PROBLEM SOLVING TECHNIQUES OF PHYSICAL CHEMISTRY FOR NEET

BY

JITENDRA HIRWANI

REDOX REACTION

ETOOSINDIA
INDIA'S NO. 1 ONLINE COACHING

Plot No. 38, Near Union Bank of India, Rajeev Gandhi Nagar,
Kota, Rajasthan – 324005 Mob. : 9214233303

BASIC EXERCISE

Oxidation Number

1. In $Ni(CO)_4$, the oxidation state of Ni is :

(1) 4 (2) 0 (3) 2 (4) 8

Ans. **2**

2. Of the following elements, which one has the same oxidation state in all of its compounds ?

(1) Hydrogen (2) Fluorine (3) Carbon (4) Oxygen

Ans. **2**

3. Oxidation number of fluorine in OF_2 is :

(1) +1 (2) +2 (3) –1 (4) –2

Ans. **3**

4. Phosphorus has the oxidation state of +3 in :

(1) Ortho phosphoric acid (2) Phosphorus acid

(3) Meta phosphoric acid (4) Pyrophosphoric acid

Ans. **2**

5. Oxidation state of oxygen in hydrogen peroxide is

(1) –1 (2) +1 (3) 0 (4) –2

Ans. **1**

6. The oxidation number of Pt in $[Pt(C_2H_4)Cl_3]^-$ is :

(1) +1 (2) +2 (3) +3 (4) +4

Ans. **2**

7. Which one of the following statements is not correct?

(1) Oxidation state of S in $(NH_4)_2S_2O_8$ is +6

(2) Oxidation number of Os in OsO_4 is +8

(3) Oxidation state of S in H_2SO_5 is +8

(4) Oxidation number of O in KO_2 is $-\frac{1}{2}$

Ans. **3**

8. Which of the following shows highest oxidation number in combined state :

(1) Os (2) Ru (3) Both (1) and (2) (4) None

Ans. **3**

9. Oxidation state of nitrogen is incorrectly given for :

	Compound	Oxidation State
(1)	$[Co(NH_3)_5Cl]Cl_2$	–3
(2)	NH_2OH	–1
(3)	$(N_2H_5)_2SO_4$	+2
(4)	Mg_3N_2	–3

Ans. **3**

10. Oxidation number of C in HNC is :

(1) +2 (2) –3 (3) +3 (4) Zero

Ans. **1**

11. Oxidation number of Fe in $Fe_{0.94}O$ is :

(1) 200 (2) 200/94 (3) 94/200 (4) None

Ans. **2**

12. Oxidation number of carbon in carbon suboxide (C_3O_2) is :

(1) $\frac{+2}{3}$ (2) $\frac{+4}{3}$ (3) +4 (4) $\frac{-4}{3}$

Ans. **2**

13. Oxidation number of sulphur in $Na_2S_2O_3$ would be :-

(1) +2 (2) +4 (3) –2 (4) 0

Ans. **1**

14. Two oxidation states for chlorine are found in the compound :

(1) $CaOCl_2$ (2) KCl (3) $KClO_3$ (4) Cl_2O_7

Ans. **1**

15.

	Compounds		O.N.
(A)	KMn^*O_4	(1)	+4
(B)	$Ni^*(CO)_4$	(2)	+7
(C)	$[Pt^*(NH_3)Cl_2]Cl_2$	(3)	0
(D)	$Na_2O_2^*$	(4)	–1

The correct code for the O.N. of asterisked atom would be :

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

Ans. **3**

16. –1/3 oxidation state of nitrogen will be obtained in case of :

(1) Ammonia (NH_3) (2) Hydrazoic acid (N_3H)
(3) Nitric oxide (NO) (4) Nitrous oxide (N_2O)

Ans. **2**

17. Compound $YBa_2Cu_3O_7$ is a super conductor. The O.N. of the copper in the compound will be:[O.No. of Y=+3]

(1) +7/3 (2) zero (3) +2 (4) +1

Ans. **1**

18. The oxidation state of iodine in $H_4IO_6^-$ is :-

(1) +7 (2) –1 (3) +5 (4) +1

Ans. **1**

19. Amongst the following, identify the species with an atom in + 6 oxidation state:-

(1) MnO_4^- (2) $Cr(CN)_6^{3-}$ (3) NiF_6^{2-} (4) CrO_2Cl_2

Ans. **1**

20. The oxidation state of + 1 for phosphorous is found in:-

(1) Phosphorous acid (H_3PO_3) (2) Orthophosphoric acid (H_3PO_4)

