarrow Zn^{2+} + 2e\,;\quad Ag^+ + e \longrightarrow Ag$

3.(A) Oxidation occurs at anode.

4.(A) In $CaOCl_2$ (bleaching powder), one chlorine is as chloride and has oxidation number –1, the other chlorine is as OCl^{-1} and has oxidation number +1.

5.(D) $4 \times 1 + a + 4(-1) = 0 \quad \therefore\ a = 0$

6.(D) $2\,BCl_3 + 3\,H_2 \rightarrow 2\,B + 6\,HCl$

10.8×2 g boron $\equiv 3 \times 22.4\,L\,H_2$

$\therefore\quad 21.6\,g$ boron $\equiv \dfrac{3 \times 22.4 \times 21.6}{2 \times 10.8} = 67.2\,L\ H_2$

7.(A) Let oxidation number of Cr be a

$a + 4 \times 0 + 2 \times (-1) = +1 \quad \therefore\ a = +3$

8.(A) Potassium dichromate in acidic medium oxidizes KI to iodine and itself gets reduced to chromium sulphate, in which the oxidation number of Cr is +3.

9.(B) $2e + S^{6+} \longrightarrow S^{4+}\,;\quad 2I^- \longrightarrow I_2 + 2e$

10.(D) $2\,Al(s) + 6\,HCl(aq) \rightarrow 2\,Al^{3+}(aq) + 6\,Cl^-(aq) + 3\,H_2(g)$

$\because$ 6 moles of HCl produce = 3 moles of $H_2 = 3 \times 22.4\,L$ of H_2 at S.T.P.

$\therefore$ 1 moles of HCl produce $= \dfrac{3 \times 22.4}{6}\,L$ of H_2 at S.T.P. $= 11.2\,L$ of H_2 at S.T.P.

11.(C) Titration of oxalic acid by $KMnO_4$ in the presence of HCl gives unsatisfactory result because HCl also reduces MnO_4^- to Mn^{2+}.

12.(C) HCl being stronger reducing agent reduces MnO_4^- to Mn^{2+} and result of the titration becomes unsatisfactory.

13.(C) Mohr's salt is $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$

Only oxidizable part is Fe^{2+}

$[Fe^{2+} \rightarrow Fe^{3+} + e] \times 6$

$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7\,H_2O$

$6\,Fe^{2+} + Cr_2O_7^{2-} + 14H^+ \rightarrow 6Fe^{3+} + 2\,Cr^{3+} + 7H_2O$

Millimoles of $Fe^{2+} = 750 \times 0.6 = 450$

Moles of $Fe^{2+} = \dfrac{450}{1000} = 0.450\,mol$

6 mol $Fe^{2+} \equiv 1\,mol\ Cr_2O_7^{2-}$

$\therefore\quad 0.450$ mol $Fe^{2+} = \dfrac{0.450}{6} = 0.075$ mol $Cr_2O_7^{2-} = 0.075 \times 294\,g = 22.05\,g$

14.(D) 18 g H_2O contains 2gH

$\therefore$ 0.72 g H_2O contains 0.08 g H

44 g CO_2 contains 12 g C

$\therefore$ 3.08 g CO_2 contains 0.84 g C

$\therefore$ $C : H = \frac{0.84}{12} : \frac{0.08}{1} = 0.07 : 0.08 = 7 : 8$

$\therefore$ Empirical formula $= C_7H_8$

15.(C) The half equations of the reaction are

$MnO_4^- \longrightarrow Mn^{2+}$

$C_2O_4^{2-} \longrightarrow CO_2$

The balanced half equations are

$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$

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

On equating number of electrons, we get

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

$5C_2O_4^{2-} \longrightarrow 10CO_2 + 10e^-$

On adding both the equations, we get

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

$\therefore$ x, y and z are 2, 5 and 16 are respectively.

16.(B) $M = \frac{V.S}{11.2}$

$1 = \frac{V.S}{11.2}$

$V.S. = 11.2$

17.(B) $C_2O_4^{2-} + MnO_4^-$

Oxidation half $C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^-$

$2e^-$ for 2 mole CO_2 produced

$1e^-$ for 1 mole CO_2 produced

18.(C) $N_2 + O_2 \longrightarrow 2NO$ (change in oxidation state of both N & O)

19.(2130) $NaClO_3(s) + Fe(s) \longrightarrow O_2(g) + NaCl(s) + FeO(s)$

Number of moles of O_2 = Number of moles of $NaClO_3$

Number of moles of $O_2(n) = \frac{PV}{RT} = \frac{1 \times 492}{0.082 \times 300} = 20$

$\therefore$ Molar mass of $NaClO_3 = 23 + 35.5 + 48 = 106.5$

$\therefore$ Mass of $NaClO_3$ required $= 20 \times 106.5 = 2130\,g$

20.(C) Compound in which central atom is present, in its Intermediate oxidation state can act as both Oxidant as well as Reductant.

So $H\overset{+3}{N}O_2, H_2\overset{-1}{O}_2, H_2\overset{+4}{S}O_3,$ can act as both oxidising and reducing agent.

But In $H_3\overset{+5}{P}O_4,$ phosphorous is present in its highest possible oxidation state. Hence can act only as oxidizing agent but not as reducing agent since phosphorous can't be oxidised further.

Correct option is (C).

21.(D) Potassium is alkali metal. It always show +1 oxidation state

$K_2O \longrightarrow 2K^+ + O^{2-}; K_2O_2 \longrightarrow 2K^+ + O_2^{2-}; KO_2 \longrightarrow K^+ + O_2^-$