Miscellaneous Exercise Question Bank

1.(C) $3Br_2 \longrightarrow 5Br^- + BrO_3^-$

36×0.5

$= 18\,m\,moles \qquad 6\,m\,moles$

$BrO_3^- + 3As^{3+} \longrightarrow 3As^{5+} + Br^-$

$6\,m\,moles \quad 18\,m\,moles$

$\therefore \quad Molarity = \dfrac{18\,m\,moles}{45\,mL} = 0.4\,M$

2.(D) $3Cu^+ \longrightarrow 3Cu^{2+} + 3e^-$

$P^{3-} \longrightarrow P^{5+} + 8e^-$

3.(B) $2MnO_4^- + 10e^- \longrightarrow 2Mn^{2+}$

4.(A) $2\,NaHCO_3 \longrightarrow Na_2CO_3 + H_2O + CO_2$ (n-factor = 2)

5.(A) $2MnO_4^- + 10MO \longrightarrow 2Mn^{2+} + 5M_2O_3$

$2\,m\,moles \quad 10\,m\,moles$

$\therefore \quad \dfrac{10}{1000} \times M_0 = 0.96\,g$

$M_0 = 96\,g = M + 16g \quad \Rightarrow \quad M = 80\,g$

6.(A) $FeC_2O_4 \longrightarrow Fe^{3+} + 2CO_2 + 3e^-$

$MnO_4^- + 5e^- \longrightarrow Mn^{2+}$

7.(C) meq of $Na_2S_2O_3 \equiv$ meq of I_2 = meq of H_2O_2

$\therefore$ meq of $H_2O_2 = 2$ meq

$Normality = \dfrac{2}{25} = 0.08\,N$

8.(A) Let 'x' moles of ICl and 'y' moles of ICl_3 are formed. $(I = 127\,amu)$

For iodine, $127x + 127y = 2.54$ or, $x + y = 0.2$

For chlorine, $35.5x + 3 \times 35.5y = 14.2$ or $x + 3y = 0.4$

Solving, $x = 0.1$ and $y = 0.1 \quad \therefore \quad x : y = 1 : 1$

9.(B) $M_{H_2O_2} \times 11.2\ell = 10$

$M_{H_2O_2} = \dfrac{10}{11.2}$

Number of moles of $H_2O_2 = 10 \times \dfrac{10}{11.2}\,mL = 8.92\,m\,moles$

$2\,MnO_4^- + 5\,H_2O_2 \longrightarrow 2Mn^{2+} + 10H_2O$

$\therefore \quad n_{MnO_4^-} = 3.568\,m\,moles$

10.(B) For the chromium oxide be CrO_x.

$2CrO_x \longrightarrow Cr_2O_7^{2-} + 2(6-2x)e^-$

$\therefore$ n-factor for $CrO_x = 6 - 2x$

Now, number of equation of ClO^- ≡ number of equation of $CrO_x = 0.15 \times 2 = 0.3\,eq$

Also, $0.3\,eq = \dfrac{12.6\,g}{E_{CrO_x}} \Rightarrow E_{CrO_x} = 42\,g$

or $E_{CrO_x} = 42 = \dfrac{M_0}{6-2x} \Rightarrow 42 = \dfrac{52+16x}{6-2x} \Rightarrow 63 - 21x = 13 + 4x$

$\Rightarrow 25x = 50 \Rightarrow x = 2$

$\therefore$ Formula is CrO_2

11.(D) $SO_2 \longrightarrow SO_4^{2-} + 2e^-$

0.25 moles 0.25 moles

12.(B) $MnO_4^- + 5Fe^{2+} \longrightarrow Mn^{2+} + 5Fe^{3+}$

$Cr_2O_7^{2-} + 6Fe^{2+} \longrightarrow 2Cr^{3+} + 6Fe^{3+}$

13.(D) $\underset{\downarrow}{N_2}H_5^+ \longrightarrow \underset{\downarrow}{N_2}$

$-2 \quad 0$

$X_F = 4$

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

$X_F = 6$

$nCr_2O_7^{-2}(6) = 0.136 \quad = \dfrac{0.136}{6} = 0.0227$

14.(A) Oleum is $H_2S_2O_7$ hence oxidation state of S is +6.

