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Time : 5 Hour | STD 11 Science chemistry | Total Marks : 600

kd700+ neet target ch-7 redox reactions

*** Chemistry** **[600]**

1. On balancing the given redox reaction,

$aCr_2O_7^{2-} + bSO_3^{2-}(aq) + cH^+(aq) \rightarrow 2aCr^{3+}(aq) + bSO_4^{2-}(aq) + \frac{c}{2}H_2O(l)$

the coefficients a, b and c are found to be, respectively-

(A) $8,1,3$ (B) $1,3,8$ (C) $3,8,1$ (D) $1,8,3$

Ans. : b

Using Ion electron method :

Reduction Half reaction : $Cr_2O_7^{2-} + 6e^- \longrightarrow 2Cr^{3+}$

Oxidation Half reaction: $SO_3^{2-} \longrightarrow SO_4^{2-} + 2\overline{e} \times 3$

Overall reaction : $Cr_2O_7^{2-} + 3SO_3^{2-} \longrightarrow 2Cr^{3+} + 3SO_4^{2-}$

- To balance 'O' atoms, adding H_2O on LHS

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

- To balance 'H' atoms, adding H^+ on RHS

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

$\therefore \quad a = 1$

$b = 3$

$c = 8$

2. The oxidation state of Cr in Cr_2O_6 is

(A) -6 (B) $+12$ (C) $+6$ (D) $+4$

Ans. : c

CrO_6 does not exist but theoretically we can say that the oxidation state of Cr in CrO_6 is $+6$ as maximum oxidation state of Cr is $+6$ and it has its maximum oxidation state in CrO_6.

3. For the redox reaction

$\mathrm{MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O}$

the correct coefficients of the reactants for the balanced equation are

	$\mathrm{MnO_4^-}$	$\mathrm{C_2O_4^{2-}}$	$\mathrm{H^+}$
(A)	16	5	2
(B)	2	5	16
(C)	2	16	5
(D)	5	16	2

Ans. : b

$\mathrm{MnO_4^- \longrightarrow Mn^{+2}; 5e^- gain \ldots (1)}$

$C_2O_4^{-2} \rightarrow CO_2\ 2e^-\ loss \ldots (2)$

multiplying (1) by 2 and (2) by 5 to balance e^-

$2MnO_4^- + 5C_2O_4^{-2} \longrightarrow 2Mn^{+2} + 10CO_2$

on balancing charge;

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

4. In acidic medium, H_2O_2 changes $Cr_2O_7^{2-}$ to CrO_5 which has two $(-O-O-)$ bonds. Oxidation state of Cr in CrO_5 is

(A) $+5$ (B) $+3$ (C) $+6$ (D) -10

Ans. : c

When H_2O_2 is added to an acidified solution of a dichromate $Cr_2O_7^{2-}$, a deep blue coloured complex, chromic peroxide $CrO_5\,[or CrO(O_2)_2]$ is formed.

$$Cr_2O_7^{2-} + 2H^+ + 4H_2O_2 \rightarrow \underbrace{2CrO(O_2)_2}_{\text{Chromic peroxide}} + 5H_2O$$

This deep blue coloured complex has the following structure

Oxidation state of Cr is $+6$ due to the presence of two peroxide linkages which can be calculated as Cr peroxide normal $x + (-1)4 + (-2) = 0, x - 6 = 0$ and $x = +6$

5. Max. number of moles of electrons taken up by one mole of NO_3^- when it is reduced to

(A) NH_3 (B) NH_2OH (C) NO (D) NO_2

Ans. : a

Oxidation state of N in the following compounds:

$NO_3^- \rightarrow +5$

$NH_3 \rightarrow -3$ [Number of moles of electrons taken $= 5 - (-3) = 8$]

$NH_2OH \rightarrow -1$ [Number of moles of electrons taken $= 5 - (-1) = 6$]

$NO \rightarrow +2$ [Number of moles of electrons taken $= 5 - (+2) = 3$]

$NO_2 \rightarrow +4$ [Number of moles of electrons taken $= 5 - (4) = 1$]

6. When Sn^{2+} changes to Sn^{4+} in a reaction

(A) It loses two electrons (B) It gains two electrons

(C) It loses two protons (D) It gains two protons

Ans. : (a) $Sn^{2+} \rightarrow Sn^{4+} + 2e^-$. In this reaction Sn^{2+} change in Sn^{4+} it is called an oxidation reaction.

7. In the following reaction, $4P + 3KOH + 3H_2O \rightarrow 3KH_2PO_2 + PH_3$

(A) P is oxidized as well as reduced

(B) P is reduced only

(C) P is oxidised only

(D) None of these

Ans. : (a) P is oxidized as well as reduced (as in option (a)).

8. The conversion of sugar $C_{12}H_{22}O_{11} \rightarrow CO_2$ is

(A) Oxidation

(B) Reduction

(C) Neither oxidation nor reduction

(D) Both oxidation and reduction

Ans. : (a) In this reaction oxidation occur.

9. The oxidation number of Ba in barium peroxide is

(A) $+6$ (B) $+2$ (C) $+1$ (D) 4

Ans. : (b) $+2$ it is a second group element.

10. Chlorine is in $+1$ oxidation state in

(A) HCl (B) $HClO_4$ (C) ICl (D) Cl_2O

Ans. : (d) In case of Cl_2O chlorine shows $+1$ oxidation state.

11. When $K_2Cr_2O_7$ is converted to K_2CrO_4, the change in the oxidation state of chromium is

(A) 0 (B) 6 (C) 4 (D) 3

Ans. : (a) $\overset{+6}{K_2Cr_2O_7} \rightarrow \overset{+6}{K_2CrO_4}$.In this reaction no change in oxidation state of chromium.

12. Oxidation number of N in $(NH_4)_2SO_4$ is

(A) $-1/3$ (B) -1 (C) $+1$ (D) -3

Ans. : (D) -3

13. Oxidation state of chlorine in perchloric acid is

(A) -1 (B) 0 (C) -7 (D) $+7$

Ans. : (d) $H\overset{*}{C}lO_4$

$1 + x - 2 \times 4 = 0;\ 1 + x - 8 = 0$

$x = 8 - 1 = +7$ oxidation state.

14. Oxidation number of oxygen in O_2 molecule is

(A) $+1$ (B) 0 (C) $+2$ (D) -2

Ans. : (b) Each molecule always show zero oxidation state.

15. Carbon is in the lowest oxidation state in

(A) CH_4 (B) CCl_4 (C) CF_4 (D) CO_2

Ans. : (a) In (b, c, d) carbon show $+4$ oxidation state while in (a) carbon show -4 oxidation state.

16. The oxidation states of phosphorus vary from

(A) -3 to $+5$ (B) -1 to $+1$ (C) -3 to $+3$ (D) -5 to $+1$

Ans. : (a) Phosphorus shows -3 to $+5$ oxidation state.

17. The oxidation number of S in $H_2S_2O_8$ is

(A) $+2$ (B) $+4$ (C) $+6$ (D) $+7$

Ans. : (c)The chemical structure of $H_2S_2O_8$ is as follows

$$H-O-\overset{\underset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O-O-\overset{\underset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O-H$$

:-So the oxidation number of S should be :$\underset{(\text{for } H)}{2\times(+1)}+\underset{(\text{for } S)}{2\times X}+\underset{(\text{for } O)}{6\times(-2)}+\underset{(\text{for } O-O)}{2\times(-1)}=0$

or $X=+6$.

18. The oxidation state of nitrogen in N_3H is

(A) $+\frac{1}{3}$ (B) $+3$ (C) -1 (D) $-\frac{1}{3}$

Ans. : (d)In hydrazoic acid (N_3H) nitrogen shows $-\frac{1}{3}$ oxidation state.

$\overset{*}{N}_3H$

$3x+1=0$, $3x=-1$, $x=-\frac{1}{3}$.

19. Sulphur has highest oxidation state in

(A) SO_2 (B) H_2SO_4 (C) $Na_2S_2O_3$ (D) $Na_2S_4O_6$

Ans. : (b) $\overset{*}{S}O_2=+4$

$H_2\overset{*}{S}O_4=+6$

$Na_2\overset{*}{S}_2O_3=+2$

$Na_2\overset{*}{S}_4O_6=+\frac{5}{2}$.

