

Daily Tutorial Sheet-1

JEE Main (Archive)

- 1.(C)** $\overset{+7}{\text{KMnO}_4} + e^- \longrightarrow \overset{+6}{\text{MnO}_4^{2+}}$
 $\overset{+7}{\text{KMnO}_4} + 3e^- \longrightarrow \overset{+4}{\text{MnO}_2}$
 $\overset{+7}{\text{KMnO}_4} + 4e^- \longrightarrow 1/2 \overset{+3}{\text{Mn}_2\text{O}_3}$
 $\text{KMnO}_4 + 5e^- \longrightarrow \overset{+2}{\text{Mn}^{2+}}$
- 2.(D)** $\text{Zn} \longrightarrow \text{Zn}^{2+} + 2e^-$; $\text{Ag}^+ + e^- \longrightarrow \text{Ag}$
- 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)** $2\text{BCl}_3 + 3\text{H}_2 \rightarrow 2\text{B} + 6\text{HCl}$
 $10.8 \times 2 \text{ g boron} \equiv 3 \times 22.4 \text{ L H}_2$
 $\therefore 21.6 \text{ g boron} \equiv \frac{3 \times 22.4 \times 21.6}{2 \times 10.8} = 67.2 \text{ L H}_2$
- 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)** $2e^- + \text{S}^{6+} \longrightarrow \text{S}^{4+}$; $2\text{I}^- \longrightarrow \text{I}_2 + 2e^-$
- 10.(D)** $2\text{Al(s)} + 6\text{HCl(aq)} \rightarrow 2\text{Al}^{3+}(\text{aq}) + 6\text{Cl}^-(\text{aq}) + 3\text{H}_2(\text{g})$
 $\therefore 6 \text{ moles of HCl produce} = 3 \text{ moles of H}_2 = 3 \times 22.4 \text{ L of H}_2 \text{ at S.T.P.}$
 $\therefore 1 \text{ moles of HCl produce} = \frac{3 \times 22.4}{6} \text{ L of H}_2 \text{ at S.T.P.} = 11.2 \text{ L of H}_2 \text{ at S.T.P.}$
- 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 $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
 Only oxidizable part is Fe^{2+}
 $[\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + e^-] \times 6$
 $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6e^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$
 $6\text{Fe}^{2+} + \text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ \rightarrow 6\text{Fe}^{3+} + 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$
 Millimoles of $\text{Fe}^{2+} = 750 \times 0.6 = 450$
 Moles of $\text{Fe}^{2+} = \frac{450}{1000} = 0.450 \text{ mol}$
 $6 \text{ mol Fe}^{2+} \equiv 1 \text{ mol Cr}_2\text{O}_7^{2-}$
 $\therefore 0.450 \text{ mol Fe}^{2+} = \frac{0.450}{6} = 0.075 \text{ mol Cr}_2\text{O}_7^{2-} = 0.075 \times 294 \text{ g} = 22.05 \text{ g}$

14.(D) 18 g H₂O contains 2gH

∴ 0.72 g H₂O contains 0.08 g H

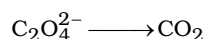
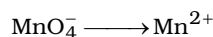
44 g CO₂ contains 12 g C

∴ 3.08 g CO₂ contains 0.84 g C

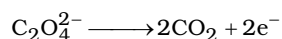
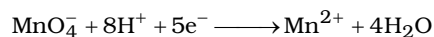
∴ $C : H = \frac{0.84}{12} : \frac{0.08}{1} = 0.07 : 0.08 = 7 : 8$

∴ Empirical formula = C₇H₈

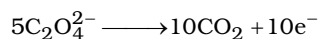
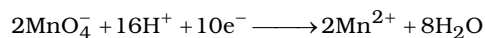
15.(C) The half equations of the reaction are



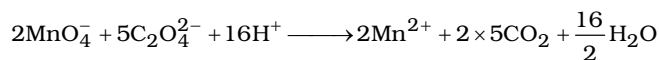
The balanced half equations are



On equating number of electrons, we get



On adding both the equations, we get



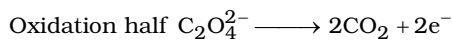
∴ x, y and z are 2, 5 and 16 are respectively.

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

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

$$V.S. = 11.2$$

17.(B) $\text{C}_2\text{O}_4^{2-} + \text{MnO}_4^-$



2e⁻ for 2 mole CO₂ produced

1e⁻ for 1 mole CO₂ produced

18.(C) $\text{N}_2 + \text{O}_2 \longrightarrow 2\text{NO}$ (change in oxidation state of both N & O)

19.(2130) $\text{NaClO}_3(\text{s}) + \text{Fe}(\text{s}) \longrightarrow \text{O}_2(\text{g}) + \text{NaCl}(\text{s}) + \text{FeO}(\text{s})$

Number of moles of O₂ = Number of moles of NaClO₃

$$\text{Number of moles of O}_2(\text{n}) = \frac{PV}{RT} = \frac{1 \times 492}{0.082 \times 300} = 20$$

∴ Molar mass of NaClO₃ = 23 + 35.5 + 48 = 106.5

∴ Mass of NaClO₃ required = 20 × 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 $\overset{+3}{\text{HNO}_2}$, $\overset{-1}{\text{H}_2\text{O}_2}$, $\overset{+4}{\text{H}_2\text{SO}_3}$, can act as both oxidising and reducing agent.

But In $\overset{+5}{\text{H}_3\text{PO}_4}$, 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

