8.REDOX REACTIONS

Single Correct Answer Type

1. Which among the following shows maximum oxidation state?
a) V b) Fe c) Mn d) Cr
2. A substance, that by its sharp colour change indicates the completion of reaction is known as :
a) Acid b) Base c) Indicator d) None of these
3. In the reaction, $CH_3OH \longrightarrow HCOOH$, the number of electrons that must be added to the right is:
a) 4 b) 3 c) 2 d) 1
4. A solution of $KMnO_4$ is reduced to MnO_2. The normality of solution is 0.6. The molarity is:
a) 1.8 M b) 0.6 M c) 0.1 M d) 0.2 M
5. In the reaction of O_3 and H_2O_2, the later acts as :
a) Oxidising agent
b) Reducing agent
c) Bleaching agent
d) Both oxidising and bleaching agent
6. Of the following reactions, only one is a redox reaction. Identify this reaction.
a) $Ca(OH)_2 + 2HCl \longrightarrow CaCl_2 + 2H_2O$
b) $2S_2O_7^{2-} + 2H_2O \longrightarrow 2SO_4^{2-} + 4H^+$
c) $BaCl_2 + MgSO_4 \longrightarrow BaSO_4 + MgCl_2$
d) $Cu_2S + 2FeO \longrightarrow 2Cu + 2Fe + SO_2$
7. Reductants are substances which :
a) Show an increase in their oxidation number during a change
b) Lose electrons during a change
c) Reduce others and oxidise themselves
d) All of the above
8. In the equation, $SnCl_2 + 2HgCl_2 \longrightarrow Hg_2Cl_2 + SnCl_4$. The equivalent weight of stannous chloride (molecular weight = 190) will be :
a) 190 b) 95 c) 47.5 d) 154.5
9. The oxoacid which acts both as oxidising and reducing agent is :
a) H_2SO_4 b) H_3PO_4 c) HNO_2 d) $HClO_4$
10. Oxidation state of oxygen is -1 in the compound :
a) NO_2 b) MnO_2 c) PbO_2 d) Na_2O_2
11. When sulphur dioxide is passed in an acidified $K_2Cr_2O_7$ solution, the oxidation state of sulphur is changed from
a) 4 to 0 b) 4 to 2 c) 4 to 6 d) 6 to 4
12. Reduction is a process which involves :
a) Electronation
b) Addition of hydrogen or removal of oxygen
c) Addition of metal or removal of non-metal
d) All of the above
13. The number of electrons lost or gained during the change $Fe + H_2O \rightarrow Fe_3O_4 + H_2$ is
a) 2 b) 4 c) 6 d) 8
14. A group of methods of quantitative chemical analysis involving the measurement of volume of reacting substance is known as :
a) Gravimetric analysis b) Volumetric analysis c) Both (a) and (b) d) None of the above
15. Which one of the following reaction is possible at anode?
a) $F_2 + 2e^- \longrightarrow 2F^-$
b) $2H^+ + \frac{1}{2}O_2 + 2e^- \longrightarrow H_2O$
c) $2Cr^{3+} + 7H_2O \longrightarrow Cr_2O_7^{2-} + 14H^+ + 6e^-$
d) $Fe^{2+} \longrightarrow Fe^{3+} + e^-$
16. The anion nitrate is converted into ammonium ion. The equivalent mass of nitrate ion in the reaction would be:

a) 6.20 b) 7.75 c) 10.5 d) 21.0

17. WI ich acts as a reducing agent?
a) HNO_3 b) $KMnO_4$ c) H_2SO_4 d) $(COOH)_2$

18. What weight of HNO_3 is needed to convert 5 g I_2 into HIO_3, $HNO_3 \longrightarrow NO$?
a) 4.13 g b) 24.8 g c) 6.2 g d) 10.2 g

19. When SO_2 is passed in acidified potassium dichromate solution, the oxidation state of S is changed from :
a) + 4 to 0 b) +4 to +2 c) +4 to +6 d) +6 to +4

20. Among the properties given below, the set of properties shown by CN^- ion towards metal species is :
1. Reducing; 2. Oxidising ; 3. Complexation
a) 1, 3 b) 1, 2, 3 c) 1, 2 d) 2, 3

21. Solution of sodium metal in liquid NH_3 is strongly reducing due to the presence of :
a) Sodium atoms b) Solvated electrons c) NaOH d) Sodium amide

22. Oxidation numbers of Fe in Fe_3O_4 are :
a) +2 and +3 b) +1 and +2 c) +1 and +3 d) None of these

23. It is found that V forms a double salt isomorphous with Mohr's salt. The oxidation number of V in this compound is :
a) + 3 b) + 2 c) + 4 d) −4

24. MnO_4^- is a good oxidising agent in different medium changing to
$MnO_4^- \longrightarrow Mn^{2+}$
$\longrightarrow MnO_4^{2-}$
$\longrightarrow MnO_2$
$\longrightarrow Mn_2O_3$
Changes in oxidation number respectively are
a) 1,3,4,5 b) 5,4,3,2 c) 5,1,3,4 d) 2,6,4,3

25. The oxidation number of Ba in barium peroxide is :
a) +2 b) −1 c) +4 d) +6

26. Strongest reducing agent among the following is :
a) K b) Mg c) Al d) Ba

27. The eq. wt. of $Na_2S_2O_3$ as reductant, in the reaction, $Na_2S_2O_3 + 5H_2O + 4Cl_2 \longrightarrow 2NaHSO_4 + 8HCl$:
a) (Mol. wt.)/1 b) (Mol. wt.)/2 c) (Mol. wt.)/6 d) (Mol. wt.)/8

28. When Fe metal is rusted then Fe is :
a) Oxidised b) Reduced c) Hydrolysed d) Precipitated

29. The value of n in $MnO_4^- + 8H^+ + ne^- \rightarrow Mn^{2+} + 4H_2O$ is
a) 5 b) 4 c) 2 d) 3

30. In nitric oxide (NO), the oxidation state of nitrogen is :
a) −2 b) +1 c) −1 d) +2

31. Reaction of acidified $KMnO_4$ with ferrous oxalate gives oxidation products containing :
a) Fe^{3+} b) CO_2 c) Both (a) and (b) d) None of these

32. How many litre a 0.5 N solution of an oxidising agent are reduced by 2 litre of 2.0 N solution of a reducing agent?
a) 8 litre b) 4 litre c) 6 litre d) 7 litre

33. In which of the following oxygen shows −1 oxidation state?
a) H_2O_2 b) CO_2 c) H_2O d) OF_2

34. The coefficients of I^-, IO_3^- and H^+ in the redox reaction, $I^- + IO_3^- + H^+ \rightarrow I_2 + H_2O$ in the balanced form respectively are
a) 5, 1, 6 b) 1, 5, 6 c) 6, 1, 5 d) 5, 6, 1

35. Which compound shows highest oxidation number for chlorine?
a) HCl b) KClO c) $KClO_3$ d) $KClO_4$

36. The number of Fe^{2+} ion oxidised by one mole of MnO_4^- ions is :
a) 1/5 b) 2/3 c) 5 d) 3/2

37. 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

38. The equivalent weight of iron in Fe_2O_3 would be :
a) 18.6 b) 28 c) 56 d) 11

39. Oxidation number of carbon in carbon suboxide is :
a) $+\frac{2}{3}$ b) $+\frac{4}{3}$ c) +4 d) $-\frac{4}{3}$

40. Volumetric estimation of $CuSO_4$ using hypo as intermediate solution along with KI solution and starch as indicator is an example of :
a) Redox titration b) Acid-base titration c) Precipitation titration d) None of these

41. Oxidation state of oxygen in H_2O_2 is
a) -1 b) $+2$ c) $+\frac{1}{2}$ d) -2

42. Which reaction indicates the oxidising behavior of H_2SO_4?
a) $2PCl_5 + H_2SO_4 \longrightarrow 2POCl_3 + 2HCl + SO_2Cl_2$
b) $2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$
c) $NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$
d) $2HI + H_2SO_4 \longrightarrow I_2 + SO_2 + 2H_2O$

43. HCO_3^- contains carbon in the oxidation state:
a) +5 b) +1 c) +4 d) zero

44. Oxidation state of oxygen atom in potassium superoxide (KO_2) is :
a) $-1/2$ b) Zero c) $+1/2$ d) -2

45. Which of the following reaction involves oxidation and reduction?
a) $NaBr + HCl \longrightarrow NaCl + HBr$ b) $HBr + AgNO_3 \longrightarrow AgBr + HNO_3$
c) $H_2 + Br_2 \longrightarrow 2HBr$ d) $Na_2O + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O$

46. The number of mole of oxalate ions oxidized by one mole of MnO_4^- ion is:
a) 1/5 b) 2/5 c) 5/2 d) 5

47. The number of mole of $KMnO_4$ that will be needed to react completely with one mole of ferrous oxalate in acidic solution is :
a) 3/5 b) 2/5 c) 4/5 d) 1

48. Equivalent mass of IO_4^- when it is converted to I_2 in acid medium :
a) $M/6$ b) $M/7$ c) $M/5$ d) $M/4$

49. The eq. wt. of Fe_3O_4 in , $Fe_3O_4 + KMnO_4 \longrightarrow Fe_2O_3 + MnO_2$ is:
a) $M/6$ b) M c) $2M$ d) $M/3$

50. What volume of 3 molar HNO_3 is needed to oxidise 8 g of Fe^{2+} to Fe^{3+}? HNO_3, gets converted to NO :
a) 8 mL b) 16 mL c) 32 mL d) 64 mL

51. Which ordering of compounds is according to the decreasing order of the oxidation state of nitrogen?
a) HNO_3, NO, NH_4Cl, N_2 b) HNO_3, NO, N_2, NH_4Cl c) HNO_3, NH_4Cl, NO, N_2 d) NO, HNO_3, NH_4Cl, N_2

52. The oxidation states of iodine in HIO_4, H_3IO_5 and H_5IO_6 are respectively
a) +1,+3,+7 b) +7,+7,+3 c) +7,+7,+7 d) +7,+5,+3

53. In which reaction H_2O_2 acts as a reducing agent?
a) $Ag_2O + H_2O_2 \longrightarrow 2Ag + H_2O + O_2$
b) $2KI + H_2O_2 \longrightarrow 2KOH + I_2$
c) $PbS + 4H_2O_2 \longrightarrow PbSO_4 + 4H_2O$
d) $H_2O_2 + SO_2 \longrightarrow H_2SO_4$