(3) Hypo phosphorous acid (H_3PO_2) (4) Hypo phosphoric acid ($H_4(P_2O_6)$

Ans. **3**

21. Match List - I (compound) with list - II (Oxidation state of N) and select the correct answer using the codes given below the list:-

List - I	List-II
(A) KNO_3	(a) – 1/3
(B) HNO_2	(b) – 3
(C) NH_4Cl	(c) 0
(D) NaN_3	(d) + 3
	(e) + 5

Codes are:-

	A	B	C	D
(1)	e	d	b	a
(2)	e	b	d	a
(3)	d	e	a	c
(4)	b	c	d	e

Ans. **1**

22. In which of the following pair oxidation number of Fe is same :-

(1) $K_3Fe(CN)_6$, Fe_2O_3 (2) $Fe(CO)_5$, Fe_2O_3

(3) Fe_2O_3, FeO (4)$Fe_2(SO_4)_3$, $K_4Fe(CN)_6$

Ans. **1**

23. In which of the following compounds of Cr, the oxidation number of Cr is not +6 :-

(1) CrO_3 (2) CrO_2Cl_2

(3) Cr_2O_3 (4) $K_2Cr_2O_7$

Ans. **3**

24. Oxidation state of cobalt in $[Co(NH_3)_4(H_2O)Cl]SO_4$ is

(1) 0 (2) +4 (3) –2 (4) +3

Ans. **4**

25. Oxidation number of 'N' in N_3H (hydrazoic acid) is :-

(1) $-\frac{1}{3}$ (2) –3 (3) +3 (4) $+\frac{2}{3}$

Ans. **1**

26. The oxidation number of arsenic atom in H_3AsO_4 is :-

(1) –1 (2) –3 (3) +3 (4) +5

Ans. **4**

27. In substance $Mg(HXO_3)$, the oxidation number of X is :-

(1) 0 (2) +2 (3) +3 (4) +4

Ans. **3**

28. The oxidation number of phosphorus in PH_4^+, PO_2^{3-}, PO_4^{3-} and PO_3^{3-} are respectively :–

(1) –3, +1, +3, +5 (2) –3, +3, +5, +1 (3) +3, –3, +5, +1 (4) –3, +1, +5, +3

Ans. **4**

29. Which of the following compounds are arranged in increasing oxidation number of S :–

(1) $H_2SO_3, H_2S, H_2SO_4, H_2S_2O_3$ (2) $H_2S_2O_3, H_2SO_3, H_2S, H_2SO_4$

(3) $H_2S, H_2SO_3, H_2SO_4, H_2S_2O_3$ (4) $H_2S, H_2S_2O_3, H_2SO_3, H_2SO_4$

Ans. **4**

30. Iodine shows the highest oxidation state in the compound :–

(1) KI (2) KI_3 (3) IF_5 (4) KIO_4

Ans. **4**

31. The sum of the oxidation states of all the carbon atoms present in the compound C_6H_5CHO is :

(1) –4 (2) 3 (3) + 5 (4) – 4/7

Ans. **1**

Application of Redox Reaction

32. The reaction $H_2S + H_2O_2 \rightarrow S + 2H_2O$ manifests :

(1) Oxidising action of H_2O_2 (2) Reducing nature of H_2O_2

(3) Acidic nature of H_2O_2 (4) Alkaline nature of H_2O_2

Ans. **1**

33. In a reaction of H_2O (steam) + C (glowing) $\rightarrow CO + H_2$

(1) H_2O is the reducing agent (2) H_2O is the oxidising agent

(3) carbon is the oxidising agent (4) oxidation-reduction does not occur

Ans. **2**

34. The compound that can work both as an oxidising as well as reducing agent is :

(1) $KMnO_4$ (2) H_2O_2 (3) $Fe_2(SO_4)_3$ (4) $K_2Cr_2O_7$

Ans. **2**

35. Reaction (A) $S^{-2} + 4\,H_2O_2 \rightarrow SO_4^{2-} + 4\,H_2O$

(B) $Cl_2 + H_2O_2 \rightarrow 2HCl + O_2$

The true statement regarding the above reactions is :

(1) H_2O_2 acts as reductant in both the reactions.

(2) H_2O_2 acts as oxidant in reaction (A) and reductant in reaction (B).

(3) H_2O_2 acts as an oxidant in both the reactions.