20. The oxidation number of Fe and S in iron pyrites are

(A) $4,-2$ (B) $2,-1$ (C) $3,-1.5$ (D) $3,-1$

Ans. : (a)$\overset{*}{F}eS_2$ FeS_2

$x-4=0$ $4+2x=0$

$x=+4$ $2x=-4$

$x=\frac{-4}{2}=-2$

21. Which one of the following has the highest oxidation number of iodine

(A) KI_3 (B) KI (C) IF_5 (D) KIO_4

Ans. : (d) $K\overset{*}{I}O_4$

$1+x-2\times4=0$; $x=8-1=+7$.

22. The oxidation number of N in $N_2H_5^+$

(A) -3 (B) -2 (C) -1 (D) $+2$

Ans. : (b) $\overset{*}{N}_2H_5^+$

$2x + 5 = +1$; $2x = 1 - 5$

$2x = -4$; $x = -2$.

23. In which of the following compounds the oxidation number of carbon is maximum

(A) $HCHO$ (B) $CHCl_3$ (C) CH_3OH (D) $C_{12}H_{22}O_{11}$

Ans. : (b)Oxidation number of C in

$HCHO = 0$

$CHCl_3 = +2$

$CH_3OH = -2$

$C_{12}H_{22}O_{11} = 0$

24. If HNO_3 changes into N_2O, the oxidation number is changed by

(A) $+2$ (B) -1 (C) 0 (D) $+4$

Ans. : (d) $HNO_3 \rightleftharpoons \overset{*}{N}_2O$

$1 + x - 6 = 0$ $2x - 2 = 0$

$x = +5$ $2x = 2$

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

25. In which one of the following changes there are transfer of five electrons

(A) $MnO_4^- \rightarrow Mn^{2+}$

(B) $CrO_4^{2} \rightarrow Cr^{3+}$

(C) $MnO_4^{2-} \rightarrow MnO_2$

(D) $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$

Ans. : (a) $MnO_4^- \rightarrow Mn^{2+} + 5e^-$.

26. The oxidation number of hydrogen in $MH_2$is

(A) $+1$ (B) -1 (C) $+2$ (D) -2

Ans. : (b)In all alkali and alkaline earth metal hydride hydrogen always shows -1 oxidation state.

27. The highest oxidation state of Mn is shown by

(A) K_2MnO_4 (B) $KMnO_4$ (C) MnO_2 (D) Mn_2O_2

Ans. : (b)Mn shows highest oxidation state in $K\overset{+7}{M}nO_4$.

28. The atomic number of an element which shows the oxidation state of $+3$ is

(A) 13 (B) 32 (C) 33 (D) 17

Ans. : (a) Al shows $+3$ oxidation state.

29. Oxidation state of oxygen in F_2O is

(A) $+1$ (B) $+2$ (C) -1 (D) -2

Ans. : (b) Oxygen shows $+2$ oxidation state in F_2O. As F most electronegative element, it always has an O. No.$= -1$

30. The oxidation state of nitrogen is highest in

(A) N_3H (B) NH_2OH (C) N_2H_4 (D) NH_3

Ans. : (a) $3 \times x + 1\,(1) = 0$

$3x + 1 = 0$

$3x = -1, \Rightarrow x = -\frac{1}{3}$ in N_3H

$x + 2\,(+1) + 1\,(-2) + 1(1) = 0$

$x = -1$ in NH_2OH

$x \times 2 + 4\,(1) = 0\, x = -\frac{4}{2} = -2$ in N_2H_4

$x + 3\,(1) = 0\, x = -3$ *in* NH_3

Hence, highest in N_3H.

31. Sulphur has lowest oxidation number in

(A) H_2SO_3 (B) SO_2 (C) H_2SO_4 (D) H_2S

Ans. : (d) $H_2\overset{*}{S}O_3 = +4$; $\overset{*}{S}O_2 = +4$

$H_2\overset{*}{S}O_4 = +6$; $H_2\overset{*}{S} = -2$.

32. The oxidation number and covalency of sulphur in the sulphur molecule (S_8) are respectively

(A) 0 and 2 (B) 6 and 8 (C) 0 and 8 (D) 6 and 2

Ans. : (a) The oxidation number of sulphur in the sulphur molecule (S_8) is 0 and 2.

33. In ferrous ammonium sulphate oxidation number of Fe is

(A) $+3$ (B) $+2$ (C) $+1$ (D) -2

Ans. : (b) In ferrous ammonium sulphate Fe shows $+2$ oxidation state.

34. A compound is in its low oxidation state. Then its will be

(A) Highly acidic

(B) Highly basic

(C) Highest oxidising property

(D) Half acidic, half basic

Ans. : c

Since the element is in lowest oxidation state, it can further oxidize into higher oxidation state hence it can act as a reducing agent., thus shall exhibit Highest Reducing Property

35. The oxidation number of Mn in $KMnO_4$ is

(A) $+7$ (B) -7 (C) $+1$ (D) -1

Ans. : (a) $K\overset{*}{M}nO_4$

$1+x-2\times4=0$; $x=8-1=+7$.

36. Oxygen has oxidation states of $+2$ in the

(A) H_2O_2 (B) CO_2 (C) H_2O (D) OF_2

Ans. : (d) Oxygen have $+2$ oxidation state in OF_2.

37. Carbon has zero oxidation number in

(A) CO (B) CH_4 (C) CH_2Cl_2 (D) CH_3Cl

Ans. : (c) $x+2\times(+1)+2(-1)=0$

$x+2-2=0$; $x=0$ in CH_2Cl_2 .

38. Nitrogen show different oxidation states in the range

(A) 0 to $+5$ (B) -3 to $+5$ (C) -5 to $+3$ (D) -3 to $+3$

Ans. : b

Since nitrogen atom have 5 electrons in its outermost shell, so higher electronegative elements can extend its oxidation state up to $+5$, while in case of taking electrons it cannot go beyond 8 electrons. So at most it can accept 3 electrons.

39. Oxidation number of Mn in K_2MnO_4 and $MnSO_4$ are respectively

(A) $+7,+2$ (B) $+6,+2$ (C) $+5,+2$ (D) $+2,+6$

Ans. : (b) $K_2\overset{*}{M}nO_4$ $\overset{*}{M}nSO_4$

$2+x-8=0$ $x+6-8=0$

$x=+6$ $x=+2$

40. Oxidation number of N in NH_3 is

(A) -3 (B) $+3$ (C) 0 (D) $+5$

Ans. : (a) $\overset{*}{N}H_3$

$x+3(+1)=0$, $x=-3$.

41. The oxidation number of sulphur in H_2S is

(A) -2 (B) $+3$ (C) $+2$ (D) -3

Ans. : (a) H_2S [$O.N.$ of $H=+1$]

$(+1)\times2+x=0$

$2+x=0$; $x=-2$

42. The oxidation state of I in IPO_4 is

(A) $+1$ (B) $+3$ (C) $+5$ (D) $+7$

Ans. : (b) Let the oxidation number of I in $IPO_4=x$ Oxidation number of $PO_4=-3$

$x+(-3)=0\Rightarrow x=+3$

43. In the equation $H_2S + 2HNO_3 \rightarrow 2H_2O + 2NO_2 + S$. The equivalent weight of hydrogen sulphide is

(A) 16 (B) 68 (C) 34 (D) 17

Ans. : (d) $H_2S \rightarrow \overset{0}{S} + 2e$

Equivalent wt. = $\frac{\text{Mol.wt.}}{2} = \frac{34}{2} = 17$.

44. If $1.2\,g$ of metal displace $1.12\,litre$ hydrogen at normal temperature and pressure ,equivalent weight of metal would be

(A) 12 (B) 24 (C) $1.2 \div 11.2$ (D) 1.2×11.2

Ans. : (a) $1.12\,ltr\,H_2 = 1.2\,g;\ \therefore\ 11.2\,ltr\,H_2 = 12\,g$.