54. In the reaction ; $2Ag + 2H_2SO_4 \longrightarrow Ag_2SO_4 + 2H_2O + SO_2$, H_2SO_4 act as :
a) Oxidising agent b) Reducing agent c) Dehydrating agent d) None of these

55. Oxidants are substances which :
a) Show a decrease in their oxidation number during a change
b) Gain electrons during a change
c) Oxidise others and reduce themselves

d) All of the above

56. One gas bleaches the colour of the flowers by reduction while the other by oxidation. The gases are :

a) CO, Cl_2 b) H_2S, Br_2 c) SO_2, Cl_2 d) NH_3, SO_3

57. 5 g of a sample of bleaching powder is treated with excess acetic acid and KI solution. The liberated I_2 required 50 mL of $N/10$ hypo. The percentage of available chlorine in the sample is :

a) 3.55 b) 7.0 c) 35.5 d) 28.2% Cl_2

58. The oxidation number of iodine in IF_5 is :

a) +5 b) −5 c) −1 d) +1

59. The eq. wt. of FeC_2O_4 in , $FeC_2O_4 \longrightarrow Fe^{3+} + 2CO_2$ is :

a) its mol. wt. b) mol. wt./3 c) mol. wt./4 d) None of these

60. Moles of H_2O_2 required for decolorizing 1 mole of acidified $KMnO_4$ are :

a) 1/2 b) 3/2 c) 5/2 d) 7/2

61. Oxidation number of sulphur in Caro's acid is

a) +6 b) +4 c) +8 d) +7

62. The equivalent weight of a reductant or an oxidant is given by :

a) $\text{Eq. wt.} = \dfrac{\text{mol. weight of reductatn or oxidant}}{\text{no. of electrons lost or gained by 1 molecule of reductant or oxidant}}$

b) $\text{Eq. wt.} = \dfrac{\text{mol. wt.}}{\text{valence}}$

c) $\text{Eq. wt.} = \dfrac{\text{mol. wt.}}{\text{total charge on cation or anion}}$

d) All of the above

63. In presence of dil. H_2SO_4. The equivalent weight of $KMnO_4$ is :

a) 1/5 of its molecular weight

b) 1/6 of its molecular weight

c) 1/10 of its molecular weight

d) 1/2 of its molecular weight

64. Respiration is :

a) Oxidation b) Reduction c) Both (a) and (b) d) None of these

65. $aK_2Cr_2O_7 + bKCl + cH_2SO_4 \longrightarrow xCrO_2Cl_2 + yKHSO_4 + zH_2O$.

The above equation balances when

a) $a = 2, b = 4, c = 6$ and $x = 2, y = 6, z = 3$

b) $a = 4, b = 2, c = 6$ and $x = 6, y = 2, z = 3$

c) $a = 6, b = 4, c = 2$ and $x = 6, y = 3, z = 2$

d) $a = 1, b = 4, c = 6$ and $x = 2, y = 6, z = 3$

66. Which of the following shows highest ox, no. in combined state?

a) Os b) Ru c) Both (a) and (b) d) None of these

67. The oxidation number of sulphur in $H_2S_2O_8$ is :

a) +2 b) +6 c) +7 d) +14

68. In the following reaction

$M^{x+} + MnO_4 \quad MO_3 + Mn^{2+} + \frac{1}{2}O_2,$

If one mole of MnO_4 oxidises 2.5 moles of M^{x+} then the value of x is

a) 5 b) 3 c) 4 d) 2

69. What volume of N $K_2Cr_2O_7$ solution is required to oxidise (in acid solution) a solution containing 10 g of $FeSO_4$? (mol.wt.of $FeSO_4 = 152$)

a) 65.78 mL b) 134 mL c) 35 mL d) 33.5 mL

70. Bleaching action of chlorine in presence of moisture is :

a) Reduction b) Oxidation c) Hydrolysis d) substitution

71. A mixture of potassium chlorate, oxalic acid and sulphuric acid and sulphuric acid is heated. During the

reaction which element undergoes maximum change in the oxidation number?
a) Cl
b) C
c) S
d) H

72. Stannous chloride gives a white precipitate with a solution of mercuric chloride. In this process mercuric chloride is :
a) Oxidized
b) Reduced
c) Converted into a complex compound containing Sn and Hg
d) Converted into a chloro complex of Hg

73. In the titration of $CuSO_4$ *vs*. Hypo in presence of KI, which statement is wrong?
a) It is iodometric titration
b) I_2 with starch gives blue colour
c) $CuSO_4$ is reduced to white Cu_2I_2 during redox change
d) The solution before titration, on addition of KI appears blue

74. Manganese acts as strongest oxidising agent in the oxidation state
a) +7 b) +2 c) +4 d) +5

75. The value of $'n'$ in the reaction
$Cr_2O_7^{2-} + 14H^+ + nFe^{2+} \longrightarrow 2Cr^{3+} + nFe^{3+} + 7H^2O$
will be
a) 2 b) 3 c) 6 d) 7

76. In a reaction 4 mole of electrons are transferred to one mole of HNO_3 when it acts as an oxidant. The possible reduction product is :
a) (1/2) mole N_2 b) (1/2) mole N_2O c) 1 mole of NO_2 d) 1 mole NH_3

77. The oxidation number of phosphorus in PO_4^{3-}, P_4O_{10} and $P_2O_7^{4-}$ is :
a) +3 b) +2 c) −3 d) +5

78. In the equation ,
$CrO_4^2 \; + SO_3^2 \qquad Cr(OH)_4 + SO_4^2$
the oxidation number of Cr changes from
a) 6 to 4 b) 6 to 3 c) 8 to 4 d) 4 to 3

79. 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 + 6 b) +5, +6 and +6 c) +3, +6 and +5 d) +5, +3 and +6

80. In alkaline condition $KMnO_4$ reacts as follows,
$2KMnO_4 + 2KOH \longrightarrow 2K_2MnO_4 + H_2O + O$
Therefore, its equivalent weight will be :
a) 31.6 b) 52.7 c) 79.0 d) 158.0

81. Oxidation number of S in SO_4^{2-}
a) +6 b) +3 c) +2 d) −2

82. Which of the following is redox reaction?
a) $N_2O_5 + H_2O \longrightarrow 2HNO_3$
b) $AgNO_3 + KI \longrightarrow AgI + KNO_3$
c) $BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$
d) $SnCl_2 + HgCl_2 \longrightarrow SnCl_4 + Hg$

83. In which of the following compounds, the oxidation number of iodine is fractional?
a) IF_3 b) IF_5 c) I_3^- d) IF_7

84. The oxidation number of Cl in $KClO_3$ is :
a) +5 b) −5 c) +3 d) −3

85. The oxidation number of oxygen in KO_3, Na_2O_2 is
a) 3,2 b) 1,0 c) 0,1 d) −0.33,−1

86. In the reaction, $I_2 + 2S_2O_3^{2-} \longrightarrow 2I^- + S_4O_6^{2-}$, Equivalent weight of iodine will be equal to:
a) Its molecular weight
b) 1/2 of its molecular weight
c) 1/4 of its molecular weight
d) Twice the molecular weight

87. The maximum oxidation number of transition metals may be:
a) +4 b) +6 c) +8 d) +10

88. The ratio of amounts of H_2S needed to precipitate all the metal ions from 100 mL 1M $AgNO_3$ and 100 mL of 1M $CuSO_4$ is :
a) 1 : 2 b) 2 : 1 c) Zero d) infinite

89. Oxidation state of sulphur in $Na_2S_2O_3$ and $Na_2S_4O_6$
a) 4 and 6 b) 3 and 5 c) 2 and 2.5 d) 6 and 6

90. Number of K^+ ions and mole of K^+ ions present in 1 litre of $\frac{N}{5}$ $KMnO_4$ acidified solution respectively are :
a) 0.04 and 2.4×10^{22}
b) 2.4×10^{22} and 0.04
c) 200 and 6.023×10^{23}
d) 6.023×10^{23} and 200

91. Conversion of $PbSO_4$ to PbS is :
a) Reduction of S b) Oxidation of S c) Dissociation d) None of these

92. Which change requires a reducing agent?
a) $CrO_4^{2-} \longrightarrow CrO_7^{2-}$ b) $BrO_3^- \longrightarrow BrO^-$ c) $H_2O_2 \longrightarrow O_2$ d) $Al(OH)_3 \longrightarrow Al(OH)_4^-$

93. In the reaction, $N_2 \longrightarrow NH_3$. The eq.wt. of N_2 and NH_3 are respectively equal to :
a) $\frac{28}{3}, \frac{17}{3}$ b) $\frac{28}{6}, \frac{17}{3}$ c) $\frac{28}{2}, \frac{17}{2}$ d) $\frac{28}{5}, \frac{17}{5}$

94. Which acts as reducing agent as well as oxidising agent?
a) O_3 b) ClO_4^- c) F_2 d) MnO_4^-

95. When Cl_2 gas reacts with hot and concentrated sodium hydroxide solution, the oxidation number of chlorine changes from :
a) Zero to −1 and zero to +3
b) Zero to +1 and zero to −3
c) Zero to +1 and zero to −5
d) Zero to −1 and zero to +5

96. Which of the following is not a redox reaction?
a) $2Na + Cl_2 \rightarrow 2NaCl$ b) $C + O_2 \rightarrow CO_2$
c) $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ d) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

97. The difference in the oxidation numbers of the two types of sulphur atoms in $Na_2S_4O_6$ is
a) 4 b) 5 c) 6 d) 7

98. A compound contains atoms X, Y, Z. The oxidation number of X is +2, Y is +5 and Z is −2. The possible formula of the compound is :
a) XY_1Z_2 b) $Y_2(XZ_3)_2$ c) $X_3(YZ_4)_2$ d) $X_3(Y_4Z)_2$

99. The equivalent weight of $SnCl_2$ in the reaction, $SnCl_2 + Cl_2 \longrightarrow SnCl_4$ is :
a) 49 b) 95 c) 45 d) 59