(4) H_2O_2 acts as reductant in reaction (A) and oxidant in reaction(B)

Ans. **2**

36. A compound contains atoms A, B and C. The oxidation number of A is +2, of B is +5 and of C is –2. The possible formula of the compound is :

(1) ABC_2 (2) $B_2(AC_3)_2$ (3) $A_3(BC_4)_2$ (4) $A_3(B_4C)_2$

Ans. **3**

37. Equivalent weight of N_2 in the change $N_2 \rightarrow NH_3$ is

(1) $\frac{28}{6}$ (2) 28 (3) $\frac{28}{2}$ (4) $\frac{28}{3}$

Ans. **1**

38. In the reaction, $2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$, the eq. wt. of $Na_2S_2O_3$ is equal to its :

(1) Mol. wt. (2) Mol. wt./2 (3) 2 x Mol. wt. (4) Mol. wt./6

Ans. **1**

39. In the reaction, $VO + Fe_2O_3 \rightarrow FeO + V_2O_5$, the eq. wt. of V_2O_5 is equal to its :

(1) Mol. wt. (2) Mol. wt./8 (3) Mol .wt./6 (4) None of these

Ans. **3**

40. The eq. wt. of iodine in, $I_2 + 2S_2O_3^{2-} \rightarrow 2I^- + S_4O_6^{2-}$ is :

(1) Its Mol. wt. (2) Mol. wt./2 (3) Mol. wt./4 (4) None of these

Ans. **2**

41. Molecular weight of $KBrO_3$ is M. What is its equivalent weight, if the reaction is :

$BrO_3^- \rightarrow Br^-$ (acidic medium)

(1) M (2) M/4 (3) M/6 (4) 6M

Ans. **3**

42. In the reaction : $A^{-n_2} + xe^- \rightarrow A^{-n_1}$, here x will be

(1) $n_1 + n_2$ (2) $n_2 - n_1$ (3) $n_1 - n_2$ (4) $n_1 . n_2$

Ans. **3**

43. What would be the equivalent weight of the reductant in the reaction :

$[Fe(CN)_6]^{-3} + H_2O_2 + 2OH^- \rightarrow 2[Fe(CN)_6]^{4-} + 2H_2O + O_2$

[Given : Fe = 56, C = 12, N = 14, O = 16, H = 1]

(1) 17 (2) 212 (3) 34 (4) 32

Ans. **1**

44. The eq. wt. of $Na_2S_2O_3$ as reductant in the reaction, $Na_2S_2O_3 + H_2O + Cl_2 \rightarrow Na_2SO_4 + 2HCl + S$ is :

(1) (Mol. wt.)/1 (2) (Mol. wt.)/2 (3) (Mol. wt.)/6 (4) (Mol. wt.)/8

Ans. **4**

45. Equivalent weight of FeC_2O_4 in the change : $FeC_2O_4 \rightarrow Fe^{3+} + CO_2$ is :

(1) M/3 (2) M/6 (3) M/2 (4) M/1

Ans. **1**

46. Oxidising product of substance Na_3AsO_3 would be

(1) $As_2O_3^{3-}$ (2) AsO_3^{-3} (3) AsO_2^{-4} (4) AsO_4^{-3}

Ans. **4**

47. The equivalent weight of $MnSO_4$ is half of its molecular weight when it is converted to :-

(1) Mn_2O_3 (2) MnO_2 (3) MnO_4^- (4) MnO_4^{-2}

Ans. **2**

48. In which of the following reaction H_2O_2 acts as reducing agent :-

(1) $2FeCl_2 + 2HCl + H_2O_2 \rightarrow 2FeCl_3 + 2H_2O$ (2) $Cl_2 + H_2O_2 \rightarrow 2HCl + O_2$

(3) $2HI + H_2O_2 \rightarrow 2H_2O + I_2$ (4) $H_2SO_3 + H_2O_2 \rightarrow H_2SO_4 + H_2O$

Ans. **2**

49. A sulphur containing species that can not be a reducing agent is :-

(1) SO_2 (2) SO_3^{-2} (3) H_2SO_4 (4) $S_2O_3^{2-}$

Ans. **3**

50. Which one is the oxidising agent in the reaction given below

$2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{-2} + H_2O$

(1) H^+ (2) $Cr_2O_7^{-2}$ (3) Cr^{++} (4) None

Ans. **4**

51. In the following change, $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

If the atomic weight of iron is 56, then its equivalent weight will be :-

(1) 42 (2) 21 (3) 63 (4) 84

Ans. **2**

52. $Cr_2O_7^{-2} + I^- + H^+ \rightarrow Cr^{+3} + I_2 + H_2O$

The equivalent weight of the reductant in the above equation is :– (At. wt. of Cr=52, I=127)