45. In which of the following reactions there is no change in valency

(A) $4KClO_3 \rightarrow 3KClO_4 + KCl$

(B) Cl_2

(C) $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$

(D) $2BaO + O_2 \rightarrow 2BaO_2$

Ans. : C

$BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$

as we know oxygen in peroxide is hare -1 oxidation no.

So, BaO_2 and H_2O_2 are peroxide have -1 oxidation in oxygon.

46. What is the equivalent mass of IO_4^- when it is converted into I_2 in acid medium

(A) $M/6$ (B) $M/7$ (C) $M/5$ (D) $M/4$

Ans. : (b) Equivalent mass $= \frac{\text{Molecular weight}}{\text{Change in oxidation number per mole}}$

Suppose molecular weight is M Oxidation number of I_2 in IO_4^- in Acidic medium i.e., $I \times (-8) + 1e^- = +7$

So eq. wt. $= M/7$.

47. In the reaction $I_2 + 2S_2O_3^{--} \rightarrow 2I^- + S_4O_6^{--}$ equivalent weight of iodine will be equal to

(A) $1/2$ of molecular weight (B) Molecular weight

(C) $1/4$ of molecular weight (D) None

Ans. : (a) $\frac{\text{Molecular weight}}{2}$ = Equivalent weight of Iodine.

48. The equivalent weight of KIO_3 in the reaction $2Cr(OH)_3 + 4OH + KIO_3 \rightarrow 2\,CrO_4^{2-} + 5H_2O + KI$ is

(A) $Mole\,wt.$

(B) $\frac{\text{Mol.wt.}}{6}$

(C) $\frac{\text{Mol.wt.}}{2}$

(D) $\frac{\text{Mol.wt.}}{3}$

Ans. : (d) $\frac{\text{Molecular weight}}{3}$ Because in KIO_3 effective oxidation number is 3.

49. Match List I with List II and select the correct answer using the codes given below the lists

$List\ \ I\ (Compound)$	$List\ II\ (Oxidation\ state\ of\ N)$
$(A)\ NO_2$	$(1)\ \ +\ 5$
$(B)\ HNO$	$(2)\ -\ 3$
$(C)\ NH_3$	$(3)\ +\ 4$
$(D)\ N_2O_5$	$(4)\ +\ 1$

code : $A\ B\ C\ D$

(A) $2\ \ 3\ \ 4\ \ 1$ (B) $3\ \ 1\ \ 2\ \ 4$ (C) $3\ \ 4\ \ 2\ \ 1$ (D) $2\ \ 3\ \ 1\ \ 4$

Ans. : (c) (a) $\overset{*}{N}O_2; x-4=0; x=+4$

(b) $H\overset{*}{N}O; 1+x-2=0; x=+1$

(c) $\overset{*}{N}H_3;\ x+3=0;\ x=-3$

(d) $\overset{*}{N}_2O_5;\ 2x-10=0; 2x=10;\ x=\frac{10}{2};\ x=5.$

50. M^{+3} ion loses $3e^-$. Its oxidation number will be

(A) 0 (B) $+3$ (C) $+6$ (D) -3

Ans. : (c) $2\times$ No. of e^- losses = Oxi. no.

$2\times 3e^- = +6$.

51. Oxidation number of oxygen in potassium super oxide (KO_2) is

(A) -2 (B) -1 (C) $-1/2$ (D) $-1/4$

Ans. : (c) $K\overset{*}{O}_2$, $+1+2x=0,\ x=-\frac{1}{2}$.

52. Consider the following statements :

In the chemical reaction

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

(1) Manganese ion is oxidised

(2) Manganese ion is reduced

(3) Chloride ion is oxidised

(4)Chloride ion is reduced.

Which of these statements are correct

(A) 1 and 3 (B) 1 and 4 (C) 2 and 3 (D) 2 and 4

Ans. : (c) Because the oxidation state of chlorine is -4 to 0 while Manganese ion is reduced because its oxidation state $+4$ to $+2$.

53. Oxidation number of S in Na_2SO_4 is

(A) -2 (B) 2 (C) -6 (D) 6

Ans. : (d) $Na_2\overset{*}{S}O_4$

$2+x-2\times 4=0$

$x=+6.$

54. In alkaline condition $KMnO_4$ reacts as $2KMnO_4+2KOH\rightarrow 2K_2MnO_4+H_2O+O$. The equivalent weight of $KMnO_4$ would be (Atomic mass of $K=39$, $Mn=55$, $O=16$)

(A) 158 (B) 79 (C) 52.7 (D) 31.6

Ans. : (a) $e^-+Mn^{7+}\rightarrow Mn^{6+}\quad\therefore E=\frac{M}{1}.$

55. In acidic medium, equivalent weight of $K_2Cr_2O_7$ $(mol.\ wt.=M)$ is

(A) $M/3$ (B) $M/4$ (C) $M/6$ (D) $M/2$

Ans. : (c) $Cr_2O_7^{2-}+14H^++6e^-\rightarrow 2Cr^{3+}+7H_2O$

Equivalent weight of $K_2Cr_2O_7$

$=\frac{\text{Molecular Mass}}{6}=\frac{294.2}{6}=\frac{M}{6}.$

56. In Which of the following process nitrogen undergoes in oxidation process

(A) $N_2\ \rightarrow\ HN_3$ (B) $N_2O_4\rightarrow 2NO_2$ (C) $NO_3^-\rightarrow N_2O_5$ (D) $N_2O\rightarrow NO$

Ans. : (D) $N_2O\rightarrow NO$

57. The oxidation number of sulphur in S_8, S_2F_2 and H_2S respectively are

(A) $0,+1,-2$ (B) $+2,+1,-2$ (C) $0,+1,+2$ (D) $-2,+1,-2$

Ans. : a

$S_8\Rightarrow$ (Homo atomic molecule)

$\Rightarrow \Delta EN=0$

$O.N$ of $S=0$

$S_2F_2\Rightarrow$ (O.N of F is always -1)

$2x+(-1)\times 2=0$

$2x=2$

$x=+1$

So $O.N$ of S in $S_2F_2=+1$

H_2S

$1\times 2+x=0$

$x=-2$

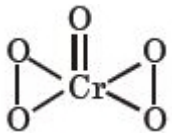
So $O.N$ of S in $H_2S=-2$

58. In acidic medium, H_2O_2 changes $Cr_2O_7^{-2}$ to CrO_5 which has two $(-O-O)$ bonds. Oxidation state of Cr in CrO_5 is

(A) 5 (B) 3 (C) 6 (D) 10

Ans. : c

CrO_5 has 2 peroxy linkage.



59. Oxidation numbers of P in PO_4^{3-}, S in SO_4^{2-} and that of Cr in $Cr_2O_7^{2-}$ are respectively

(A) $-3, +6$ and $+6$ (B) $+5, +6$ and $+6$ (C) $+3, +6$ and $+5$ (D) $+5, +3$ and $+6$

Ans. : b

Let oxidation number of P in PO_4^{3-} be x.

$\therefore x + 4(-2) = -3 \Rightarrow x = +5$

Let oxidation number of $\sin SO_4^{2-}$ be y.

$\therefore y + 4(-2) = -2 \Rightarrow y = +6$

Let oxidation number of Crin $Cr_2O_7^{2-}$ be z.

$\therefore 2z + 7(-2) = -2 \Rightarrow z = +6$

60. Oxidation number of C in HNC is

(A) $+2$ (B) -3 (C) $+3$ (D) 0

Ans. : a

$H - \overset{\cdot\cdot}{N} \rightleftharpoons C$

$+1 \quad \overset{-1}{-2} \quad +2$

direction of co-ordinate bond is from more EN atom to less EN atom. So there is no development of charge due to this co-ordinate bond.