100. What is the ox. no. of Mn in K_2MnO_4 ?
a) +4 b) +6 c) +2 d) +8

101. The stable oxidation states of Mn are :
a) +2, +3 b) +3, +7 c) +2, +7 d) +3, +5

102. 25 mL of 0.50 M H_2O_2 solution is added to 50 mL of 0.20 M $KMnO_4$ in acidic solution. Which of the following statements is true?
a) 0.010 mole of oxygen is liberated
b) 0.005 mole of $KMnO_4$ are left

c) 0.030 g atom of oxygen gas is evolved

d) 0.0025 mole H_2O_2 does not react with $KMnO_4$

103. Oxidation number of carbon in KCN is :

a) +2 b) −2 c) +1 d) +3

104. The oxidation state of Ni in $Ni(CO)_4$ is :

a) Zero b) +4 c) +8 d) +2

105. M is the molecular weight of $KMnO_4$. The equivalent weight of $KMnO_4$ when it is converted into K_2MnO_4 is :

a) M b) $M/3$ c) $M/5$ d) $M/7$

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

a) + 7 and +2 b) +6 and +2 c) +5 and +2 d) +2 and +6

107. Which is the best description of behaviour of bromine in the reaction given below?

$H_2O + Br_2 \longrightarrow HBr + HOBr$

a) Proton accepted only b) Both oxidised and reduced

c) Oxidised only d) Reduced only

108. The oxidation number of P in KH_2PO_2 is :

a) +1 b) +3 c) −3 d) +5

109. $LiAIH_4$ is used as :

a) Oxidising agent b) Reducing agent c) A mordant d) Water softner

110. The brown ring complex $[Fe(H_2O)_5NO^+]SO_4$ has ox.no. of Fe :

a) +1 b) +2 c) +3 d) +4

111. The oxidation state of Fe in Fe_3O_4 is

a) +3 b) 8/3 c) +6 d) +2

112. In the reactions; $As_2S_3 + HNO_3 \longrightarrow H_3AsO_4 + H_2SO_4 + NO$, the element oxidized is/ are :

a) As only b) S only c) N only d) As and S both

113. The eq. wt. of $KMnO_4$ in the reaction, $MnO_4^- + Mn^{2+} + H_2O \longrightarrow MnO_2 + H^+$ (unbalanced) is :

a) 52.7 b) 158 c) 31.6 d) None of these

114. NO_3^- ions are converted to NH_4^+ ions by a suitable reactant. The equivalent mass of NO_3^- and NH_4^+ are :

a) 7.75, 2.25 b) 7.75, 7.75 c) 2.25, 7.75 d) 2.25, 2.25

115. Oxidation number of chlorine in $HClO_4$ is :

a) +1 b) −1 c) −7 d) +7

116. Iodine has +7 oxidation state in :

a) HIO_4 b) H_3IO_5 c) H_5IO_6 d) all of these

117. The violent reaction between sodium and water is an example of :

a) Reduction

b) Oxidation

c) Redox reaction

d) neutralisation reaction

118. Oxidation number of Fe in $K_3[Fe(CN)_6]$ is :

a) +2 b) +3 c) +4 d) +1

119. One mole of acidified $K_2Cr_2O_7$ on reaction with excess KI will liberate………mole(s) of I_2.

a) 6 b) 1 c) 7 d) 3

120. In the preparation of chlorine from HCl, MnO_2 acts as :

a) Reducing agent b) oxidising agent c) Catalytic agent d) Dehydrating agent

121. What volume of O_2 measured at standard conditions will be formed by the action of 100 mL of 0.5 N $KMnO_4$ on hydrogen peroxide in an acidic solution? The skeleton equation for the reaction is,

$KMnO_4 + H_2SO_4 + H_2O_2 \longrightarrow KHSO_4 + MnSO_4 + H_2O + O_2$:

a) 0.12 litre b) 0.28 litre c) 0.56 litre d) 1.12 litre

122. Which quantities are conserved in all oxidation-reduction reactions?

a) Charge only b) Mass only

c) Both charge and mass | d) Neither charge nor mass

123. Which substance serves as a reducing agent in the following reaction,
$14H^+ + Cr_2O_7^{2-} + 3Ni \longrightarrow 2Cr^{3+} + 7H_2O + 3Ni^{2+}$?
a) H_2O b) Ni c) H^+ d) $Cr_2O_7^{2-}$

124. Which of the following chemical reactions depicts the oxidising behaviour of H_2SO_4?
a) $2HI + H_2SO_4 \longrightarrow I_2 + SO_2 + 2H_2O$
b) $Ca(OH)_2 + H_2SO_4 \longrightarrow CaSO_4 + 2H_2O$
c) $NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$
d) $2PCl_5 + H_2SO_4 \longrightarrow 2POCl_3 + 2HCl + SO_2Cl_2$

125. In the aluminothermic process, aluminium acts as :
a) An oxidising agent b) A flux c) A reducing agent d) A solder

126. In the reaction, $SO_2 + 2H_2S \rightarrow 3S + 2H_2O$ the substance that oxidizes is,
a) H_2S b) SO_2 c) S d) H_2O

127. The oxidation number of sulphur in S_8, S_2F_2, H_2S respectively are :
a) 0, +1 and −2 b) +2, +1 and −2 c) 0, +1 and +2 d) −2, +1 and −2

128. Maximum oxidation state is present in :
a) CrO_2Cl_2 and MnO_4^-
b) MnO_2
c) $[Fe(CN)_6]^{3-}$ and $[Co(CN)_6]^{3-}$
d) MnO

129. With which element oxygen shows positive oxidation state in its compounds?
a) Na b) Cl c) N d) F

130. What is the oxidation number of chlorine in ClO_3^-?
a) +5 b) +3 c) +4 d) +2

131. NaClO solution reacts with H_2SO_3 as, $NaClO + H_2SO_3 \longrightarrow NaCl + H_2SO_4$
A solution of NaClO used in the above reaction contained 15 g of NaClO per litre. The normality of the solution would be :
a) 0.40 b) 0.20 c) 0.60 d) 0.80

132. In sodium hydride, oxidation state of sodium is :
a) Zero b) +1 c) −1 d) +2

133. The oxidation number of xenon in $XeOF_2$ is
a) Zero b) 2 c) 4 d) 3

134. Which is not a redox reaction?
a) $H_2 + Br_2 \longrightarrow 2HBr$
b) $NH_4Cl \longrightarrow NH_3 + HCl$
c) $NH_4NO_3 \longrightarrow N_2O + 2H_2O$
d) $Fe + S \longrightarrow FeS$

135. In $C + H_2O \longrightarrow CO + H_2$; H_2O acts as :
a) Oxidant b) Reductant c) Both (a) and (b) d) None of these

136. Millimole of a solute in a solution can be given by :
a) $M \times V_{\text{in litre}}$ b) $M \times V_{\text{in mL}}$ c) $\frac{\text{wt.}}{\text{mol. wt.}} \times 1000$ d) Both (b) and (c)

137. The oxidation number of carbon in $H_2C_2O_4$ is :
a) +2 b) +3 c) +4 d) +1

138. What is the oxidation state of P in $Ba(H_2PO_2)_2$?
a) +1 b) +2 c) +3 d) −1

139. Oxidation state of +1 for phosphorus is found in :
a) H_3PO_3 b) H_3PO_4 c) H_3PO_2 d) $H_4P_2O_7$

140. Oxidation number of S in $(CH_3)_2SO$ is :
a) Zero b) +1 c) +2 d) +3

141. In which reaction the underlined substance has been reduced?
a) <u>Carbon monoxide</u> + copper oxide ⟶ carbon dioxide + copper
b) <u>Copper oxide</u> + hydrochloric acid ⟶ water + copper chloride

c) Steam + iron ⟶ hydrogen + iron oxide
d) Hydrogen + iron oxide ⟶ water + iron

142. The decomposition of $KClO_3$ to KCl and O_2 on heating is an example of :
a) Intermolecular redox change
b) Intramolecular redox change
c) Disproportionation or auto redox change
d) None of the above

143. Mohr's salt is oxidised to ……. in presence of acidized $KMnO_4$.
a) Fe^{2+} b) Fe^{3+} c) Fe d) None of these

144. Fluorine is a strong oxidising agent because :
a) It has several isotopes
b) It is very small and has 7 electrons in valency shell
c) Its valency is one
d) It is the first member of the halogen series

145. In the conversion of Br_2 to BrO_3^-, the oxidation number of Br changes from
a) Zero to +5 b) +1 to +5 c) Zero to −3 d) +2 to +5

146. The oxidation number of Cr in CrO_5 is
a) +3 b) +5 c) +6 d) 0

147. An indicator used for redox reaction is itself :
a) Either an oxidant or a reductant
b) Neither an oxidant nor a reductant
c) Acid or base
d) None of the above

148. CrO_5 reacts with H_2SO_4 to give $Cr_2(SO_4)_3, H_2O$ and O_2. Moles of O_2 liberated by 1 mole of CrO_5 in this reaction are :
a) 2.5 b) 1.25 c) 4.5 d) 1.75

149. In the following reaction, $4P + 3KOH + 3H_2O \rightarrow 3KH_2PO_2 + PH_3$
a) P is only oxidized b) P is only reduced
c) P is both oxidized as well as reduced d) None of the above

150. Oxidation number of P in $P_2O_7^{4-}$ is :
a) +3 b) +4 c) +5 d) +6

151. In the conversion of $K_2Cr_2O_7$ to K_2CrO_4 the oxidation number of chromium :
a) Increases b) Remains the same c) Decreases d) None of these

152. In which of the following, the oxidation number of oxygen has been arranged in increasing order?
a) $OF_2 < KO_2 < BaO_2 < O_3$ b) $BaO_2 < KO_2 < O_3 < OF_2$
c) $BaO_2 < O_3 < OF_2 < KO_2$ d) None of these

153. Oxidation number of sodium in sodium amalgam is :
a) +2 b) +1 c) −2 d) zero

154. The apparatus in which standard solution is prepared is known as :
a) Measuring flask b) Round bottom flask c) Burette d) None of these

155. $K_3Fe(CN)_6$ is used as ……. Indicator for $FeSO_4$ *vs.* $K_2Cr_2O_7$ titrations.
a) Self b) External c) Internal d) Not an

156. The oxidation number of N in $N_2H_5^+$ is :
a) −2 b) +3 c) +2 d) −3

157. Which can act as oxidant?
a) H_2O_2 b) H_2S c) NH_3 d) None of these

158. What weight of HNO_3 is needed to convert 5 g of iodine into iodic acid according to the reaction, $I_2 + HNO_3 \longrightarrow HIO_3 + NO_2 + H_2O$?
a) 12.4 g b) 24.8 g c) 0.248 g d) 49.6 g

159. In which SO_2 acts as oxidant, while reacting with :

a) Acidified $KMnO_4$ b) Acidified $K_2Cr_2O_7$ c) H_2S d) Acidified C_2H_5OH

160. HBr and HI reduce H_2SO_4, HCl can reduce $KMnO_4$ and HF can reduce:
a) H_2SO_4 b) $K_2Cr_2O_7$ c) $KMnO_4$ d) None of these