(1) 26 (2) 127 (3) 63.5 (4) 10.4

Ans. **2**

Redox Reaction

53. How many moles of $KMnO_4$ are reduced by 1 mole of ferrous oxalate in acidic medium:-

(1) $\frac{1}{5}$ (2) $\frac{5}{3}$ (3) $\frac{1}{3}$ (4) $\frac{3}{5}$

Ans. **4**

54. The reaction

$2K_2MnO_4 + Cl_2 \rightarrow 2KMnO_4 + 2KCl$ is an example of

(1) Redox (2) Reduction only (3) Neutralization (4) Disproportionation

Ans. **1**

55. Which one of the following is a redox reaction ?

(1) $H_2 + Br_2 \rightarrow 2HBr$ (2) $2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl$

(3) $HCl + AgNO_3 \rightarrow AgCl + HNO_3$ (4) $NaOH + HCl \rightarrow NaCl + H_2O$

Ans. **1**

56. Which of the following is not a redox change ?

(1) $2H_2S + SO_2 \rightarrow 2H_2O + 3S$ (2) $2BaO + O_2 \rightarrow 2BaO_2$

(3) $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$ (4) $2KClO_3 \rightarrow 2KCl + 3O_2$

Ans. **3**

57. In the reaction $4Fe + 3O_2 \rightarrow 4Fe^{3+} + 6O^{2-}$ which of the following statements is incorrect ?

(1) It is a redox reaction (2) Metallic iron is a reducing agent

(3) Fe^{3+} is an oxidising agent (4) Metallic iron is reduced to Fe^{3+}

Ans. **4**

58. In the reaction, $Cl_2 + OH^- \rightarrow Cl^- + ClO_4^- + H_2O$, chlorine is :

(1) Oxidised (2) Reduced

(3) Oxidised as well as reduced (4) Neither oxidised nor reduced

Ans. **3**

59. Which of the following example does not represent disproportionation -

(1) $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$ (2) $2H_2O_2 \rightarrow 2H_2O + O_2$

(3) $4KClO_3 \rightarrow 3KClO_4 + KCl$ (4) $3Cl_2 + 6NaOH \rightarrow 5NaCl + NaClO_3 + 3H_2O$

Ans. **1**

60. The decomposition of $KClO_3$ to KCl and O_2 on heating is an example of :

(1) Intermolecular redox change (2) Intramolecular redox change

(3) Disproportionation or auto redox change (4) None

Ans. **2**

61. Which of the following change represents a disproportionation reaction (s) :

(1) $Cl_2 + 2OH^- \rightarrow ClO^- + Cl^- + H_2O$ (2) $Cu_2O + 2H^+ \rightarrow Cu + Cu^{2+} + H_2O$

(3) $2HCuCl_2 \xrightarrow[\text{Water}]{\text{dilution with}} Cu + Cu^{2+} + 4Cl^- + 2H^+$ (4) All of the above

Ans. **4**

62. One mole of iron [55.8 gm], when oxidised to +2 oxidation state gives up :

(1) $1N_A$ electron (2) $2N_A$ electron

(3) $3N_A$ electron (4) 0.5 mole of electron

Ans. **2**

63. How many electrons should X_2H_4 liberate so that in the new compound X shows oxidation number of $-½$ (E.N. X > H)

(1) 10 (2) 4 (3) 3 (4) 2

Ans. **3**

64. Which of the following reaction represents the oxidising behaviour of H_2SO_4 :-

(1) $2PCl_5 + H_2SO_4 \rightarrow 2POCl_3 + 2HCl + SO_2Cl_2$ (2) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

(3) $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$ (4) $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$

Ans. **4**

65. Which one of the following is not a redox reaction :-

(1) $CaCO_3 \rightarrow CaO + CO_2$ (2) $2H_2 + O_2 \rightarrow 2H_2O$

(3) $Na + H_2O \rightarrow NaOH + \frac{1}{2} H_2$ (4) $MnCl_3 \rightarrow MnCl_2 + \frac{1}{2} Cl_2$

Ans. **1**

Balancing of Redox Reaction

66. In the balanced equation

$MnO_4^- + H^+ + C_2O_4^{2-} \rightarrow Mn^{2+} + CO_2 + H_2O$, the moles of CO_2 formed are :-

(1) 2 (2) 4 (3) 5 (4) 10

Ans. **4**

67. Balance given following half reaction for the unbalanced whole reaction :

$CrO_4^{2-} \rightarrow CrO_2^- + OH^-$ is :

(1) $CrO_4^{-2} + 2H_2O + 3e^- \rightarrow CrO_2^- + 4OH^-$ (2) $2CrO_4^{-2} + 8H_2O \rightarrow CrO_2^- + 4H_2O + 8OH^-$

(3) $CrO_4^{-2} + H_2O \rightarrow CrO_2^- + H_2O + OH^-$ (4) $3CrO_4^{-2} + 4H_2O + 6e^- \rightarrow 2CrO_2^{-1} + 8OH^-$