15.(D) $K_2Cr_2O_7$: $Cr \rightarrow +6$

Cl_2O_7 : $Cl \rightarrow +7$

$\left[Fe(CN)_6\right]^{3-}$: $Fe \rightarrow +3$

VO^{2+} : $V \rightarrow +4$

K_2MnO_4 : $Mn \rightarrow +6$

16.(B) AlO_2^- : $Al \rightarrow +3$

$\left[CrCl_2(H_2O)_4\right]^{2+}$: $Cr \rightarrow +4$

17.(BD) In (A) & (C), O.S. of nitrogen remains same i.e. +5

In (B) : $\underset{+5}{HNO_3} \longrightarrow \underset{+2}{NO}$ (Reduction)

In (D) : $\underset{+5}{HNO_3} \longrightarrow \underset{+4}{NO_2}$ (Reduction)

18.(BD) ClO_4^- : $Cl \rightarrow +7$

Cl^- : $Cl \rightarrow -1$

19.(BC) $2MnO_4^- + 5H_2O_2 \longrightarrow 2Mn^{2+} + 5O_2$

10 m moles 12.5 m moles

5 m moles – 5 m moles 12.5 m moles

20.(CD) $S_2O_3^{2-} \longrightarrow 2SO_4^{2-} + 8e^- \quad \left(E = \frac{M}{8}\right)$

$S_2O_3^{2-} + 4e^- \longrightarrow 2S \quad \left(E = \frac{M}{4}\right)$

21.(ABD)

HNO_2 : $N \rightarrow +3$

So, N can be oxidised further as well as reduced

H_2O_2 : $O \rightarrow -1$

SO_2 : $S \rightarrow +4$

22.(ABC) In acidic medium,

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

$0.5 \text{ mol } Fe^{2+} \longrightarrow Fe^{3+} \equiv 0.5\,\text{eq}$

$0.166\,\text{mol } FeC_2O_4 \longrightarrow Fe^{3+} + 2CO_2 \equiv 0.166 \times 3 = 0.5\,\text{eq}$

$0.25\,\text{mol } C_2O_4^{2-} \longrightarrow 2CO_2 \equiv 0.25 \times 2 = 0.5\,\text{eq}$

$0.6\,\text{mol } Cr_2O_7^{2-} \longrightarrow 2Cr^{3+} \equiv 0.6 \times 6 = 3.6\,\text{eq}$

23.(B) In acidic medium,

$MnO_4^- \longrightarrow Mn^{2+} \qquad (n = 5)$

$\therefore$ For 1 L 1 N $KMnO_4$ solution,

We have, 1 gm-eq of $KMnO_4$

$\Rightarrow \quad \frac{M_0}{5} = 31.6\,g$

24.(C) $MnO_4^- + 5e^- \longrightarrow Mn^{2+}$

$H_2O_2 \longrightarrow O_2 + 2e^-$

25.(D) $MnO_4^- + 1e^- \longrightarrow MnO_4^{2-} \qquad (n = 1)$

$\therefore \quad E = \frac{M_0}{1} = 158\,g$

26.(B) For $KMnO_4$, meq of $KHC_2O_4 \equiv$ meq of $KMnO_4 = 10\,\text{meq}$

$\therefore \quad x = \frac{10}{1000} \times \frac{128}{2} = 0.64\,g \quad \left(E_{KHC_2O_4} = \frac{128}{2}\,g\right)$

For $Ca(OH)_2$, meq of $KHC_2O_4 \equiv$ meq of $Ca(OH)_2 = 10\,\text{meq}$

$\therefore \quad y = \frac{10}{1000} \times 128 = 1.28\,g \quad \left(E_{KHC_2O_4} = 128\,g\right)$