161. Equivalent mass of $Na_2S_2O_3$ in its reaction with I_2 is equal to :
a) Molar mass b) Molar mass / 2 c) Molar mass / 3 d) Molar mass / 4

162. Which of the following change represents a disproportionation reaction(s)?
a) $Cl_2 + 2OH^- \longrightarrow ClO^- + Cl^- + H_2O$
b) $Cu_2O + 2H^+ \longrightarrow Cu + Cu^{2+} + H_2O$
c) $2HCuCl_2 \xrightarrow[\text{water}]{\text{Dilution with}} Cu + Cu^{2+} + 4Cl^- + 2H^+$
d) All of the above

163. Oxidation number of 'N' in N_3H(hydrazoic acid) is
a) $-\frac{1}{3}$ b) +3 c) 0 d) −3

164. Cerric ammonium sulphate and potassium permanganate are used as oxidising agents in acidic medium for oxidation of ferrous ammonium sulphate to ferric sulpahte. The ratio of number of moles of cerric ammonium sulphate required per mole of ferrous ammonium sulphate to the number of moles of $KMnO_4$ required per mole of ferrous ammonium sulphate, is
a) 5.0 b) 0.2 c) 0.6 d) 2.0

165. Eq.wt. of NH_3 in, $NH_3 + O_2 \longrightarrow NO + H_2O$ is :
a) 3.4 b) 17 c) 8.5 d) None of these

166. Carbon is in the lowest oxidation state in :
a) CH_4 b) CCl_4 c) CO_2 d) CF_4

167. When the ion $Cr_2O_7^{2-}$ acts as an oxidant in acidic aqueous solution the ion $Cr^{3+}$is formed. How many mole of Sn^{2+} would be oxidised to Sn^{4+} by one of $Cr_2O_7^{2-}$ ions?
a) 2/3 b) 3/2 c) 2 d) 3

168. 100 mL of 0.1 M solution of a reductant is diluted to 1 litre, which of the following changes?
a) Molarity b) Millimole c) Milliequivalent d) None of these

169. If H_2S is passed through an acidified $K_2Cr_2O_7$ solution, the colour of the solution :
a) Will remain unchanged
b) Will change to deep red
c) Will change to dark green
d) Will change to dark brown

170. Ozone tails mercury. The reaction is ….of Hg.
a) Reduction b) Oxidation c) Substitution d) None of these

171. The oxidation number of Cr in $[Cr(NH_3)_4Cl_2]^+$ is :
a) +3 b) +2 c) +1 d) zero

172. In the reaction, $VO + Fe_2O_3 \longrightarrow FeO + V_2O_5$. The eq.wt. of V_2O_5 is equal to its :
a) mol. wt. b) mol. wt./8 c) mol. wt./6 d) None of these

173. The eq. wt. of K_2CrO_4 as an oxidising agent in acid medium is :
a) (mol. wt.)/2 b) (2 × mol. wt.)/3 c) (mol. wt.)/3 d) (mol. wt.)/6

174. Which reaction involves neither oxidation nor reduction?
a) $CrO_4^{2-} \longrightarrow Cr_2O_7^{2-}$ b) $Cr \longrightarrow CrCl_3$ c) $Na \longrightarrow Na^+$ d) $2S_2O_3^{2-} \longrightarrow S_4O_6^{2-}$

175. The number of equivalent per mole of H_2S used in its oxidation to SO_2 is :
a) 3 b) 6 c) 4 d) 2

176. Oxidation number of sulphur in Na_2SO_4 is :
a) +2 b) +4 c) +6 d) −2

177. Which can have both +ve and –ve oxidation states?
a) F b) I c) Na d) He

178. Milliequivalent of a solute in a solution can be given by:
a) $Mz_{eq.} = M \times V_{\text{in mL}}$

b) $M_{eq}. = N \times V_{\text{in mL}}$

c) $Mz_{eq}. = \frac{\text{wt}}{\text{Eq.wt.}} \times 1000$

d) Both (b) and (c)

179. H_2S is passed through an acidified solution of copper sulphate and a black precipitate is formed. This is due to :

a) Oxidation of Cu^{2+}

b) Reduction of Cu^{2+}

c) Double decomposition

d) Reduction and oxidation

180. Iodine has highest oxidation number in the compound :

a) KIO_4 b) IF_5 c) KI_2 d) KI

181. Oxidation number of S in $S_2O_3^{2-}$ is :

a) +2 b) −2 c) 4 d) zero

182. In the reaction, $Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 3H_2O + 3I_2$, The eq.wt. of Cr^{3+} is :

a) $\frac{\text{mol. wt.}}{3}$ b) $\frac{\text{at. wt.}}{6}$ c) $\frac{\text{at. wt.}}{3}$ d) $\frac{\text{mol. wt.}}{6}$

183. In the reaction, $H_2O_2 + Na_2CO_3 \rightarrow Na_2O_2 + CO_2 + H_2O$ the substance undergoing oxidation is

a) H_2O_2 b) Na_2CO_3 c) Na_2O_2 d) None of these

184. The least count of burette used normally in laboratory is :

a) 0.1 mL b) 0.01 mL c) 0.2 mL d) 0.02 mL

185. Among NH_3, HNO_3, NaN_3 and Mg_3N_2; the number of molecules having nitrogen in negative oxidation state is

a) 1 b) 2 c) 3 d) 4

186. In which iron has the lowest oxidation state?

a) $Fe(CO)_5$

b) Fe_2O

c) $K_4Fe(CN)_6$

d) $FeSO_4.(NH_4)2SO_4.6H_2O$

187. A chemical balance used normally for weighing in laboratory can weigh upto a least count of :

a) 0.0001 g b) 0.001 g c) 0.0002 g d) 0.002 g

188. When NaCl is dissolved in water, the sodium ion becomes :

a) Oxidized b) Reduced c) Hydrolysed d) hydrated

189. Which is not a redox reaction?

a) $BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$

b) $2BaO + O_2 \longrightarrow 2BaO_2$

c) $4KClO_3 \longrightarrow 4KClO_2 + 2O_2$

d) $SO_2 + 2H_2S \longrightarrow 2H_2O + 3S$

190. When BrO_3^- ion reacts with Br^- ion in acidic solution Br_2 is liberated. The equivalent weight of $KBrO_3$ is :

a) $M/8$ b) $M/3$ c) $M/5$ d) $M/6$

191. Corrosion of iron is :

a) Redox process

b) Neutralization process

c) Precipitation process

d) None of these

192. During a redox titration involving a solution containing Fe^{2+} ions against MnO_4^- in the presence of excess of H^+ ions, the number of electrons that gets transferred is

a) 6 b) 5 c) 4 d) 2

193. In which of the following oxidation number of chlorine is +5?

a) HClO b) $HClO_2$ c) $HClO_3$ d) $HClO_4$

194. In the reaction, $Zn + 2H^+ + 2Cl^- \longrightarrow Zn^{2+} 2Cl^- + H_2$, the spectator ion is :

a) Cl^- b) Zn^{2+} c) H^+ d) All of these

195. Turn bull's blue is :
a) $Fe_3[Fe(CN)_6]_2$ b) $K_4Fe(CN)_6$ c) $K_3Fe(CN)_6$ d) $Na_4Fe(CN)_6$

196. The oxidation state shown by silicon when it combines with strongly electropositive metals is
a) -2 b) -4 c) $+4$ d) $+2$

197. The compound that can work both as an oxidising and reducing agent is:
a) $KMnO_4$ b) H_2O_2 c) $Fe_2(SO_4)_3$ d) $K_2Cr_2O_7$

198. An element A in a compound ABD has oxidation number A^{n-}. It is oxidized by $Cr_2O_7^{2-}$ in acidic medium. In the experiment 1.68×10^{-3} mole of $K_2Cr_2O_7$ were used for 3.26×10^{-3} mole of ABD. The new oxidation number of A after oxidation is :
a) 3 b) $3 - n$ c) $n - 3$ d) $+n$

199. The burning of hydrogen is called :
a) Hydrogenation b) Hydration c) Oxidation d) reduction

200. Oxidation number of chlorine in chlorine heptaoxide is :
a) +1 b) +4 c) +6 d) +7

201. The correct order of reducing power of halide ions is :
a) $Cl^- > Br^- > I^- > F^-$
b) $Cl^- > I^- > Br^- > F^-$
c) $Br^- > Cl^- > I^- > F^-$
d) $I^- > Br^- > Cl^- > F^-$

202. The reaction, $3ClO^-(aq) \longrightarrow ClO_3^-(aq) + 2Cl^-(aq)$ is an example of :
a) Oxidation reaction
b) Reduction reaction
c) Disproportionation reaction
d) Decomposition reaction

203. The ox.no. of S in $Na_2S_4O_6$ is :
a) + 2.5
b) +2 and +3 (two S have +2 and other two have +3)
c) +2 and +3 (three S have +2 and one S has +3)
d) +5 and 0 (two S have +5 and the other two S have 0)

204. Oxidation is a process which involves :
a) de-electronation b) Electronation c) Addition of hydrogen d) Addition of metal

205. A student states that heating of limestone is an oxidation process, the reason he gives that an oxide of the metal is produced on heating. Which one is correct?
a) The statement and reason are true
b) The statement and reason are wrong
c) The statement is true but the reason is false
d) None of the above

206. A sulphur containing species that cannot be an oxidising agent is :
a) H_2SO_4 b) H_2S c) SO_2 d) H_2SO_3

207. $KMnO_4$ acts as ……. indicator in its redox titrations.
a) Self b) External c) Internal d) Not an

208. In a reaction between zinc and iodine in which zinc iodide is formed, which is oxidised?
a) Zinc ions b) Iodide ions c) Zinc atom d) Iodine

209. The best oxidising agent of the oxygen family is:
a) Tellurium b) Selenium c) Sulphur d) Oxygen

210. The oxidation state of iron in sodium nitroprusside is :
a) +2 b) +1 c) Zero d) +3

211. A compound of Xe and F is found to have 53.3% Xe. Oxidation number of Xe in this compound is :
a) -4 b) Zero c) +4 d) +6

212. Which combination is odd with respect to oxidation numbers of S, Cr, N and H respectively:
a) $H_2SO_5, H_2S_2O_8, H_2SO_4, SF_6$
b) $K_2Cr_2O_7, K_2CrO_4, CrO_5, CrO_2Cl_2$
c) $NH_3, NH_4^+, N_3H, NO_2^-$
d) CaH_2, NaH, LiH, MgH_2