Ans. **1**

68. Choose the set of coefficients that correctly balances the following equation :

$x\ Cr_2O_7^{2-} + yH^+ + z\ e^- \rightarrow a\ Cr^{+3} + + bH_2O$

	x	y	z	a	b
(1)	2	14	6	2	7
(2)	1	14	6	2	7
(3)	2	7	6	2	7
(4)	2	7	6	1	7

Ans. **2**

69. In the reaction: $MnO_4^- + xH^+ + ne^- \rightarrow Mn^{2+} + yH_2O$

What is the value of n :

(1) 5 (2) 8 (3) 6 (4) 3

Ans. **1**

70. The number of electrons required to balance the following equation –

$NO_3^- + 4H^+ + e^- \longrightarrow 2H_2O + NO$ is

(1) 5 (2) 4 (3) 3 (4) 2

Ans. **3**

71. The molar mass of $CuSO_4.5\ H_2O$ is 249. Its equivalent mass in the reaction (a) and (b) would be

(a) Reaction $CuSO_4 + KI \rightarrow$ product

(b) Electrolysis of $CuSO_4$ solution.

(1) (a) 249 (b) 249 (2) (a) 124.5 (b) 124.5 (3) (a) 249 (b) 124.5 (4) (a) 124.5 (b) 249

Ans. **3**

72. $2KMnO_4 + 5H_2S + 6H^+ \rightarrow 2Mn^{2+} + 2K^+ + 5S + 8H_2O$. In the above reaction, how many electrons would be involved in the oxidation of 1 mole of reductant?

(1) Two (2) Five (3) Ten (4) One

Ans. **1**

73. The value of *n* in : $MnO_4^- + 8\ H^+ + ne \rightarrow Mn^{2+} + 4\ H_2O$ is

(1) 5 (2) 4 (3) 3 (4) 2

Ans. **1**

74. For the redox reaction

$Zn + NO_3^- \rightarrow Zn^{2+} + NH_4^+$ in basic medium, coefficients of Zn, NO_3^- and OH^- in the balanced equation respectively are :

(1) 4, 1, 7 (2) 7, 4, 1 (3) 4, 1, 10 (4) 1, 4, 10

Ans. **3**

75. In the following reaction the value of 'X' is

$H_2O + SO_3^{2-} \rightarrow SO_4^{2-} + 2H^+ + X$

(1) $4e^-$ (2) $3e^-$ (3) $2e^-$ (4) $1e^-$

Ans. **3**

ANALATYCICAL EXERCISE

1. The ratio of number of moles of $KMnO_4$ and $K_2Cr_2O_7$ required to oxidise 0.1 mol Sn^{2+} to Sn^{+4} in acidic medium

(1) 6 : 5 (2) 5 : 6 (3) 1 : 2 (4) 2 : 1

Ans. **(1)**

2. $Cl_2 \xrightarrow{NaOH} NaCl + NaClO_3 + H_2O$

The equivalent mass of Cl_2 in the above reaction is

(1) M (2) $\frac{M}{3}$ (3) $\frac{M}{2}$ (4) $\frac{3M}{5}$

Ans. **(4)**

3. KCl is used as an electrolyte in salt bridge because

(1) K^+ and Cl^- are isoelectronic (2) Monovalent ions are required

(3) Both the ions have almost same velocity (4) They are having similar size

Ans. **(3)**

4. EMF of the given cell, $A_{(s)} \mid A^{2+}_{(aq)} \parallel B^{2+}_{(aq)} \mid B_{(s)}$

Given $E^{o}_{A/A^{2+}} : +1.4V$ and $E^{o}_{B/B^{2+}} : -1.4V$

(1) 2.8 V (2) 1.8 V (3) 0 V (4) – 1.8 V

Ans. **(1)**

5. Electrode potential depends upon

(1) Size of electrode (2) Surface area of electrode

(3) Temperature (4) Shape of electrode

Ans. **(3)**

6. Oxidation number of Cr atom in CrO_5 and K_3CrO_8 respectively

(1) +6 , +6 (2) +5, +6 (3) +6, +5 (4) +5, +5

Ans. **(3)**

7. Number of electrons involved in the reaction when 0.1 mol NH_3 dissolved in water

(1) 2 (2) 0.4 (3) 0.9 (4) Zero

Ans. **(4)**

8. $\frac{1}{2}F_2 + e^- \longrightarrow F^-$ $E° = +3.02$ V

Electrode potential for given reaction

$F_2 + 2e^- \rightarrow 2F^-$

(1) 3.02 V (2) 6.04 V (3) 1.5 V (4) –3.02 V

Ans. **(1)**

9. Three metals A, B and C are arranged in increasing order of standard reduction electrode potential, hence their chemical reactivity order will be