27.(C) As an acid, n-factor of $NaHC_2O_4 = 1$

$\therefore$ Molarity of $NaHC_2O_4$ solution $= 0.1\,M$

$$\underset{0.4\,\text{m moles}}{2MnO_4^-} + \underset{1\,\text{m moles}}{5HC_2O_4^-} \longrightarrow 2Mn^{2+} + 10CO_2$$

$\therefore$ Molarity of $KMnO_4$ solution $= \frac{0.4}{10} = 0.04\,M$

28.(B) 10 m moles of I_2 will be formed and KI would be left out.

29.(B) Number of meq of $Na_2S_2O_3 = 12.12 \times 0.1 = 1.212$ meq

$\therefore$ Number of Cu^{2+} ions $= 1.212$ meq

$$\% \text{ of Cu} = \frac{1.212}{1000} \times \frac{63.5}{1.1} \times 100 \simeq 7\%$$

30.(B) Number of meq of I_2 librated $\equiv$ Number of meq of $K_2Cr_2O_7 = 25$ meq

$\therefore$ Amount of $I_2 = \frac{25}{1000} \times \frac{254}{2}$ [n-factor for I_2 is 2]

$= 3.175$ g

31.(B) $I_2 + Na_2S_2O_3 \longrightarrow 2NaI + Na_2S_4O_6$

40 mL 0.1 M $Na_2S_2O_3$ $\Rightarrow$ 2 meq of $Na_2S_2O_3$

$\therefore$ I_2 formed $\Rightarrow$ 4 meq

$2KI + H_2O_2 + H_2SO_4 \longrightarrow I_2 + 2H_2O + K_2SO_4$

For 4 meq of I_2 $\Rightarrow$ we req. 4 meq of H_2O_2

$\therefore$ Concentration of $H_2O_2 = \frac{4}{5} = 0.8$ N

32.(C) H_2O_2 is getting reduced to H_2O.

33.(A) Oxidation number of H_2O is zero

34.(D) Sodium amalgam is an alloy of sodium and mercury

35.(C) O.S. of oxygen $\rightarrow -2$

Cl $\rightarrow -1$

36.(B) $M^{4+} \longrightarrow M^{7+} + 3e^-$

37.(B) Bleaching powder is $CaCl_2 \cdot Ca(OCl)_2$

38.(A) CO is a neutral molecule

39.(D) KO_3 : K $\rightarrow$ always in +1 O.S.

40.(A) $MnO_4^- \longrightarrow MnO_4^{2-} + 1e^-$

41.(C) $H_2O_2 + 2e^- \longrightarrow 2H_2O$ (As O.A.) $H_2O_2 \longrightarrow O_2 + 2e^-$ (As R.A.)

42.(D) Ca : +2 O.S.
O : −2 O.S.

43.(A) Oxygen : −2 O.S.

44.(D) $\underset{+7}{MnO_4^-} \longrightarrow \underset{+2}{Mn^{2+}}$ (Reduction)

45.(A) Group 13 elements show maximum O.S. of +3

Z = 13 $\longrightarrow$ Aℓ (Group 13)

Z = 32 $\longrightarrow$ Ge (Group 14)

Z = 33 $\longrightarrow$ As (Group 15)

Z = 17 $\longrightarrow$ Cl (Group 17)

46.(C) $K_2HgI_4 \longrightarrow$ Hg : +2 O.S.

I : −1 O.S.

$KICl_2 \longrightarrow$ I : +1 O.S.

Cl : −1 O.S.

$I_4O_9 \longrightarrow O : -2$ O.S.

$I : \frac{+9}{2}$ O.S.

$KI_3 \longrightarrow K : +1$ O.S.

$I : -\frac{1}{3}$ O.S.