213. 0.2 g of a sample of H_2O_2 required 10 mL of N $KMnO_4$ in a titration in the presence of H_2SO_4. Purity of H_2O_2 is :
a) 25% b) 85% c) 65% d) 95%

214. When $KMnO_4$ as oxidising agent and ultimately forms MnO_4^{2-}, Mn_2O_3 and Mn^{2+}, the number of electrons transferred per mole of $KMnO_4$ each case respectively is :
a) 4, 3, 1, 5 b) 1, 5, 3, 7 c) 1, 3, 4, 5 d) 1, 3, 8, 5

215. Titration of KI with H_2O_2 in presence of acid is a :
a) Clock reaction b) Redox reaction c) Intermolecular redox d) All of these

216. Oxidation state of nitrogen is incorrectly given for :

Compound	**Oxidation state**
a) $[Co(NH_3)_5Cl]Cl_2$	-3
b) NH_2OH	-1
c) $(N_2H_5)_2SO_4$	$+2$
d) Mg_3N_2	-3

217. Fluorine exhibits only -1 oxidation state, while iodine exhibits oxidation states of -1, $+1$, $+3$, $+5$ and $+7$. This is due to :
a) Fluorine being a gas
b) Available d-orbitals in iodine
c) Non-availability of d-orbitals in iodine
d) None of the above

218. Elements which generally exhibit multiple oxidation states and whose ions are coloured are known as :
a) Metalloid b) Non-metals c) Metals d) Transition metals

219. The oxidation state of sulphur in sodium tetrathionate ($Na_2S_4O_6$) is
a) 2 b) 0 c) 2.5 d) 3.5

220. Which is strongest oxidising agent?
a) O_3 b) O_2 c) Cl_2 d) F_2

221. Sulphur has the highest oxidation state in :
a) SO_2 b) SO_3 c) H_2SO_3 d) H_2S

222. Nitrogen has fractional oxidation number in :
a) N_2H_4 b) NH_4 c) HN_3 d) N_2F_2

223. As the oxidation state for any metal increases, the tendency to show ionic nature:
a) Decreases b) Increases c) Remains same d) None of these

224. In acid medium Zn reduces nitrate ion to NH_4^+ ion according to the reaction
$Zn + NO_3 \quad\quad Zn^{2+} + NH_4^+ + H_2O$ (unbalanced)
How many moles of HCl are required to teduce half a mole of $NaNO_3$ completely? Assume the availability of sufficient Zn.
a) 5 b) 4 c) 3 d) 2

225. Weight of $FeSO_4$ (mol. wt. = 152) oxidized by 200 mL of 1 N $KMnO_4$ solution is :
a) 30.4 g b) 15.2 g c) 60.8 g d) 158 g

226. In the ionic equation,
$BiO_3^- + 6H^+ + xe^- \longrightarrow Bi^{3+} + 3H_2O$
The values of x is
a) 6 b) 2 c) 4 d) 3

227. The reaction, $5H_2O_2 + XClO_2 + 2OH^- \longrightarrow XCl^- + YO_2 + 6H_2O$ is balanced if :
a) $X = 5, Y = 2$ b) $X = 2, Y = 5$ c) $X = 4, Y = 10$ d) $X = 5, Y = 5$

228. What volume of 0.40 M $Na_2S_2O_3$ would be required to react with the I_2 liberated by adding excess of KI to 50 mL of 0.20 M $CuSO_4$ solution?
a) 12.5 mL b) 25 mL c) 50 mL d) 2.5 mL

229. For the reaction, $2Fe^{3+} + Sn^{2+} \longrightarrow 2Fe^{2+} + Sn^{4+}$ The normality of $SnCl_2$ (mol.wt. = 189.7) solution prepared by dissolving 47.5 g in acid solution and diluting with H_2O to a total of 2.25 litre is :
a) 0.222 N b) 0.111 N c) 0.333 N d) 0.444 N

230. The eq.wt. of $Fe_2(SO_4)_3$, the salt to be used as an oxidant in an acidic solution is :
a) (Mol. wt.)/1 b) (Mol. wt.)/2 c) (Mol. wt.)/3 d) (Mol. wt.)/5

231. Oxalic acid on reacting with acidified $KMnO_4$ is oxidised to :
a) CO and H_2 b) CO_2 and H_2 c) CO_2 and H_2O d) CO and H_2O

232. The oxidation number of N and Cl in $NOClO_4$ respectively are
a) +2 and +7 b) +3 and +7 c) −3 and +5 d) +2 and −7

233. Sulphur in +3 oxidation state is present in
a) Sulphurous acid b) Pyrosulphuric acid c) Dithionous acid d) Thiosulphuric acid

234. Among the properties (a) reducing, (b) oxidising and (c) complexing the set of properties shown by CN^- ion towards metal species is :
a) a, b, c b) b, c c) c, a d) a, b

235. Magnesium reacts with acids producing hydrogen and corresponding magnesium salts. In such reactions magnesium undergoes :
a) Oxidation
b) Reduction
c) Neither oxidation nor reduction
d) Simple dissolution

236. What volume of 0.1 N oxalic acid solution can be reduced by 250 g of an 8 per cent by weight $KMnO_4$ solution?
a) 6.3 litre b) 12.6 litre c) 25.2 litre d) 0.63 litre

237. The oxidation state of +3 for phosphorus is in:
a) Hypophosphorous acid
b) Meta-phosphoric acid
c) Ortho-phosphoric acid
d) Phosphorous acid

238. When SO_2 is passed through acidified solution of potassium dichromate, then chromium sulphate is formed. The change in oxidation number of chromium is :
a) +4 to +2 b) +5 to +3 c) +6 to +3 d) +7 to +2

239. Oxidation no. of P in $H_4P_2O_5, H_4P_2O_6, H_4P_2O_7$ are respectively :
a) +3, +5, +4 b) +4, +3, +5 c) +3, +4, +5 d) +5, +3, +4

240. Oxidation of thiosulphate ($S_2O_3^{2-}$) ions by iodine gives:
a) SO_3^- b) SO_4^{2-} c) $S_4O_6^{2-}$ d) $S_2O_8^{2-}$

241. 0.3 g of an oxalate salt was dissolved in 100 mL solution. The solution required 90 mL of $N/20$ $KMnO_4$ for complete oxidation. The % of oxalate ion in salt is:
a) 33% b) 66% c) 70% d) 40%

242. How many litre of Cl_2 at STP will be liberated by the oxidation of NaCl with 10 g $KMnO_4$?
a) 3.54 litre b) 7.08 litre c) 1.77 litre d) None of these

243. What is the normality of a $KMnO_4$ solution to be used as an oxidant in acid medium, which contain 15.8 g of the compound in 100 mL of solution? Mol. wt. of $KMnO_4$ is 158 :
a) 2 N b) 3 N c) 4 N d) 5 N

244. $KMnO_4$ in acid medium is always reduced to :
a) Mn^{4+} b) Mn^{2+} c) Mn^{6+} d) Mn

245. In balancing the half reaction, $S_2O_3^{2-} \longrightarrow S(s)$, the number of electrons that must be added is :
a) 2 on the right b) 2 on the left c) 3 on the right d) 4 on the left

246. What volume of 0.1 M $KMnO_4$ is needed to oxidise 100 mg of FeC_2O_4 in acidic solution?

a) 4.1 mL | b) 8.2 mL | c) 10.2 mL | d) 4.6 mL

247. Which one is not a redox titration?

a) $FeSO_4$ $vs.$ $K_2Cr_2O_7$ | b) $CuSO_4$ $vs.$ hypo | c) I_2 $vs.$ hypo | d) $AgNO_3$ $vs.$ KCl

248. A 0.518 g sample of lime stone is dissolved in HCl and then the calcium is precipitated as CaC_2O_4. After filtering and washing the precipitate, it requires 40.0 mL of 0.250 N $KMnO_4$, solution acidified with H_2SO_4 to titrate is as, $MnO_4^- + H^+ + C_2O_4^{2-} \longrightarrow Mn^{2+} + CO_2 + 2H_2O$. The percentage of CaO in the sample is :

a) 54.0 % | b) 27.1 % | c) 42% | d) 84%

249. The missing term in following equation is : $2Fe^{3+}(aq) + Sn^{2+}(aq) \longrightarrow 2Fe^{2+}(aq) + ?$

a) Sn^{4+} | b) Sn^{2+} | c) Sn | d) None of these

250. Reaction of Br_2 with Na_2CO_3 in aqueous solution gives sodium bromide and sodium bromate with evolution of CO_2 gas. The number of sodium bromide molecules involved in the balanced chemical equation is

a) 1 | b) 3 | c) 5 | d) 7

251. Oxidation number of carbon in C_3O_2, Mg_2C_3 are respectively :

a) $-4/3, +4/3$ | b) $+4/3, -4/3$ | c) $-2/3, +2/3$ | d) $-2/3, +4/3$

252. The reaction; $KI + I_2 \longrightarrow KI_3$ shows :

a) Oxidation | b) Reduction | c) Complex formation | d) All of these

253. The oxidation state of Cr in chromium trioxide is

a) +3 | b) +4 | c) +5 | d) +6

254. Oxidation number of S in S_2Cl_2 is :

a) +1 | b) +6 | c) Zero | d) −1

255. In which of the following N has lowest oxidation number?

a) NO | b) NO_2 | c) N_2O | d) N_2O_5

256. 2 mole of $FeSO_4$ are oxidized by $'X'$ mole of $KMnO_4$ whereas 2 mole of FeC_2O_4 are oxidized by $'Y'$mole of $KMnO_4$. The ration f $'X'$ and $'Y'$ is :

a) 1 : 3 | b) 1 : 2 | c) 1 : 4 | d) 1 : 5

257. H_2S reacts with halogens, the halogens :

a) Are oxidised | b) Are reduced | c) Form sulphur halides | d) None of these

258. In an experiment 50 mL of 0.1 M solution of a salt reacted with 25 mL of 0.1 M solution of sodium sulphite. The half equation for the oxidation of sulphite ion is :

$SO_3^{2-}(aq) + H_2O(l) \longrightarrow SO_4^{2-}(aq) + 2H^+(aq) + 2e^-$

If the oxidation number of metal in the salt was 3, what would be the new oxidation number of metal?

a) Zero | b) 1 | c) 2 | d) 4

259. The most stable oxidation state of copper is :

a) +2 | b) +1 | c) +3 | d) +4

260. White phosphorus reacts with caustic soda, the products are PH_3 and NaH_2PO_2. This reaction is an example of

a) Oxidation | b) Reduction | c) Disproportionation | d) Neutralisation

261. When a sulphur atom becomes a sulphide ion :

a) It gains two electrons
b) The mass number changes
c) There is no change in the composition of atom
d) None of the above