(1) A < B < C (2) A > B > C (3) B > C > A (4) A = B = C

Ans. **(2)**

10. Find the incorrect statement

(1) Higher reduction potential of non-metal means stronger reducing agent

(2) Lower oxidation potential of a metal means strong oxidising agent

(3) Oxidation state of oxygen in O_3 is –1

(4) All of these

Ans. **(4)**

11. When an alkali metal is reacted with hydrogen then metallic hydride is formed. In this reaction

(1) Hydrogen is oxidised

(2) Hydrogen is reduced

(3) Hydrogen is neither oxidised nor reduced

(4) Hydrogen is oxidised as well as reduced

Ans. **(2)**

12. In case of CH_3COOH, the oxidation number of carbon of carboxylic group is

(1) –3 (2) Zero (3) +1 (4) +3

Ans. **(4)**

13. How many moles of $KMnO_4$ are required to oxidise one mole of $SnCl_2$ in acidic medium ?

(1) $\frac{1}{5}$ (2) $\frac{2}{5}$ (3) $\frac{3}{5}$ (4) $\frac{4}{5}$

Ans. **(2)**

14. Which compound acts as oxidising agent only ?

(1) SO_2 (2) H_2S (3) H_2SO_4 (4) HNO_2

Ans. **(3)**

15. The average oxidation state of chlorine in bleaching powder is

(1) –1 (2) +1 (3) Zero (4) –2 as well as +2

Ans. **(3)**

16. When benzaldehyde is oxidised to give benzoic acid then the oxidation state of carbon of aldehydic group is changed from

(1) +2 to +3 (2) +1 to +3 (3) Zero to +2 (4) No change

Ans. **(2)**

17. Which of the following is incorrect regarding salt bridge solution ?

(1) Solution must be a strong electrolyte

(2) Solution should be inert towards both electrodes

(3) Size of cations and anions of salt should be much different

(4) Salt bridge solution is prepared in gelatin or agar-agar to make it semi-solid

Ans. **(3)**

18. Standard electrode potentials of redox couples A^{2+}/A, B^{2+}/B, C/C^{2+} and D^{2+}/D are 0.3 V, –0.5 V, –0.75 V and 0.9 V respectively. Which of these is best oxidising agent and reducing agent respectively ?

(1) D^{2+}/D and B^{2+}/B (2) B^{2+}/B and D^{2+}/D (3) D^{2+}/D and C^{2+}/C (4) C^{2+}/C and D^{2+}/D

Ans. **(1)**

19. The number of moles of H_2O_2 required to completely react with 400 ml of 0.5 N $KMnO_4$ in acidic medium are

(1) 0.1 (2) 0.2 (3) 1.0 (4) 0.5

Ans. **(1)**

20. $Cl_2(g) + XOH \rightarrow YClO_3^- + ZH_2O + 10e^-$

The coefficient X, Y and Z are

(1) 6, 2, 2 (2) 5, 1, 3 (3) 12, 2, 6 (4) 12, 1, 6

Ans. **(3)**

21. In the reaction $CH_3OH \rightarrow HCOOH$, the number of electrons that must be added to the right is :-

(1) 4 (2) 3 (3) 2 (4) 1

Ans. **1**

22. Which statement is wrong :–

(1) Oxidation number of oxygen is +1 in peroxides

(2) Oxidation number of oxygen is +2 in oxygen difluoride

(3) Oxidation number of oxygen is $-\frac{1}{2}$ in superoxides

(4) Oxidation number of oxygen is –2 in most of its compound

Ans. **1**

23. In the reaction $8Al + 3Fe_3O_4 \rightarrow 4Al_2O_3 + 9Fe$, the number of electrons transferred from reductant to oxidant is :-

(1) 8 (2) 4 (3) 16 (4) 24

Ans. **4**

24. In which of the following reaction hydrogen is acting as an oxidising agent :-

(1) With iodine to give hydrogen iodide

(2) With lithium to give lithium hydride

(3) With nitrogen to give ammonia

(4) With sulphur to give hydrogen sulphide

Ans. **2**

25. Oxidation number of Xe in XeF_5^- is :

(1) +1 (2) +2 (3) +3 (4) +4

Ans. **4**

26. Which is the best description of the behaviour of bromine in the reaction given below :-

$H_2O + Br_2 \rightarrow HOBr + HBr$

(1) Both oxidized and reduced (2) Oxidized only

(3) Reduced only (4) Proton acceptor only

Ans. **1**

27. In the following reaction

$2FeCl_3 + H_2S \longrightarrow 2FeCl_2 + 2HCl + S$

(1) $FeCl_3$ is oxidant (2) $FeCl_3$ & H_2S are oxidised

(3) $FeCl_3$ is oxidised & H_2S is reduced (4) None of these

Ans. **1**

28. Consider the following reaction

$xMnO_4^- + yC_2O_4^{-2} + zH^+ \rightarrow xMn^{+2} + 2y\ CO_2 + z/2\ H_2O$. The values of x, y, z in the reaction are