So in HNC $\Rightarrow$

$O \cdot N$ of $H = +1$

$O \cdot N$ of $N = -3$

$O \cdot N$ of $C = +2$

61. In which pair of species the oxidation number of chlorine is same

(A) $ClO^{-1}, HClO_3$ (B) $ICl, NaCl$ (C) $NaCl, NaClO_3$ (D) ICl, ClF_3

Ans. : b

ICl^{-1}, $NaCl^{-1}$

$\overset{+1}{Cl}O^-$, $+H\overset{+5}{Cl}O_3$, $Na\overset{+5}{Cl}O_3$

62. The oxidation number of H in KH, MgH_2 and $NaOH$ are respectively

(A) $-1, -1, +1$ (B) $+1, +1, +1$ (C) $+2, +11, -2$ (D) $-2, -3, -1$

Ans. : a

Metal hydride : KH, MgH_2

Oxidation state of $H = -1$

$NaOH$ (Hydroxide)

Oxidation state of $H = +1$

63. The correct set of oxidation number of N in NH_4NO_2 is

(A) $-3, +5$ (B) $+5, -3$ (C) $-3, -3$ (D) $-3, +3$

Ans. : d

$$NH_4NO_2 \rightarrow \underset{-3}{\underset{\downarrow}{NH_4^+}} + \underset{+3}{\underset{\downarrow}{NO_2^-}}$$

64. In the reaction

$8Al + 3Fe_3O_4 \rightarrow 4Al_2O_3 + 9Fe$

the number of moles of electrons transfered by $1\,mol$ of reductant

(A) 24 (B) 8 (C) 3 (D) 12

Ans. : c

$R.A.$

Change in oxidation no. of

reductant $=$ moles of electrons transferred by

1 mol reductant $= 3$

65. $KMnO_4$ oxidises oxallic acid to CO_2 in acidic medium then equivalent weight of $KMnO_4$ is $(Mn = 55)$

(A) 158 (B) 31.6 (C) 39.6 (D) 52.67

Ans. : b

$\mathrm{MnO_4^-} \quad \rightarrow \quad$ (Oxidation number of $\mathrm{Mn} = +2$)

Equivalent mass of $\mathrm{KMnO_4} = \dfrac{\text{Molecular mass}}{\text{Change in oxidation number}} = \dfrac{158}{5} = 31.6$

66. Oxidation number of N in ammonium nitrate is

(A) $+3$ (B) -3 (C) -3 and $+5$ (D) $+5$

Ans. : c

Ammonium nitrate $\longrightarrow \mathrm{NH_4NO_3}$

which can be written as $\mathrm{NH_4^+NO_3^-}$ For $\mathrm{NH_4^+}$

Let oxidation state of $\mathrm{N} = \mathrm{x}$

we know that oxidation state of $\mathrm{H} = +1$

Sum of total oxidation state of all atoms $=$ Overall charge on the compound.

$x + 4 \times (1) = 1$

$\mathrm{x} = -3$

Let oxidation state of N in $\mathrm{NO_3^-} = \mathrm{y}$, we know that oxidation state of $\mathrm{O} = -2$

Applying above formula $y+3\times(-2)=1$

$y=+5$

Oxidation state of N in $NH_4NO_3=-3,+5$

67. The oxidation number of Cr in K_3CrO_8 is $+5$ how many peroxy linkages are present in this molecule

(A) 4 (B) 3 (C) 5 (D) 2

Ans. : a

The number of peroxy linkages in a compound can be calculated by using the formula = (Theoretical Oxidation number) - (Maximum Oxidation number)

68. Which of the following is not a peroxide

(A) Na_2O_2 (B) CaO_2 (C) PbO_2 (D) H_2O_2

Ans. : c

PbO_2 are not true peroxide because they do not liberate H_2O_2 on treatment with dilute acids.

Lead (IV) oxide and the lead atom shares its 4 electrons 2 each with oxygen atoms.

In Peroxide there a bond sharing of two oxygen atoms as in:

Hydrogen Peroxide $H-O-O-H$

Water is an oxide $H-O-H$

Likewise PbO_2 is an oxide P b has a valency 4

$O=Pb=O$

69. Which of the following can act both as an oxidising as well as reducing agent ?

(A) HNO_2 (B) $KMnO_4$ (C) H_2S (D) H_2SO_4

Ans. : a

Central atom nitrogen $(O.N.=+3)$ present in intermediate oxidation state so it can act as oxidant as well as reductant.

70. Which one of the following does not have an underlined atom with fractional oxidation state

(A) $\underline{Fe}_3O_4$ (B) $\underline{N}_3H$ (C) $K\underline{O}_2$ (D) $Na_2\underline{S}_2O_3$

Ans. : (D) $Na_2\underline{S}_2O_3$

71. In which of the following reaction element sulphur get reduced

(A) $SO_3^{2-}+Cr_2O_7^{2-}\longrightarrow SO_4^{2-}+Cr^{+3}$

(B) $H_2S+MnO_4^-\longrightarrow Mn^{+2}+S$

(C) $H_2SO_4+I^-\longrightarrow I_2+SO_2$

(D) $H_2SO_4+2NaOH\longrightarrow Na_2SO_4+2H_2O$

Ans. : c

$\overset{+6}{H_2S}O_4\longrightarrow \overset{+4}{S}O_2$

72. What is the equivalent weight of hydrochloric acid in given redox reaction

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

If molar mass of hydrochloric acid is M.

(A) M (B) $M/2$ (C) $3M/4$ (D) $2M$

Ans. : d

n factor for $4\,mol HCl$ is 2

n factor for $1\,mol HCl = \frac{2}{4} = \frac{1}{2}$

Eq. wt. of $HCl = \frac{M}{n\cdot \text{ factor}} = \frac{M}{1/2} = 2\,M$

73. $2\,mole$ of N_2H_4 loses $16\,mole$ of electron is being converted to a new compound X. Assuming that all of the N appears in the new compound. What is the oxidation state of $'N'$ in X ?

(A) -1 (B) -2 (C) $+2$ (D) $+4$

Ans. : c

$1\,mole\ N_2H_4$ loses $8\,mole\ e^-$; $1\,mole\ N$ loses $4\,mole$ of e^-

$\therefore$ New oxidation state of N is $-2 + 4 \Rightarrow 2$

74. The stability order of oxide, peroxide and superoxide of alkaline metals is

(A) Normal oxide $>$ Peroxide $>$ Superoxide

(B) Peroxide $>$ Normal oxide $>$ Superoxide

(C) Superoxide $>$ Normal oxide $>$ Peroxide

(D) None of these

Ans.: (A) Normal oxide $>$ Peroxide $>$ Superoxide

75. Which of the following is not a redox reaction

(A) $2Rb + 2H_2O \rightarrow 2RbOH + H_2$

(B) $2CuI_2 \rightarrow 2CuI + I_2$

(C) $2H_2O_2 \rightarrow 2H_2O + O_2$

(D) $4KCN + Fe(CN)_2 \rightarrow K_4Fe(CN)_6$

Ans. : (d) In the reaction $4KCN + Fe(CN)_2 \rightarrow K_4Fe(CN)_6$, change in oxidation state is not taking place.

76. $P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + PH_3$ is an example of

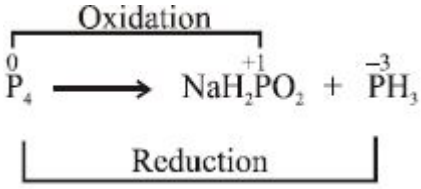
(A) Inter molecular Redox reaction

(B) Intra molecular Redox reaction

(C) Disproportionation Redox reaction

(D) None of these

Ans. : c



77. Assign A, B, C, D from given type of reaction.
$XeF_4 + H_2O \longrightarrow Xe + XeO_3 + HF + O_2$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans.: (A) for disproportionation reaction.

78. Number of moles of $K_2Cr_2O_7$ reduced by one mole of Sn^{2+} ions is

(A) $1/3$ (B) 3 (C) 1.6 (D) 6

Ans. : a

Ionic form of reaction is:

$Cr_2O_7^{2-} + Sn^{+2} + H^+ \rightarrow Sn^{-4} + Cr^{+3} + H_2O$

Step 1 : Assign the oxidation state using oxidation number of $O = -2$.

we get:

$Cr_2O_7^{2-} + Sn^{+2+} + H^+ \rightarrow Sn^{+4} + Cr^{+3} + H_2O$

Reduction half-reaction:

$Cr_2O_7^{2-} \rightarrow 2Cr^{-3}$: Gain of 6 electrons

Oxidation half reaction:

$Sn^{+2} \rightarrow Sn^{+4}$: Loss of 2 electrons

Step 2 : Equalise the number of electrons as:

Oxidation half reaction:

$3Sn^{-2} \rightarrow 3Sn^{+4}$

Step 3 : balance O atoms by adding H_2O and then H by H^+

$Cr_2^{+6}O_7^{2-} + 14H^+ \rightarrow 2Cr^{-3+} + 7H_2O$

Step 4 : overall reaction:

$Cr_2^{+6}O_7^{2-} + 14H^+ + 3Sn^{+2} \rightarrow 2Cr^{3+} + 3Sn^{+4} + 7H_2O$

Thus 3 mole of Sn^{2+} will reduce 1 moles of $K_2Cr_2O_7$.