262. Titre value is the volume of titrant used for a definite amount of unknown reagent at its :

a) Equivalence point | b) End point | c) Neutralization point | d) All of these

263. Oxidation states of X, Y, Z are +2, +5 and −2 respectively. Formula of the compound formed by these wii be

a) X_2YZ_6 | b) XY_2Z_6 | c) XY_5 | d) X_3YZ_4

264. In which compound, oxygen has an oxidation state of +2 ?

a) H_2O_2 b) H_2O c) OF_2 d) CO

265. If equal volumes of $1M$ $KMnO_4$ and $1\ M$ $K_2Cr_2O_7$ solutions are allowed to oxidise F^{2+} to F^{3+} in acidic medium volume of oxidant required for one mole of F^{2+}will be :
a) $V_{KMnO_4} > V_{K_2Cr_2O_7}$
b) $V_{KMnO_4} < V_{K_2Cr_2O_7}$
c) $V_{KMnO_4} = V_{K_2Cr_2O_7}$
d) Nothing can be predicted

266. How many gram of $KMnO_4$should be taken to make up 250 mL of a solution of such strength that 1 mL is equivalent to 5.0 mg of Fe in $FeSO_4$?
a) 1.414 g b) 0.70 g c) 3.16 g d) 1.58 g

267. The oxidation number of Cr in K_2CrO_4 is
a) +3 b) −6 c) +6 d) −3

268. In the reaction, $2Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$, the oxidation state of sulphur is :
a) Decreased b) Increased c) Unchanged d) None of these

269. The equivalent weight of $KMnO_4$ (acidic medium) is (at. wt. of K = 39; Mn = 55) :
a) 158 b) 15.8 c) 31.6 d) 3.16

270. The oxidation number of chromium in potassium dichromate is
a) +2 b) +4 c) +6 d) +8

271. The equivalent weight of $MnSO_4$ is half of its molecular weight when it is converted to :
a) Mn_2O_3 b) MnO_2 c) MnO_4^- d) Mn_4^{2-}

272. Aqueous solution of SO_2 reacts with H_2S to precipitate sulphur. Here SO_2 acts as :
a) Catalyst b) Reducing agent c) Oxidizing agent d) Acid

273. Saline hydrides are :
a) Strong oxidants
b) Strong reductants
c) Strong dehydrating agents
d) Strong bleaching agents

274. State the oxidation number of carbonyl carbon in methanal and methanoic acid respectively
a) 0 and 0 b) 0 and +2 c) +1 and +2 d) +1 and +3

275. The eq. wt. of I_2 in the change $I_2 \longrightarrow IO_3^-$ is :
a) 12.7 b) 63.5 c) 25.4 d) 2.54

276. Equivalent mass of oxidizing agent in the reaction is.
$SO_2 + 2H_2S \longrightarrow 3S + 2H_2O$
a) 32 b) 64 c) 16 d) 8

277. In a conjugate pair of reductant and oxidant, the reductant has :
a) Lower ox.no. b) Higher ox.no. c) Same ox.no. d) Either of these

278. In which of the following reactions, hydrogen is acting as an oxidising agent?
a) With Li to form LiH b) With I_2 to give HI c) With S to give H_2S d) None of the above

279. The number of moles of Mohr's salt required per mole of dichromate ion is :
a) 3 b) 4 c) 5 d) 6

280. For reducing one mole of Fe^{2+}ion to Fe, the number of faraday of electricity is :
a) 2 b) 1 c) 1.5 d) 4

281. $Co(s) + Cu^{2+}(aq) \longrightarrow Co^{2+}(aq) + Cu(s)$. This reaction is :
a) Oxidation reaction b) Reduction reaction c) Redox reaction d) None of these

282. The oxidation state of I in $H_4IO_6^-$ is :
a) +7 b) −1 c) +5 d) +1

283. The oxidation number of N in NH_3 is :
a) −3 b) +3 c) Zero d) 5

284. Mn^{2+} can be converted into Mn^{7+} by reacting with
a) SO_2 b) Cl_2 c) PbO_2 d) $SnCl_2$

285. The oxidation number of Ni in $K_4[Ni(CN)_4]$ is :
a) +1 b) +2 c) −1 d) 0

286. Which change occur when lead monoxide is converted into lead nitrate?
a) Oxidation
b) Reduction
c) Neither oxidation nor reduction
d) Both oxidation and reduction

287. How many mole of electron are involved in the reduction of one mole of MnO_4^- ion in alkaline medium to MnO_3^-?
a) 2 b) 1 c) 3 d) 4

288. The oxidation number of Fe in $K_4Fe(CN)_6$ is :
a) +2 b) +3 c) +4 d) +6

289. For the reaction, $NH_3 + OCl^- \longrightarrow N_2H_4 + Cl^-$
occurring in basic medium, the coefficient of N_2H_4 in the balanced equation will be
a) 1 b) 2 c) 3 d) 4

290. In the reaction $H_2O + H_2O_2 \longrightarrow S + 2H_2O$
a) H_2S is an acid and H_2O_2 is a base
b) H_2S is a base and H_2O_2 is an acid
c) H_2S is an oxidising agent and H_2O_2 is a reducing agent
d) H_2S is a reducing agent and H_2O_2 is an oxidising agent

291. When H_2SO_3 is converted into H_2SO_4 the change in the oxidation state of sulphur is from:
a) 0 to +2 b) +2 to +4 c) +4 to +2 d) +4 to +6

292. The oxidation number of nitrogen in NH_2OH is :
a) +1 b) −1 c) −3 d) −2

293. In the reaction, $2CuSO_4 + 4KI \longrightarrow Cu_2I_2 + 2K_2SO_4 + I_2$ The ratio of equivalent weight of $CuSO_4$ to its molecular weight is :
a) 1/8 b) 1/4 c) 1/2 d) 1

294. In the reaction between acidified $K_2Cr_2O_7$ and iron (II) ions shown by the equation : $Cr_2O_7^{2-}(aq) + 6\,Fe^{2+}(aq) + 14H^+(aq) \longrightarrow 2Cr^{3+}(aq) + 7H_2O(l) + 6Fe^{3+}(aq)$
a) The colour of the solution changes from green to blue
b) The iron (II) ions are reduced
c) The dichromate ions are reduced
d) Hydrogen ions are reduced

295. Which is the reducing agent in the reaction, $8H^+ + 4NO_3^- + 6Cl^- + Sn(s) \longrightarrow SnCl_6^{2-} + 4NO_2 + 4H_2O$?
a) Sn(s) b) Cl^- c) NO_3^- d) $NO_2(g)$

296. Which is a redox reaction?
a) $H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$
b) $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$
c) $CH_3COOH + C_2H_5OH \longrightarrow CH_3COOC_2H_5 + H_2O$
d) $2FeCl_3 + SnCl_2 \longrightarrow 2FeCl_2 + SnCl_4$

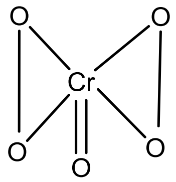
297. Which one of the following reactions involves disproportionation?
a) $2H_2SO_4 + Cu$ $CuSO_4 + 2H_2O + SO_2$ b) $As_2O_3 + 3H_2S$ $As_2S_3 + 3H_2O$
c) $2KOH + Cl_2$ $KCl + KOCl + H_2O$ d) $Ca_3P_2 + 6H_2O$ $3Ca(OH)_2 + 2PH_3$

298. The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is
a) +3 b) +2 c) +6 d) +4

299. Which of the following acts as an oxidising as well as reducing agent?
a) Na_2O b) Na_2O_2 c) $NaNO_3$ d) $NaNO_2$

300. Oxidation state of carbon in graphite is:
a) Zero b) +1 c) +4 d) +2

301. Which compound has oxidation number of carbon equal to zero?
a) C_6H_6 b) CH_3 c) C_2H_4 d) $C_6H_{12}O_6$
302. In the reaction, $2KMnO_4 + 16HCl \longrightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2$, the reduction product is :
a) Cl_2 b) $MnCl_2$ c) KCl d) H_2O
303. The oxidation number of phosphorus in $Mg_2P_2O_7$ is :
a) + 5 b) − 5 c) +6 d) − 7
304. 1 mole of chlorine combines with a certain weight of a metal giving 111 g of its chloride. The atomic weight of the metal (assuming its valency to be 2) is :
a) 40 b) 20 c) 80 d) None of these
305. Oxidation state of chromium



a) +10 b) +6 c) +3 d) +2
306. Oxidation states of the metal in the minerals haematite and magnetite, respectively, are
a) II, III in haematite and III in magnetite
b) II, III in haematite and II in magnetite
c) II in haematite and II, III in magnetite
d) III in haematite and II, III in magnetite
307. The colour of $K_2Cr_2O_7$ changes from red-orange to lemon-yellow on treatment with KOH(aq) because of :
a) Reduction of Cr(VI) to Cr(III)
b) Formation of chromium hydroxide
c) Conversion of dichromate into chromate ion
d) Oxidation of potassium hydroxide to potassium peroxide
308. How many electrons are involved in oxidation of $KMnO_4$ in basic medium?
a) 1 b) 2 c) 5 d) 3
309. The oxidation state of nitrogen in NH_4NO_3 is :
a) −3 and +5 b) +3 and +5 c) +5 d) +3
310. When Sn(IV) chloride is treated with excess HCl, the complex $[SnCl_6]^{2-}$ is formed. The oxidation state of Sn in this complex is:
a) +6 b) −2 c) +4 d) −5
311. Oxidation number of chlorine in HOCl is :
a) Zero b) −1 c) +1 d) +2
312. In the reaction, $C + 4HNO_3 \longrightarrow CO_2 + 2H_2O + 4NO_2$, HNO_3 acts as :
a) An oxidising agent
b) An acid
c) An acid as well as oxidising agent
d) A reducing agent
313. Change of hydrogen into proton is :
a) Oxidation of hydrogen
b) Acid-base reaction
c) Reduction of hydrogen
d) Displacement reaction
314. 8 g of sulphur are burnt to form SO_2 which is oxidised by Cl_2 water. The solution is treated with $BaCl_2$ solution. The amount of $BaSO_4$ precipitated is :
a) 1.0 mole b) 0.5 mole c) 0.24 mole d) 0.25 mole
315. The number of mole of ferrous oxalate oxidised by one mole of $KMnO_4$ is:
a) 1/5 b) 3/5 c) 2/3 d) 5/3
316. Reactants react in the equal number of …….. to give products.
a) Mole b) Weights c) Equivalent d) All of these
317. Mole and millimole of reactants react in the ……….as represented by balanced stoichiometric equation.