47.(C)

	P	$\longrightarrow$	$H_2PO_2^{1-}$	+	PH_3
O.S. $\rightarrow$	0		+1		−3

48.(A) HCN : $N \rightarrow -3$ O.S.
$H \rightarrow +1$ O.S.
$C \rightarrow +2$ O.S.

49.(A) Option (A) is a decomposition reaction.

50.(A) Oxidation number of Cl does not change

51.(B) Sodium hydride $\rightarrow$ NaH

52.(C) Option (A), (B) & (D) are double-displacement reactions

53.(A) $Li \longrightarrow Li^+ + e^-$

$H_2 + 2e^- \longrightarrow 2H^-$

54.(B) $BiO_3^- + 2e^- \longrightarrow Bi^{3+}$

$Mn^{2+} \longrightarrow MnO_4^- + 5e^-$

55.(C)

	NO_3^-	$\longrightarrow$	NO
O.S.	+5		+2

56.(A) $2MnO_4^- + C_2O_4^{2-} + 4OH^- \longrightarrow 2MnO_4^{2-} + 2CO_3^{2-} + 2H_2O$

57.(D) All these statements are correct regarding oxidation number.

58.(D) C_6H_5CHO

Let O.S. of C be 'x'

$\therefore \quad 7x + 6(+1) + 1(-2) = 0 \quad \Rightarrow \quad 7x = -4$

59.(D) O.S. of H is +1

$N_3H \Rightarrow 3x + 1 = 0$

$x = -\frac{1}{3}$

60.(B) Let oxidation number of S be x

$\therefore\ 2x - 6 = -2$

$x = +2$

61.(B) O.S. of C_2H_4 and H_2O is zero

62.(B) $BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$

63.(C) $H_2PO_2^{1-} \longrightarrow P = +1$

64.(C) $FeSO_4 \cdot (NH_4)_2 SO_4 \cdot 6H_2O \quad \Rightarrow \quad Fe = +2$

$K_4Fe(CN)_6 \quad \Rightarrow \quad Fe = +2$

$Fe(CO)_5 \quad \Rightarrow \quad Fe$ = zero

$FeO \quad \Rightarrow \quad Fe = +2$

65.(C) $0.94\,x - 2 = 0 \Rightarrow \quad x = \dfrac{2}{0.94}$ **66.(D)** Metallic iron is getting oxidised to Fe^{3+}

67.(C) $\underset{\text{O.S.}\rightarrow}{\overset{}{Br_2}} \longrightarrow \underset{-1}{Br^-} + \underset{+5}{BrO_3^-}$ (O.S. → 0)

68.(C) $\underset{\text{O.S.}\rightarrow +3}{NO_2^-} \longrightarrow \underset{+5}{NO_3^-} + 2e^-$

69.(A) MnO_4^- : $Mn \rightarrow +7$

MnO_3^- : $Mn \rightarrow +5$

70.(A) $H_4IO_6^- \Rightarrow 4(+1) + x + 6(-2) = -1$

$\Rightarrow \quad x - 12 + 4 = -1 \quad \Rightarrow \quad x = +7$

71.(B) Carbon sub-oxide is C_3O_2.

72.(CD) In option (C), O.S. of N remains same ; In option (D), O.S. of Fe remains same

73.(BC) $S_2O_3^{2-}$ is getting oxidised while I_2 is getting reduced

74.(BCD) In option (A), the O.S. of Cr remains same i.e. +6 **75.(CD)** O.S. of C ranges from -4 to 4

76.(BC) In $KMnO_4$, Mn is in highest O.S. i.e. +7 ; In $K_2Cr_2O_7$, Cr is in highest O.S. i.e. +6

77.(CD) In option (A), SO_2 is getting reduced to FeS ; In option (B), SO_2 is getting reduced to S

78.(BD) MnO_4^- : $Mn \rightarrow +7$; $O \rightarrow -2$

NiF_6^{2-} : $Ni \rightarrow +4$; $F \rightarrow -1$

79.(BD) **(A)** O.S. of $N = -3$ **(C)** O.S. of $N = -2$

80.(B) The required reaction is $Y + 3H^+ \longrightarrow Y^{3+} + \dfrac{3}{2}H_2$

$\therefore$ Molar ratio of Yttrium to hydrogen produced is 2 : 3

81.(A) $\overset{+4}{Mn}O_2 + (NH_4)_2SO_4 \longrightarrow \overset{+2}{Mn}SO_4 + (NH_2)_2S_2O_8$

(n = 2) (n = 1)

Let the moles of ammonium sulphate reacting with 1 mole of MnO_2 are x.