Therefore,1 mole of Sn^{2+} will reduce $\frac{1}{3}$ moles of $K_2Cr_2O_7$.

79. The number of moles of acidified $KMnO_4$ required to convert one mole of sulphite ion into sulphate ion is

(A) $2/5$ (B) $3/5$ (C) $4/5$ (D) 1

Ans. : a

The balanced chemical reaction is:

$2\mathrm{MnO_4^-} + 5\mathrm{CO_4^{2-}} + 16\mathrm{H^+} \rightarrow 2\mathrm{Mn^{2+}} + 5\mathrm{SO_4^{2-}} + 3\mathrm{H_2O}$

From the balanced chemical equation we can say that:

$\because$ 5 moles $\mathrm{SO_4^{2-}}$ reacts with 2 moles of $\mathrm{KMnO_4}$.

$\therefore$ 1 mole $\mathrm{SO_4^{2-}}$ reacts with $2/5$ mole of $\mathrm{KMnO_4}$

Hence, the correct option is A

80. Which of the following equations is a balanced one ?

(A) $5BiO_3^- + 22H^+ + Mn^{2+} \rightarrow 5Bi^{3+} + 7H_2O + MnO_4^-$

(B) $5BiO_3^- + 14H^+ + 2Mn^{2+} \rightarrow 5Bi^{3+} + 7H_2O + 2MnO_4^-$

(C) $2BiO_3^- + 4H^+ + Mn^{2+} \rightarrow 2Bi^{3+} + 2H_2O + MnO_4^-$

(D) $6BiO_3^- + 12H^+ + 3Mn^{2+} \rightarrow 6Bi^{3+} + 6H_2O + 3MnO_4^-$

Ans. : b

The balanced redox equation is as given below:

$5\mathrm{BiO_3^-} + 14\mathrm{H^+} + 2\mathrm{Mn^{2+}} \rightarrow 5\mathrm{Bi^{3+}} + 7\mathrm{H_2O} + 2\mathrm{MnO_4^-}$

In this equation, the number of atoms of each element on the left side are equal to the number of atoms on the right side.

The charges are also balanced on the two sides of equation.

Hence, option B is the correct answer.

81. What will be the coefficients in the balanced form of following equation

$xIO_3^- + yHSO_3^- \rightarrow zI^- + pH^+ + qSO_4^{-2}$

$x \quad y \quad z$

(A) 1 3 3 (B) 5 3 1 (C) 1 3 1 (D) 1 2 1

Ans. : c

$IO_3^- + 3HSO_3^- \rightarrow I^- + 3H^+ + 3SO_4^{-2}$

82. In the balanced chemical reaction

$IO_3^- + aI^- + bH^+ \rightarrow cH_2O + dI_2$

a, b, c, d respectively corresponds to

(A) $5,6,3,3$ (B) $5,3,6,3$ (C) $3,5,3,6$ (D) $5,6,5,5$

Ans. : a

$IO_3^- + 5\underset{a}{I^-} + 6\underset{b}{H^+} \rightarrow 3\underset{c}{H_2O} + 3\underset{d}{I_2}$

83. The values of coefficients to balance the following reaction are

$Cr(OH)_3 + ClO^- + OH^- \rightarrow CrO_4^{2-} + Cl^- + H_2O$

$Cr(OH)_3 \quad - \quad ClO^- \quad - \quad CrO_4^{2-} \quad - \quad Cl^-$

(A) 2 – 3 – 3 – 3

(B) $2 - 4 - 3 - 2$

(C) $2 - 4 - 4 - 2$

(D) $2 - 3 - 2 - 3$

Ans. : d

$2Cr(OH)_3 + 3ClO^- + 4OH^- \rightarrow 2CrO_4^{2-} + 3Cl^- + 5H_2O$

84. For the redox reaction

$xP_4 + yHNO_3 \rightarrow H_3PO_4 + NO_2 + H_2O$

(A) $x = 1, y = 5$ (B) $x = 2, y = 10$ (C) $x = 1, y = 20$ (D) $x = 1, y = 15$

Ans. : c

$P_4 + 20HNO_3 \rightarrow 4H_3PO_4 + 20NO_2 + 4H_2O$

85. In the given half reaction $Cr_2O_7^{2-} + ZH^+ + e^- \rightarrow Cr^{3+} + H_2O$ Find the value of Z ?

(A) 6 (B) 5 (C) 8 (D) 14

Ans. : (D) 14

86. Which of the following is not intramolecular redox reaction?

(A) $NH_4NO_2 \rightarrow N_2 + 2H_2O$

(B) $2Mn_2O_7 \rightarrow 4MnO_2 + 3O_2$

(C) $2KClO_3 \rightarrow 2KCl + 3O_2$

(D) $2H_2O_2 \rightarrow 2H_2O + O_2$

Ans. : d

Intramolecular redox change involve oxidation of one atom and reduction of one atom within a molecule.

87. Which of the following reaction is not a redox reaction ?

(A) $SO_2 + H_2S \longrightarrow 2H_2O + S$

(B) $4KClO_3 \longrightarrow 3KClO_4 + KCl$

(C) $Na_2O + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O$

(D) $2Na + O_2 \longrightarrow Na_2O_2$

Ans. : (C) $Na_2O + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O$

88. Assign A, B, C, D from given type of reaction. $Fe(s) + H_2O(l) \xrightarrow{Boil} Fe_3O_4 + H_2 \uparrow$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

89. Assign A, B, C, D from given type of reaction. $Zn\,(s) + 2HCl \longrightarrow ZnCl_2 + H_2$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

90. Assign A, B, C, D from given type of reaction.

$PbO_2 + HCl\ (dil) \xrightarrow{Warm} PbCl_2 \downarrow + Cl_2 \uparrow + H_2O$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

91. Assign A, B, C, D from given type of reaction.

$Cr_2O_7^{2-} + H^+ + SO_3^{2-} \longrightarrow Cr^{3+}\,(aq.) + SO_4^{2-}$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

92. Assign A, B, C, D from given type of reaction.

A for disproportionation reaction.

B for comproportionation reaction.

C for either intermolecular redox reaction or displacement reaction.

D for either thermal combination redox reaction or thermal decomposition redox reaction.

$MnO_4^- + H^+ + Br^- \longrightarrow Mn^{2+}\,(aq.) + Br_2 \uparrow$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

93. Assign A, B, C, D from given type of reaction.
$Fe^{2+}(aq.) + Cr_2O_7^{2-} + H^+ \longrightarrow Fe^{3+}(aq.) + Cr^{3+}$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

94. Assign A, B, C, D from given type of reaction. $I_2 + S_2O_3^{2-} \longrightarrow I^- + S_4O_6^{2-}$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

95. Assign A, B, C, D from given type of reaction. $Cu^{2+}(aq.) + 2I^- \longrightarrow CuI\downarrow + \frac{1}{2}I_2$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

96. Assign A, B, C, D from given type of reaction.
$H_3PO_2 + AgNO_2 \longrightarrow Ag\downarrow + H_3PO_4 + NO$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

97. Assign A, B, C, D from given type of reaction.
$H_3PO_2 + CuSO_4 \longrightarrow Cu\downarrow + H_3PO_4 + HNO_3$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

98. Assign A, B, C, D from given type of reaction.

$N_2O_3 \xrightarrow{R.T.} NO + NO_2$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either thermal combination redox reaction or thermal decomposition redox reaction.