(1) 2, 5, 16 (2) 16, 5, 2 (3)2, 16, 5 (4) 5, 2, 16

Ans. **1**

29. Which of the following act both as oxidant & reductant :–

(1) H_2S (2) SO_3 (3) H_2O_2 (4) F_2

Ans. **3**

30. Which of the following reaction is spontaneous oxidation–reduction reaction

(1) $Mn^{+2} + 5Fe^{+3} + 4H_2O \rightarrow MnO_4^- + 5Fe^{+2} + 8H^+$

(2) $MnO_4^- + 5Fe^{+3} + 8H^+ \rightarrow Mn^{+2} + 5Fe^{+2} + 4H_2O$

(3) $MnO_4^- + 5Fe^{+2} + 8H^+ \rightarrow Mn^{+2} + 5Fe^{+3} + 4H_2O$

(4) $Mn^{+2} + 5Fe^{+2} + 4H_2O \rightarrow MnO_4^- + 5Fe^{+3} + 8H^+$

Ans. **3**

31. In Redox reaction :

$Fe + HNO_3 \rightarrow Fe(NO_3)_2 + NH_4NO_3 + H_2O$

the coefficient of HNO_3, $Fe(NO_3)_2$, NH_4NO_3 is :-

(1) 1 : 10 : 4 (2) 10 : 4 : 1 (3) 4 : 10 : 1 (4) 10 : 1 : 4

Ans. **2**

32. From the following statements regarding H_2O_2 choose the incorrect statement.

(1) It can act only as an oxidising agent.

(2) It decomposed on exposure to light.

(3) It has to be stored in plastic or wax lined glass bottles in dark.

(4) It has to be kept away from dust.

Ans. **(1)**

33. In which of the following reactions, hydrogen peroxide acts as an oxidizing agent ?

(1) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$ (2) $I_2 + H_2O + 2OH^- \rightarrow 2I^- + 2H_2O + O_2$

(3) $PbS + 4H_2O \rightarrow PbSO_4 + 4H_2O$ (4) $2MnO_4 + 3O_2 + 2H_2O + 2OH^-$

Ans. **(3)**

34. Which of the following reactions is an example of a redox reaction ?

(1) $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$ (2) $XeF_2 + PF_5 \rightarrow [XeF]^+ PF_6^-$

(3) $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$ (4) $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

Ans. **(1)**

35. Consider the reaction

$$H_2SO_{3(aq)} + Sn^{4+}_{(aq)} H_2O_{(l)} \rightarrow Sn^{2+}_{(aq)} + HSO^-_{4(aq)} + 3H^+_{(aq)}$$

Which of the following statements is correct?

(1) H_2SO_3 is the reducing agent because it undergoes oxidation

(2) H_2SO_3 is the reducing agent because it undergoes reduction

(3) Sn^{4+} is the reducing agent because it undergoes oxidation

(4) Sn^{4+} is the oxidizing agent because it undergoes oxidation

Ans. **(1)**

36. How many electrons are involved in the following redox reaction ?

$Cr_2O_7^{2-} + Fe^{2+} + C_2O_4^{2-} \rightarrow Cr^{3+} + Fe^{3+} + CO_2$ (Unbalanced)

(1) 3 (2) 4 (3) 5 (4) 6

Ans. **(4)**

37. In the standardisation of $Na_2S_2O_3$ using $K_2Cr_2O_7$ by iodometry, the equivalent weight of $K_2Cr_2O_7$ is

(1) (Molecular weight) / 2 (2) (Molecular weight) / 6

(3) (Molecular weight) / 3 (4) Same as molecular weight

Ans. **(B)**

38. In basic medium I^- oxidises by MnO_4^-. In this process I^- replaces by :

(1) IO_3^- **(2)** I_2 **(3)** IO_4^- **(4)** IO^-

Ans. **(1)**

39. The oxidation number of Mn in the product of alkaline oxidative fusion of MnO_2 is :

(1) 2 (2) 4 (3) 6 (4) 8

Ans. **(1)**

40. Hydrogen peroxide in its reaction with KIO_4 and NH_2OH respectively, is acting as a

(1) reducing agent, oxidising agent **(2)** reducing agent, reducing agent

(3) oxidising agent, oxidising agent. **(4)** oxidising agent, reducing agent

Ans. **(1)**

7. **Assertion :–** In NH_4NO_3, the oxidation number of the two N-atoms is not equal.
Reason :– One N atom is present in the ammonium ion while the other is present in the nitrate ion.
Ans. **A**