Since, equivalents of MnO_2 = Equivalents of $(NH_4)_2SO_4$

$\therefore$ $1 \times 2 = 1 \times x$, $x = 2$

82.(BCD) Since the disproportionation reaction is the one in which oxidising and reducing agents are same.

83.(A) Molar ratio of reactants being 1 : 2

$\therefore$ n factor ratio has to be 2 : 1. As n-factor of OH^- is 1.

$\therefore$ n factor of H_3PO_3 is 2 $\therefore$ Normality = $0.3 \times 2 = 0.6$ N

84.(B) $2S_2O_3^{2-} \longrightarrow S_4O_6^{2-} + 2e^-$

n-factor = 1 $\therefore$ $E = \dfrac{M_o}{1}$

85.(B) $NO_3^- + 8e^- \longrightarrow NH_4^+$ $\therefore$ $E = \dfrac{62}{8} = 7.75\,g$

86.(D) $2\,MnO_4^- + 10HCl \longrightarrow 2Mn^{2+} + 5Cl_2$

87.(C) $\overset{+5}{Br}O_3^- + 5Br^- \longrightarrow 3\overset{0}{Br_2}$ $\quad\therefore\quad$ n-factor for BrO_3^- is 5

88.(B) $Mn_3O_4 \quad\Rightarrow\quad MnO\cdot MnO_2$

89.(A) $BrO_3^- + 6e^- \longrightarrow Br^-$

$X^{n+} \longrightarrow X^{m+} + (m-n)e^-$

$\therefore \quad 1.34\times10^{-3}\times6 = 4.02 + 10^{-3}\times(m-n)$

$\Rightarrow \quad m-n=2 \quad\Rightarrow\quad m=n+2$

90.(D) ICl : O.S. of I is +1 ; HIO_4 : O.S. of I is +7

91.(D) $H_2S \longrightarrow S + 2e^-$ $\quad\therefore\quad E_{H_2S} = \frac{34}{2} = 17\,g$ **92.(A)** Refer to theory

93.(C) In CO_2, C is in maximum O.S. of +4 and

$\therefore$ Cannot be further oxidised

94.(B) Refer to module

95. **(A-t) (B-s) (C-q) (D-p)**

In $NaN_3 \rightarrow$ O.S. of Na is +1

O.S. of N is $-\frac{1}{3}$

96.(ABCD) $28NO_3^- + 3As_2S_3 + 4H_2O \longrightarrow 6AsO_4^{3-} + 28NO + 9SO_4^{2-} + 8H^+$

97.(AB) $2FeS_2 + \frac{11}{2}O_2 \longrightarrow Fe_2O_3 + 4SO_2$

$Fe^{2+} \longrightarrow Fe^{3+} + 1e^-$

$2S^{-1} \longrightarrow 2SO_2 + 10e^-$

98.(ACD) $2MnO_4^- + 5HC_2O_4^- \longrightarrow 2Mn^{2+} + 10CO_2$

0.2 m moles 0.5 m moles

$\therefore$ Molarity of $NaHC_2O_4 = \frac{0.5}{10} = 0.05\,M$

As an acid, n-factor for $NaHC_2O_4 = 1$

$\therefore$ Normality = 0.05 N

99.(ABC) As an acid, n-factor = 2. As an oxidizing agent, n-factor = 2

100.(A) $3I_2 \longrightarrow 5I^{1-} + IO_3^{1-}$