(D) Both (A) and (C)

Ans. : (D) Both (A) and (C)

99. Assign A, B, C, D from given type of reaction. $CO + I_2O_5(s) \longrightarrow CO_2 + I_2$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

100. Assign A, B, C, D from given type of reaction $KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2 \uparrow$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (D) for either thermal combination redox reaction or thermal decomposition redox reaction.

101. Assign A, B, C, D from given type of reaction. $K_2Cr_2O_7 \xrightarrow{\Delta} K_2CrO_4 + Cr_2O_3 + O_2 \uparrow$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (D) for either thermal combination redox reaction or thermal decomposition redox reaction.

102. Assign A, B, C, D from given type of reaction.

$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 \uparrow + Cr_2O_3 \downarrow + H_2O \uparrow$

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (D) for either thermal combination redox reaction or thermal decomposition redox reaction.

103. Assign A, B, C, D from given type of reaction. $N_2 + O_2 \xrightarrow{\text{High temp.}} NO \uparrow - \text{Heat}$

(A) for either thermal combination redox reaction or thermal decomposition redox reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) Both (A) and (C)

Ans. : (D) Both (A) and (C)

104. Assign A, B, C, D from given type of reaction.

$NaNO_2 + FeSO_4 + H_2SO_4 \longrightarrow [Fe(H_2O)_5NO]SO_4$

(Ring complex)

(A) for disproportionation reaction.

(B) for comproportionation reaction.

(C) for either intermolecular redox reaction or displacement reaction.

(D) for either thermal combination redox reaction or thermal decomposition redox reaction.

Ans. : (C) for either intermolecular redox reaction or displacement reaction.

105. $Cu^{2+}(aq.)$ does not undergo redox reaction with solution of

(A) $(NH_4)_2S$ (B) $Na_2S_2O_3$ (C) KI (D) NH_4SCN

Ans. : a

$Cu^{2+}(aq.)$ do not undergo redox reaction with $(NH_4)_2S$

106. Colour of acidified $K_2Cr_2O_7$ is not changed by

(A) H_2O_2 (B) $Sn^{2+}(aq.)$ (C) HF (D) HBr

Ans. : c

The color of acidified $K_2Cr_2O_7$ is not changed if after reacting with a substance,

the oxidation state of the transition metal, Cr, in the compound remains the same.

The oxidation state of Cr in $K_2Cr_2O_7$ is calculated as :

$2 + 2x + (-2) \times 7 = 0$

$\Rightarrow 2 + 2x - 14 = 0$

$\Rightarrow 2x - 12 = 0$

$\Rightarrow 2x = +12$

$\Rightarrow x = +6$

$\therefore$ Oxidations state of $Cr = +3$

Potassium dichromate reacts with hydrogen fluoride to produce potassium fluorotrioxochromate (VI) and water. The reaction involved is :

$K_2Cr_2O_7 + 2HF \rightarrow 2K[CrO_3F] + H_2O$

The oxidation state of Cr in $K[CrO_3F]$ can be calculated as follows:

$+1 + x + (-2) \times 3 + (-1) = 0$

$\Rightarrow +1 + x - 6 - 1 = 0$

$\Rightarrow x - 6 = 0$

$\Rightarrow x = +6$

$\therefore$ Oxidations state of $Cr = +3$

Since, there is no change in the oxidation state of Cr in the reactant and in the product, the color of the solution doesn't change. Therefore, the color of acidified $K_2Cr_2O_7$ is not changed by HF.

107. $aIO_3^- + bI^- + 6H^+ \rightarrow cI_2 + 3H_2O$

In above reaction coefficient a, b and c are respectively

(A) $1, 5, 3$ (B) $3, 1, 5$ (C) $1, 3, 5$ (D) $5, 3, 1$

Ans. : a

$IO_3^- + 5I^- + 6H^+ \rightarrow 3I_2 + 3H_2O$

108. $H^+ + Cr_2O_7^{2-} + SO_3^{2-} \rightarrow Cr^{+3} + SO_4^{2-} + H_2O$ In balance reaction coefficient of H^+ and SO_4^{2-} will be respectively

(A) $3,8$ (B) $3,4$ (C) $4,1$ (D) $8,3$

Ans. : d

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

109. The compound $YBa_2Cu_3O_7$ which shows superconductivity has copper in oxidation state ..... Assume that the rare earth element Yttrium is in its usual $+3$ oxidation state

(A) $3/7$ (B) $7/3$ (C) 3 (D) 7

Ans. : (b) $Ba_2\overset{*}{C}u_3O_7$

$3 + 2 \times 2 + 3x - (2 \times 7) = 0$

$3 + 4 + 3x - 14 = 3x = 7$

$x = \frac{7}{3}$.

110. For the redox reaction $MnO_4^- + C_2O_4^{-2} + H^+ \rightarrow Mn^{2+} + CO_2 + H_2O$ the correct coefficients of the reactants for the balanced reaction are

MnO_4^-	$C_2O_4^{2-}$	H^+
(A) 2	5	16
(B) 16	5	2
(C) 5	16	2
(D) 2	16	5

Ans. : (a) $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O \times 2$

$C_2O_4^{2-} \rightarrow 2CO_2 + 2e^- \times 5$

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

Thus the coefficient of MnO_4^-, $C_2O_4^{2-}$ and H^+ in the above balanced equation respectively are $2, 5, 16$.

111. The compound which could not act both as oxidising as well as reducing agent is

(A) SO_2 (B) MnO_2 (C) Al_2O_3 (D) CrO

Ans. : (c) Al_2O_3 could not act as a oxidising and reducing agent.

112. The number of electrons to balance the following equation $NO_3^- + 4H^+ + e^- \rightarrow 2H_2O + NO$ is

(A) 5 (B) 4 (C) 3 (D) 2

Ans. : (c) $NO_3^- + 4H^+ + 4e^- \rightarrow 2H_2O + NO$. In this equation all the atoms are balanced. For balancing added $3e^-$ to $L.H.S.$ we have, $NO_3^- + 4H^+ + 3e^- \rightarrow 2H_2O + NO$.

113. The oxidation number of carbon in CH_2O is

(A) -2 (B) $+2$ (C) 0 (D) $+4$

Ans. : (c) $\overset{*}{C}H_2O$

$x + 2 - 2 = 0$

$x = 0.$

114. One mole of N_2H_4 loses $10\,mol$ of electrons to form a new compound Y. Assuming that all nitrogen appear in the new compound, what is the oxidation state of N_2 in Y ? (There is no change in the oxidation state of hydrogen)

(A) $+3$ (B) -3 (C) -1 (D) $+5$

Ans. : (a) $N_2^{-2}H_4 \rightleftharpoons 2N^{a+} + 10e^-$

$(-2) \times 2 = 2a - 10$

$2a - [2 \times (-2)] = 10$

$a = +3.$

115. When Fe^{2+} changes to Fe^{3+} in a reaction

(A) It loses an electron (B) It gains an electron

(C) It loses a proton (D) It gains a proton

Ans. : (a) $Fe^{2+} \rightarrow Fe^{3+} + e^{-}$ oxidation.

116. The process in which oxidation number increases is known as

(A) Oxidation (B) Reduction

(C) Auto-oxidation (D) None of the above

Ans. : a

The increase in oxidation state of an atom, through a chemical reaction, is known as an oxidation

$Cu \overset{\text{Oxidation}}{\longrightarrow} Cu^{2+} + 2$ electrons

Here oxidation number increases from 0 to $+2$

117. In an oxidation process, oxidation number

(A) Decreases (B) Increases

(C) Does not change (D) First increases then decreases

Ans. : (b) In oxidation process oxidation state always increases.

118. An oxidising agent is a substance, which

(A) Accept proton (B) Accept electron (C) Accept neutron (D) Donate electron

Ans. : b

Oxidising agent oxidises another substance and reduces it self i.e. accepts electron.

119. A reducing agent is a substance which can

(A) Accept electron (B) Donate electrons (C) Accept protons (D) Donate protons

Ans. : (b) A substance which is capable of reducing other substances and is capable of donating electrons during reduction is called a reducing agent or reductant.