8. **Assertion :–** Oxidation state of Hydrogen is +1 in H_2O while –1 in CaH_2.
Reason :– CaH_2 is a metal hydride and for metal hydrides, hydrogen is assigned the oxidation number of –1.
Ans. **A**

9. **Assertion :–** Oxidation number of carbon in CH_2O is zero.
Reason :– CH_2O (formaldehyde) is a covalent compound.
Ans. **B**

10. **Assertion :–** Nitrous acid (HNO_2) may act as an oxidising agent as well as a reducing agent.
Reason :– The oxidation number of Nitrogen remains same in all the compounds.
Ans. **C**

11. **Assertion :–** Oxidation number of Ni in $[Ni(CO)_4]$ is zero.
Reason :– Nickel is bonded to neutral ligand, carbonyl.
Ans. **A**

12. **Assertion :–** A reducing agent is a substance which accepts electron.
Reason :– A substance which helps in oxidation is known as reducing agent.
Ans. **D**

13. **Assertion :–** Bromide ion is serving as a reducing agent in the reaction.
$2MnO^-_4(aq.) + Br^-(aq.) + H_2O \longrightarrow 2MnO_2(aq.) + BrO^-_3(aq.) + 2OH^-(aq.)$
Reason :– Oxidation number of Br increases from –1 to +5.
Ans. **A**

14. **Assertion :–** Equivalent weight of NH_3 in the reaction $N_2 \rightarrow NH_3$ is 17/3 while that of N_2 is 28/6.
Reason :– Equivalent weight $= \dfrac{\text{Molecular weight}}{\text{number of } e^- \text{ lost or gained/ mole}}$
Ans. **A**

15. **Assertion :–** In acidic medium, equivalent weight of $K_2Cr_2O_7$ is equal to 294/6.
Reason :– In acidic medium, $Cr_2O_7^{-2}$ is reduced in Cr^{+3}.
Ans. **A**

16. **Assertion :–** In a redox reaction, the oxidation number of the oxidant decreases while that of reductant increases.
Reason :– Oxidant gains electron(s) while reductant loses electron(s).
Ans. **A**

17. **Assertion :–** H_2SO_4 can not act as reducing agent.
Reason :– Sulphur can not increase its oxidation number beyond +6.
Ans. **A**

18. **Assertion :–** In $HClO_4$, Chlorine has the oxidation number of +4.
Reason :– $HClO_4$ (perchloric) acid has two peroxide linkages.
Ans. **D**

19. **Assertion :–** Oxidation number of S in HSO_3^- is +4.

Reason :– Sulphur is in different oxidation state in different compounds.

Ans. **B**

20. **Assertion :–** Oxidation number of Carbon in all it's compounds is +4.

Reason :– An element has a fixed oxidation state.

Ans. **D**

21. **Assertion :–** H_2 is the reducing agent and Cl_2 is reduced in the reaction.

$H_2 + Cl_2 \longrightarrow 2HCl$

Reason :– Reducing agent is the one which has been oxidised and decrease of oxidation number means reduction.

Ans. **A**

22. **Assertion :–** MnO_4^- is always reduced to Mn^{+2}.

Reason :– Decrease in oxidation number or gaining of electron means oxidation.

Ans. **D**

23. **Assertion :–** $KClO_3 \longrightarrow KClO_4 + KCl$

This is a disproportionation type reaction.

Reason :– The reaction in which one substance oxidise or reduce is known as disproportionation reaction.

Ans. **C**

24. **Assertion :–** Oxidation number of Cr in CrO_5 is +6.

Reason :– In CrO_5, four oxygen atoms are involved in peroxide linkage.

Ans. **A**

25. **Assertion :–** Oxidation number of Cr in $Cr(CO)_6$ is zero.

Reason :– Cr is a metal.

Ans. **B**

26. ***Assertion :–*** Cr^{+2} is a reducing agent and Mn^{+3} is oxidising agent.
Reason :– Mn^{+3} has d^5 configuration.

Ans. **C**

27. ***Assertion :-*** The formal oxidation no. of sulphar in $Na_2S_4O_6$ is 2.5 **[AIIMS-2011]**

Reason :- Two S-atoms are not directly linked with O-atoms

Ans. **A**