120. Oxidation number of C in $C_6H_{12}O_6$ is

(A) $+6$ (B) -6 (C) 0 (D) $+4$

Ans. : (c) C has oxidation number $= 0$.

121. Oxidation number of iodine varies from

(A) -1 to $+1$ (B) -1 to $+7$ (C) $+3$ to $+5$ (D) -1 to $+5$

Ans. : (b) Iodine shows -1 to $+7$ oxidation state.

122. Oxidation state of oxygen in hydrogen peroxide is

(A) -1 (B) $+1$ (C) 0 (D) -2

Ans. : (a)In all peroxide oxygen shows -1 oxidation state.

123. The oxidation number of phosphorus in $Ba(H_2PO_2)_2$ is

(A) -1 (B) $+1$ (C) $+2$ (D) $+3$

Ans. : (b) $Ba(H_2\overset{*}{P}O_2)_2$; $BaH_4\overset{*}{P}_2O_4$

$2+4+2x-8=0$;

$2x=2x=\frac{2}{2}=+1$.

124. Oxidation number of As atoms in H_3AsO_4 is

(A) -3 (B) $+4$ (C) $+6$ (D) $+5$

Ans. : (d) H_3AsO_4

$+3+x-2\times4=0$; $x=8-3=+5$.

125. Oxidation number of carbon in CH_3-Cl is

(A) -3 (B) -2 (C) -1 (D) 0

Ans. : (b) $\overset{*}{C}H_3-Cl$

$x+3(+1)+(-1)\times1=0$

$x+3-1=0$; $x+2=0$

$x=-2$.

126. The sum of the oxidation numbers of all the carbons in C_6H_5CHO is

(A) $+2$ (B) 0 (C) $+4$ (D) -4

Ans. : (d) In benzaldehyde all carbon atoms show -4 oxidation state.

127. Which is correctly matched

Compound $\rightarrow$ O.State of $C.M.I.$

(A) Ferrocene $\rightarrow$ $+3$

(B) Sodium Nitropruside $\rightarrow$ $+1$

(C) Brown Ring complex $\rightarrow$ $+3$

(D) None of these

Ans. : (D) None of these

128. The equivalent weight of $Na_2S_4O_6$ in the reaction $2Na_2S_2O_3+I_2\rightarrow Na_2S_4O_6+2NaI$ is :-

(A) M (B) $\frac{M}{8}$ (C) $\frac{M}{0.5}$ (D) $\frac{M}{2}$

Ans. : d

$\overset{(+2)}{Na_2S_2O_3}\rightarrow\overset{(+2.5)}{Na_2S_4O_6}$

$n-$factor $(\mathrm{Na_2S_4O_6})=(+2.5\,\text{to}\,+2)\times4$

$=2$

$\therefore E=\frac{M}{2}$

129. A compound containing x,y and z atoms oxidation no of x is $+3$, y is -5 and z is $+1$ then the possible formula of compound is

(A) xyz (B) xyz_2 (C) x_2yz (D) $(xy)_2z$

Ans. : b

(1) xyz

$+3-5+1 \neq 0$

(2) xyz_2

$+3-5+1 \times 2=0$

(3) x_2yz

$3x2-5+1 \neq 0$

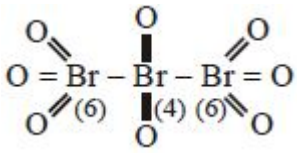
$(4)(\mathrm{xy})_2\mathrm{z}$

$(+3-5) \times 2+1 \neq 0$

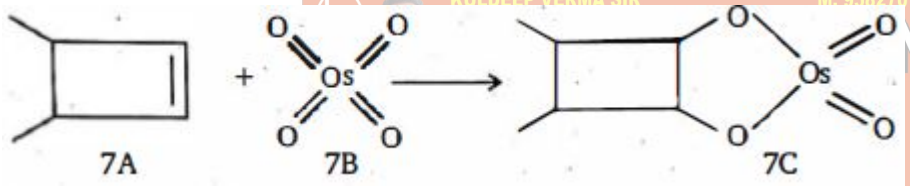
130. The correct set of oxidation numbers of Br in Br_3O_8 is

(A) $6,6,6$ (B) $6,4,6$ (C) $7,2,7$ (D) $7,6,3$

Ans. : b

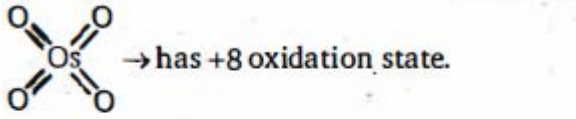


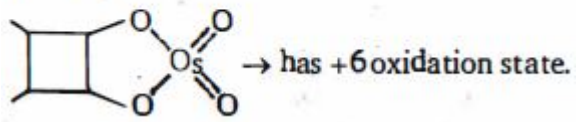
131. What is the oxidation state of osmium in $7B$ and $7C$, respectively ?



(A) $6,8$ (B) $8,6$ (C) $6,6$ (D) $8,8$

Ans. : b





132. What is the equivalent weight of hydrochloric acid in given redox reaction $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

If molar mass of hydrochloric acid is M.

(A) M (B) $M/2$ (C) $3M/4$ (D) $2M$

Ans. : d

n factor for $4\mathrm{molHCl}$ is 2

n factor for $1\mathrm{mol}$ HCI $=\frac{2}{4}=\frac{1}{2}$

Eq. wt. of $\mathrm{HCl}=\frac{\mathrm{M}}{\mathrm{n.factor}}=\frac{\mathrm{M}}{1/2}=2\mathrm{M}$

133. Oxidation state of $'S'$ in peroxodisulphuric acid and sodium tetrathionate

(A) $+6,+5,0$ (B) $+6,+6,+6$ (C) $+6,+4,+2$ (D) $+6,+2,0$

Ans. : a

Peroxydisulfuric acid is the inorganic compound with the chemical formula $H_2S_2O_8$. It contains sulfur in its $+6$ oxidation state and a peroxide group.

The tetrathionate anion, $S_4O_6^{2-}$, is a sulphur oxoanion derived from the compound tetrathionic acid, $H_2S_4O_6$. Two of the sulphur atoms present in the ion are in oxidation state 0 and two are in oxidation state $+5$.

134. In following reaction $yMnO_4^- + xH^+ + C_2O_4^- \rightarrow yMn^{++} + 2CO_2 + \frac{x}{2}H_2O$, x and y are

(A) 2 and 16 (B) 16 and 2 (C) 8 and 16 (D) 5 and 2

Ans. : (b) $2MnO_4^- + 16H^+ + C_2O_4^{-\,-} \rightarrow 2Mn^{+2} + 2CO_2 + 8H_2O$

135. 1 mole of $H_2C_2O_4$ is oxidised by x mole of MnO_4^- in strong basic medium and 1 mole of $NaHC_2O_4$ is oxidised by y mole of MnO_4^- in acidic medium. Ratio of x/y is

(A) $2:1$ (B) $5:1$ (C) $3:1$ (D) $1:3$

Ans. : b

$H_2C_2O_4$

$NaHC_2O_4$

$1 = \frac{x}{Y \cdot 5}$

$\frac{x}{Y} = \frac{5}{1}$

$1 \times 2 = X.1$

$1 \times 2 = Y.5$

136. $I^-(aq.) + MnO_4^-(aq.) \xrightarrow{H^+} X + Mn^{2+}(aq.)$

$I^-(aq.) + MnO_4^-(aq.) \xrightarrow[weakly\ OH^-]{Neutral\ or} Y + MnO_2$

$MnO_4^-(aq.) + Mn^{2+}(aq.) \xrightarrow{ZnSO_4} Z + 4H^+$

Products X, Y and Z are respectively :

(A) I_2, IO_3^-, MnO_2 (B) IO_3^-, I_2, MnO_2 (C) I_2, IO_3^-, MnO_4^{2-} (D) IO_3^-, I_2, MnO_4^{2-}

Ans. : a

MnO_4^- in basic medium is better oxidant than acidic medium, hence oxidises $I^-(aq.)$ ion upto $IO_3^-(aq.)$ ion.

137. Which of the following compound undergoes disproportionation in presence of SO_3 gas ?

(A) K_2MnO_4 (B) K_2CrO_4 (C) I_2 (D) $Hg(NO_3)_2$

Ans. : a

The green solution of $MnO_4^{2-}(aq.)$ is stable only in strong basic medium, in neutral

(or) acidic (or) tess basic medium it disproportionates into MnO_2 and MnO_4^- .

$$K_2MnO_4(Green) \xrightarrow[SO_3/acidic\ midium]{In\ presence\ of} KMnO_4(Purple) + MnO_2(Dark\ brown)$$

138. Comproportionation occurs between

(A) $Cl^-(aq.) + ClO^-(aq.) + OH^-(aq.)$

(B) $PH_3(g) + H_3PO_4$ acid

(C) $Na_2S(aq.) + Na_2SO_3(aq.)$

(D) $MnO_4^-(aq.) + Mn^{2+}(aq.) + ZnSO_4(aq.)$

Ans. : d

$$MnO_4{}^-(aq.) + Mn^{2+}(aq.) \xrightarrow[Comproportionation\ \ reaction]{Zn^{2+}(aq.)} MnO_2$$

139. A mixture of potassium chlorate, oxalic acid and sulphuric acid is heated. During the reaction which element undergoes maximum change in the oxidation number ?

(A) S (B) H (C) Cl (D) C

Ans. : c

When a mixture of potassium chlorate, oxalic acid and sulphuric acid is heated, the following reaction occurs:

$$\overset{+1+5-2}{KClO_3} + \overset{+1+3-2}{H_2C_2O_4} + \overset{+1+6-2}{H_2SO_4} \rightarrow \overset{+1+6-2}{K_2SO_4} + \overset{+1-1}{KCl} + \overset{+4-2}{CO_2} + \overset{+4-2}{H_2O}$$

Thus, Cl is the element which undergoes maximum change in the oxidation state.

140. Oxidation numbers of P in PO_4^{3-}, of S in SO_4^{2-} and that of Cr in $Cr_2O_7^{2-}$ are respectively

(A) $+3, +6$ and $+5$ (B) $+5, +3$ and $+6$ (C) $-3, +6$ and $+6$ (D) $+5, +6$ and $+6$

Ans. : d

(i) Sum of oxidation states of all atoms $=$ charge of ion.

(ii) oxidation number of oxygen $= -2$

Let the oxidation state of P in PO_4^{3-} " is x. PO_4^{3-}

$x + 4(-2) = -3$

$x - 8 = -3$

$x = +5$

Let the oxidation state of s in SO_4^{2-} is y

$y + 4(-2) = -2$

$y - 8 = -2$

$y = +6$

Let the oxidation state of Cr in $Cr_2O_7^{2-}$ is z

$2 \times z + 7(-2) = -2$

$2z - 14 = -2$

$z = +6$

Hence, oxidation state of P, S and Cr are $+5, +6$ and $+6$

141. Number of moles of MnO_4^- required to oxidize one mole of ferrous oxalate completely in acidic medium will be ..... moles

(A) 7.5 (B) 0.2 (C) 0.6 (D) 0.4

Ans. : d

In acidic medium MnO_4^- oxidises ferrous oxalate as follows:

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

$\therefore 5$ moles of oxalate ions are oxidised by 2 moles of MnO_4^-

$\therefore 1$ mole of oxalate ion is oxidised by

$\frac{2}{5}$ mole of MnO_4^-

$= 0.4$ mole of $\mathrm{MnO_4^-}$

142. The oxidation states of sulphur in the anions $SO_3^{2-}, S_2O_4^{2-}$ and $S_2O_6^{2-}$ follow the order

(A) $S_2O_6^{2-} < S_2O_4^{2} < SO_3^{2-}$ (B) $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$

(C) $SO_3^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$ (D) $S_2O_4^{2} < S_2O_6^{2-} < SO_3^{2-}$

Ans. : (b) $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$

Oxi. state of sulphur in $S_2O_4^{2-} = +3$

Oxi. state of sulphur in $SO_3^{2-} = +4$

Oxi state of sulphur in $S_2O_6^{2-} = +5$.

143. Which substance is serving as a reducing agent in the following reaction

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

(A) H_2O (B) Ni (C) H^+ (D) $Cr_2O_7^{2-}$

Ans. : (b) The oxidation number of Ni changes from 0 to $+1$

144. An element which never has a positive oxidation number in any of its compounds

(A) Boron (B) Oxygen (C) Chlorine (D) Fluorine

Ans. : (d) Fluorine always shows -1 oxidation state.

145. When $KMnO_4$ acts as an oxidising agent and ultimately forms $[MnO_4]^{-2}$, MnO_2, Mn_2O_3, Mn^{+2} then the number of electrons transferred in each case respectively is

(A) $4, 3, 1, 5$ (B) $1, 5, 3, 7$ (C) $1, 3, 4, 5$ (D) $3, 5, 7, 1$

Ans. : (c) Number of e^- transferred in each case is $1, 3, 4, 5$.

146. $20\ gm$ iron pyrite, FeS_2, is roasted completely and SO_2 gas produced is absorbed completely in $400\ ml\ NaOH$ solution. If only $50\%\ NaOH$ is used in the reaction, the molarity of $NaOH$ solution was

(A) $\frac{5}{3}M$ (B) $\frac{10}{3}M$

(C) $\frac{5}{6}M$ (D) $\frac{20}{3}M$

Ans. : b

$\underset{\frac{20}{120}=\frac{1}{6}\ mole}{2FeS_2} + \frac{11}{2}O_2 \rightarrow Fe_2O_3 + \underset{\frac{1}{3}\ mol}{4SO_2}$

$SO_2 + 2NaOH \rightarrow Na_2SO_3 + H_2O$

$\frac{1}{3}$ mole $\frac{2}{3}$ mole

$\frac{2}{3} = \frac{1}{2} \times \frac{400 \times M}{1000} \Rightarrow M = \frac{10}{3}$

147. Define the oxidation states of Mn in product of the given reaction

$3K_2MnO_4 + 2H_2O + 4CO_2 \rightarrow 2X + Y + 4KHCO_3$

(A) $+7, +4$ (B) $+6, +3$ (C) $+7, +2$ (D) $+5, +5$

Ans.: (A) $+7, +4$

148. When CrI_3 oxidises to $Cr_2O_7^{-2}$ and IO_4^-, equivalent mass of CrI_3 will be :-

(A) $\frac{M}{33}$ (B) $\frac{M}{27}$ (C) $\frac{M}{28}$ (D) $\frac{M}{24}$

Ans. : b

$\overset{(+3)(-1)}{CrI_3} \rightarrow \overset{+6}{Cr_2O_7^{-2}} + \overset{(+7)}{IO_4^-}$

$n-$factor $\Rightarrow \text{Cr} = (+3 \text{ to } +6) = 3e^-\ loss$

$I = (-1 \text{ to } +7) \times 3 = 24e\ loss$

$n-$factor $= 27$

$\therefore E = \frac{M}{27}$

149. $6Fe_3O_4 + 2MnO_4^- + H_2O \rightarrow 9Fe_2O_3 + 2MnO_2 + 2OH^-$

Calculate the equivalent weight of Fe_3O_4 in the above equation

(A) M (B) $\frac{3M}{8}$ (C) $\frac{M}{2}$ (D) $\frac{M}{6}$

Ans. : a

n factor $= \left(3 - \frac{8}{3}\right) \times 3$

$= 9 - 8 = 1$

$\text{E}_\text{w} = \frac{\text{M}}{1}$

150. In the redox reaction

$x\ MnO + y\ PbO_2 + z\ HNO_3 \rightarrow a\ HMnO_4 + b\ Pb(NO_3)_2 + c\ H_2O$

(A) $x = 2, y = 5, z = 10$ (B) $x = 2, y = 7, z = 8$

(C) $x = 2, y = 5, z = 8$ (D) $x = 2, y = 5, z = 5$

Ans. : a

$2MnO + 5PbO_2 + 10HNO_3 \rightarrow 2HMnO_4 + 5Pb(NO_3)_2 + 4H_2O$

----- "Don't be afraid to fail, be afraid not to try" -----