a) Molar ratio b) Equal amount c) Both (a) and (b) d) None of these

318. The reaction of white phosphorus with aqueous NaOH gives phosphine along with another phosphorus containing compound. The reaction type the oxidation states of phosphorus in phosphine and the other product are respectively :
a) Redox reaction; -3 and -5
b) Redox reaction; $+3$ and $+5$
c) Disproportionation reaction; -3 and $+1$
d) Disproportionation reaction; -3 and $+3$

319. Which can act only as oxidising agent?
a) Oxygen b) Fluorine c) Iodine d) H_2O_2

320. For the reaction : $N_2 + 3H_2 \longrightarrow 2NH_3$; if E_1 and E_2 are equivalent masses of NH_3 and N_2 respectively, then $E_1 - E_2$ is :
a) 1 b) 2 c) 3 d) 4

321. Bleaching action of SO_2 is due to :
a) Reduction b) Oxidation c) Hydrolysis d) Acidic nature

322. In $N_2 + 2H_2O \longrightarrow NH_4^+ + NO_2^-$; N is :
a) Oxidised b) Reduced c) Both (a) and (b) d) None of these

323. If three electrons are lost by a metal ion M^{3+}, its final oxidation number will be :
a) Zero b) +6 c) +2 d) +4

324. In the reaction, $NaH + H_2O \longrightarrow NaOH + H_2$:
a) H^- is oxidised
b) Na^+ is reduced
c) Both NaH and H_2O are reduced
d) None of the above

325. Which of the following acts as an oxidizing agent?
a) HNO_3 b) Cl_2 c) $FeCl_3$ d) All of these

326. How many gram of I_2 are present in a solution which requires 40 mL, of 0.11 N $Na_2S_2O_3$ to react with it, $S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^-$?
a) 12.7 g b) 0.558 g c) 25.4 g d) 11.4 g

327. The number of mole of $KMnO_4$ that will be needed to react with one mole of sulphite ion in acidic solution is :
a) 2/5 b) 3/5 c) 4/5 d) 1

328. What weight of HNO_3 is required to make 1 litre of 2 N solution to be used as an oxidising agent in the reaction? $3Cu + 8HNO_3 \longrightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$
a) 63 g b) 21 g c) 42 g d) 84 g

329. The oxidation state of two sulphur atoms in $H_2S_2O_8$
a) -6 b) -2 c) $+6$ d) -4

330. In a conjugate pair of reductant and oxidant, the oxidant has :
a) Higher ox.no. b) Lower ox.no. c) Same ox.no. d) Either of these

331. In the equation, $H_2S + 2HNO_3 \longrightarrow 2H_2O + 2NO_2 + S$. The equivalent weight of hydrogen sulphide is :
a) 17 b) 34 c) 68 d) 18

332. In which transfer of five electrons takes place?
a) $MnO_4^- \longrightarrow Mn^{2+}$ b) $CrO_4^{2-} \longrightarrow Cr^{3+}$ c) $MNO_4^- \longrightarrow MnO_2$ d) $Cr_2O_7^{2-} \longrightarrow 2Cr^{3+}$

333. Oxidation number of nitrogen is highest in
a) N_3H b) N_2O_4 c) NH_2OH d) NH_3

334. Starch gives blue colour with :
a) KI b) I_2 c) Cl_2 d) None of these

335. The number of mole of potassium salt, $i.e$, $KHC_2O_4 . H_2C_2O_4 . 2H_2O$ oxidised by one mole of permanganate ion is :
a) 2/5 b) 4/5 c) 1 d) 5/4

336. When an acidified solution of ferrous ammonium sulphate is treated with $KMnO_4$ solution, the ion which is oxidised is :
a) Fe^{2+} b) SO_4^{2-} c) NH_4^+ d) MnO_4^-
337. Oxidation number of N in N_3H is :
a) -3 b) $+3$ c) Zero d) $-1/3$
338. Hydrogen peroxide in aqueous solution decomposes on warming to give oxygen according to the equation, $2H_2O_2(aq) \longrightarrow 2H_2O(l) + O_2(g)$ under conditions where one mole of gas occupies 24 dm^3, 100 cm^3 of XM solution of H_2O_2 produces 3 dm^3 of O_2. Thus, X is :
a) 2.5 b) 1 c) 0.5 d) 0.25
339. $CuSO_4$ and KI on mixing gives :
a) $CuI_2 + K_2SO_4$ b) $Cu_2I_2 + K_2SO_4$ c) $Cu_2I_2 + K_2SO_4 + I_2$ d) $CuI_2 + K_2SO_4 + I_2$
340. Which metal exhibits more than one oxidation states?
a) Na b) Mg c) Al d) Fe
341. Which of the following oxidation state is the most common among the lanthanoides :
a) 4 b) 2 c) 5 d) 3
342. 13.5 g aluminium changes to Al^{3+} in solution by losing :
a) 18×10^{23} electrons
b) 6.023×10^{23} electrons
c) 3.01×10^{23} electrons
d) 9×10^{23} electrons
343. In CH_2Cl_2, the oxidation number of C is :
a) -4 b) $+2$ c) Zero d) $+4$
344. In the compounds $KMnO_4$ and $K_2Cr_2O_7$, the highest oxidation state is of the element
a) Mn b) K c) O d) Cr
345. The oxidation state of nitrogen varies from :
a) -3 to $+5$ b) 0 to $+5$ c) -3 to 1 d) $+3$ to $+5$
346. The oxidation state of hydrogen in CaH_2 is :
a) $+1$ b) -1 c) Zero d) $+2$
347. The most common oxidation state of an element is —2. The number of electrons present in its outermost shell is :
a) 2 b) 4 c) 6 d) 8
348. A good indicator must possess the following characteristics :
a) The colour change should be sharp
b) The colour change should be clear
c) It must be sensitive to the equivalent point
d) All of the above
349. The oxidation number of Xe in XeF_4 and XeO_2 is
a) $+6$ b) $+4$ c) $+1$ d) $+3$
350. The oxidation number of arsenic in arsenate is :
a) $+5$ b) $+4$ c) $+6$ d) $+2$
351. The reaction,
$Ag^{+2}(aq) + Ag(s) \rightleftharpoons 2Ag^+(aq)$
is an example of
a) Reduction b) Oxidation c) Disproportionation d) None of these
352. During the presence of SO_3^{2-} and S^{2-} in a mixture, on addition of dil. H_2SO_4, one notice that:
a) SO_2 and H_2S are not formed
b) SO_2 and H_2S formed during change undergoes a redox change forming colloidal sulphur and thus, no smell
c) A smell of burning sulphur
d) A smell of rotten egg

353. Which is not an oxidising agent?
a) $KClO_3$ b) O_2 c) $C_6H_{12}O_6$ d) $K_2Cr_2O_7$
354. The charge on cobalt in $[Co(CN)_6]^{3-}$ is :
a) -6 b) $+3$ c) -3 d) $+6$
355. The most stable oxidation state of chromium is :
a) + 5 b) + 3 c) + 2 d) + 4
356. Arrange the following as increase in oxidation number
(i)Mn^{2+} (ii) MnO_2
(iii) $KMnO_4$ (iv) K_2MnO_4
a) (i)>(ii)>(iii)>(iv) b) (i)<(ii)<(iv)<(iii) c) (ii)<(iii)<(i)<(iv) d) (iii)>(i)>(iv)>(ii)
357. What mass of MnO_2 is reduced by 35 mL of 0.16 *N* oxalic acid in acidic solution? The skeleton equation is, $MnO_2 + H^+ + H_2C_2O_4 \longrightarrow CO_2 + H_2O + Mn^{2+}$:
a) 8.7 g b) 0.24 g c) 0.84 g d) 43.5 g
358. Stronger is oxidising agent, more is;
a) Standard reduction potential of that species
b) The tendency to get itself oxidised
c) The tendency to lose electrons by that species
d) Standard oxidation potential of that species
359. How many g of $KMnO_4$ are needed to prepare 3.75 litre of 0.850 *N* solution if $KMnO_4$ is reduced as, $MnO_4^- + 8H^+ + 5e \longrightarrow Mn^{2+} + 4H_2O$?
a) 101 g b) 202 g c) 50.5 g d) 303.0 g $KMnO_4$
360. When $KMnO_4$ is reduced with oxalic acid in acid medium, the oxidation number of Mn changes from:
a) +7 to +4 b) +6 to +4 c) +7 to +2 d) +4 to +2
361. Addition of zinc powder to $CuSO_4$ solution precipitates copper due to :
a) Reduction of Cu^{2+} b) Reduction of SO_4^{2-} c) Reduction of Zn d) Hydrolysis of $CuSO_4$
362. Titrations in which liberated I_2 is estimated to carry out the volumetric estimations are known as ….titrations.
a) Iodometric b) Iodimetric c) Acidimetric d) Alkalimetric
363. In the course of chemical reaction, an oxidant :
a) Loses electron b) Gains electron c) Either of these d) None of these
364. In alkaline condition $KMnO_4$ reacts as follows :
$2KMnO_4 + 2KOH \longrightarrow 2K_2MnO_4 + H_2O + O$. The eq. wt. of $KMnO_4$ is :
a) 52.7 b) 158 c) 31.6 d) 79
365. Oxidation number of nitrogen in $AgNO_3$ is:
a) +5 b) -3 c) +3 d) -2
366. Total number of AlF_3 molecules in a sample of AlF_3 containing 3.01×10^{23} ions of F^- is :
a) 9×10^{24} b) 3×10^{24} c) 7×10^{23} d) 10^{23}
367. Oxidation number of N in NOCl is :
a) +3 b) +2 c) +1 d) +4
368. The oxidation state of chlorine is highest in the compound :
a) Cl_2 b) HCl c) Cl_2O d) Cl_2O_7
369. How many gram of $KMnO_4$ are contained in 4 litre of 0.05 *N* solution? The $KMnO_4$ is to be used as an oxidant in acidic medium :
a) 1.58 g b) 15.8 g c) 6.32 g d) 31.6 g
370. The reaction; $H_2S + H_2O_2 \longrightarrow 2H_2O + S$ shows :
a) Acidic nature of H_2O_2
b) Alkaline nature of H_2O_2
c) Oxidising action of H_2O_2
d) Reducing action of H_2O_2
371. For redox reaction,

$MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O$
coefficient of reactants in balanced states are
MnO_4^- $C_2O_4^{2-}$ H^+
a) 2 5 16
b) 16 5 2
c) 5 16 2
d) 2 16 5
372. Chlorine has +1 oxidation state in :
a) HCl
b) $HClO_3$
c) Cl_2O
d) ICl_3
373. Which statement is incorrect?
a) Oxidation of a substance is followed by reduction of another
b) Reduction of a substance is followed by oxidation of another
c) Oxidation and reduction are complementary reactions
d) It is not necessary that both oxidation and reduction should take place in the same reaction
374. In the standardization of $Na_2S_2O_3$ using $K_2Cr_2O_7$ by iodometry, the equivalent weight of $K_2Cr_2O_7$ is :
a) (molecular weight)/2
b) (molecular weight)/6
c) (molecular weight)/3
d) Same as molecular weight
375. When SO_2 is passed in a solution of potassium iodate, the oxidation state of iodine changes from :
a) +5 to 0
b) +5 to −1
c) −5 to 0
d) −7 to −1
376. The halogen that shows same oxidation state in all its compounds with other elements is:
a) I_2
b) F_2
c) Cl_2
d) Br_2
377. The reaction,
$P_4 + 3NaOH + 3H_2O \longrightarrow 3NaH_2PO_2 + PH_3$
is an example of
a) Disproportionation reaction
b) Neutralisation reaction
c) Double-decomposition reaction
d) Pyrolytic reaction
378. Titrations in which I_2 solution is used as intermediate are known as ….titrations.
a) Iodometric
b) Iodimetric
c) Acidimetric
d) alkalimetric
379. In the reaction, $Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 7H_2O + 3I_2$, which element is reduced?
a) I
b) O
c) H
d) Cr
380. Carbon reacts with oxygen to form two oxides, CO and CO_2. This is because :
a) Carbon has two crystalline forms
b) Carbon has two oxidation states
c) Oxygen donates as well as accept electrons
d) Oxygen has a strong affinity for carbon
381. How many milliliter of 0.5 N $SnCl_2$ solution will reduce 600 mL of 0.1 N $HgCl_2$ to Hg_2Cl_2?
a) 120 mL
b) 60 mL
c) 30 mL
d) 240 mL
382. What weight of $FeSO_4$ (mol. wt. =152) will be oxidised by 200 mL of normal $KMnO_4$ solution in acidic solution?
a) 30.4 g
b) 60.8 g
c) 121.6 g
d) 15.8 g
383. How many milligram of iron (Fe^{2+}) are equal to 1 mL of 0.1055 N $K_2Cr_2O_7$ equivalent?
a) 5.9 mg
b) 0.59 mg
c) 59 mg
d) 59×10^{-3} mg
384. Number of moles of MnO_4^- required to oxidise one mole of ferrous oxalate completely in acidic medium will be :
a) 0.4 mole
b) 7.5 mole
c) 0.2 mole
d) 0.6 mole
385. A, B and C are three elements forming a part of compound in oxidation states of +2, +5 and −2 respectively. What could be the compound?
a) $A_2(BC)_2$
b) $A_2(BC_4)_3$
c) $A_3(BC_4)_2$
d) ABC
386. In an oxidation process for a cell $M_1 \longrightarrow M_1^{n+} + ne$, the other metal ($M_2$) being univalent showing reduction takes up the …..electrons to complete redox reaction.

a) $(n-1)$ b) 1 c) n d) 2

387. In which of the following reactions, chlorine acts as an oxidising agent?

(i) $CH_3CH_2OH + Cl_2 \quad CH_3CHO + HCl$

(ii) $CH_3CHO + Cl_2 \quad CCl_3CHO + HCl$

(iii) $CH_4 + Cl_2 \quad CH_3Cl + HCl$

The correct answer is

a) (i) only

b) (ii) only

c) (i) and (iii)

d) (i),(ii) and (iii)

388. During a redox change, the oxidant $K_2Cr_2O_7$ is always reduced to :

a) Cr^{5+} b) Cr^{4+} c) Cr^{3+} d) Cr^{2+}

389. When potassium permanganate is titrated against ferrous ammonium sulphate, the equivalent weight of potassium permanganate is :

a) Molecular weight/10 b) Molecular weight/5 c) Molecular weight/2 d) Molecular weight

390. Which conversion is an oxidation?

a) $SO_4^{2-} \longrightarrow SO_3^{2-}$ b) $Cu^{2+} \longrightarrow Cu$ c) $H^+ \longrightarrow H$ d) $H^- \longrightarrow H$

391. In which case +1 oxidation state is stable than +3?

a) Ga b) Al c) Tl d) B

392. In the reduction of dichromate by Fe(II), the number of electrons involved per chromium atom is :

a) 3 b) 1 c) 2 d) 4

393. When $K_2Cr_2O_7$ is converted into K_2CrO_4, the change in oxidation number of chromium is

a) 0 b) 5 c) 7 d) 9

394. Which of the following acts as both an oxidizing as well as reducing agent?

a) HNO_3 b) HNO_2 c) HI d) H_2SO_4

395. In which of the following compounds, nitrogen exhibits highest oxidation state?

a) N_3H b) NH_2OH c) N_2H_4 d) NH_3

396. 1 mole of MnO_4^{2-} in neutral aqueous medium disproportionates to :

a) $\frac{2}{3}$mole of MnO_4^- and $\frac{1}{3}$ mole of MnO_2

b) $\frac{1}{3}$mole of MnO_4^- and $\frac{2}{3}$ mole of MnO_2

c) $\frac{1}{3}$mole of Mn_2O_7 and $\frac{1}{3}$ mole of MnO_2

d) $\frac{2}{3}$mole of Mn_2O_7 and $\frac{1}{3}$ mole of MnO_2

397. Which one of the compound does not decolourised an acidified solution of $KMnO_4$?

a) SO_2 b) $FeCl_3$ c) H_2O_2 d) $FeSO_4$

398. When one mole of $KMnO_4$ reacts with HCl, the volume of chlorine liberated at NTP will be:

a) 11.2 litre b) 22.4 litre c) 44.8 litre d) 56.0 litre

399. What would happen when a small quantity of H_2O_2 is added to a solution of $FeSO_4$?

a) Colour disappears

b) H_2 is evolved

c) An electron is added to Fe^{2+}

d) An electron is lost by Fe^{2+}

400. The oxidation state of I in IPO_4 is

a) +1 b) +3 c) +5 d) +7

401. The number of moles of $KMnO_4$ reduced by one mole of KI in alkaline medium is

a) 1 b) 5 c) ½ d) 1/5

402. A 0.50 M solution of KI reacts with excess of H_2SO_4 and KIO_3 solutions according to the equation, $6H^+ + 5I^- + IO_3^- \longrightarrow 3I_2 + 3H_2O$. Which of the following statements is true?

a) 200 mL of the KI solution reacts with 0.10 mole KIO_3.

b) 100 mL of the KI solution reacts with 0.060 M of H_2SO_4.

c) 0.5 litre of the KI solution produces 0.15 mole of I_2
d) None of the above

403. Oxidation number of chromium in $K_2Cr_2O_7$ is :
a) +2 b) +3 c) +6 d) —4

404. A standard solution is one whose :
a) Concentration is 1 M
b) Concentration is unknown
c) Concentration is known
d) None of the above

405. In the reaction, $SO_2 + 2H_2S \longrightarrow 3S + 2H_2O$, the substance oxidised is
a) H_2S b) SO_2 c) S d) H_2O

406. Oxidation number of P in $HP_2O_7^-$ ion is
a) +5 b) +6 c) +7 d) +3

407. The oxidation number that iron does not exhibit in its common compounds or in its elemental state is :
a) Zero b) +1 c) +2 d) +3

408. Oxidation number of Cl in $NOClO_4$ is :
a) +7 b) −7 c) +5 d) −5

409. In which reaction is hydrogen acting as an oxidising agent?
a) With iodine to give hydrogen iodide
b) With lithium to give lithium hydride
c) With nitrogen to give ammonia
d) With sulphur to give hydrogen sulphide

410. In presence of moisture SO_2 can :
a) Gain electrons
b) Lose electrons
c) Act as oxidising agent
d) Does not act as reducing agent

411. The oxidation number of Mn in MnO_2 is :
a) +4 b) +6 c) +2 d) −4

412. Which is not correct in case of Mohr's salt?
a) It decolourises $KMnO_4$
b) It is primary standard
c) It is a double salt
d) Oxidation state of Fe is +3 in the salt

413. In the reduction of dichromate by Fe (II), the number of electrons involved per chromium atom is :
a) 3 b) 1 c) 2 d) 4

414. Which of the following is a redox reaction?
a) $NaCl + KNO_3 \longrightarrow NaNO_3 + KCl$
b) $CaC_2O_4 + 2HCl \longrightarrow CaCl_2 + H_2C_2O_4$
c) $Ca(OH)_2 + 2NH_4Cl \longrightarrow CaCl_2 + 2NH_3 + 2H_2O$
d) $2K[Ag(CN)_2] + Zn \longrightarrow 2Ag + K_2[Zn(CN)_4]$

415. What volume of $2N$ $K_2Cr_2O_7$ solution is required to oxidise 0.81 g of H_2S in acidic medium?
a) 47.8 mL b) 23.8 mL c) 40 mL d) 72 mL

416. Oxidation number of As atom in H_3AsO_4 is :
a) +5 b) +6 c) +4 d) −3

417. In the following change, $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$. If the atomic weight of iron is 56, then its equivalent weight will be :
a) 42 b) 21 c) 63 d) 84

418. In permonosulphuric acid (H_2SO_5), the oxidation number of sulphur is
a) +8 b) +4 c) +5 d) +6

419. The reaction,
$Ag^{2+}(aq) + Ag(s) \rightleftharpoons 2Ag^+(aq)$

is an example of

a) Reduction b) Oxidation c) Comproportionation d) Disproportionation

420. Amount of oxalic acid present in a solution can be determined by its titration with $KMnO_4$ solution in the presence of H_2SO_4. The titration gives unsatisfactory result when carried out in the presence of HCl, because HCl :

a) Oxidises oxalic acid to carbon dioxide and water

b) Gets oxidized by oxalic acid to chlorine

c) Furnishes H^+ ions in addition to those from oxalic acid

d) Reduces permanganate to Mn^{2+}

421. Which is not a redox change?

a) $CaCO_3 \longrightarrow CaO + CO_2$

b) $2H_2 + O_2 \longrightarrow 2H_2O$

c) $Na + H_2O \longrightarrow NaOH + \frac{1}{2}H_2$

d) $MnCl_3 \longrightarrow MnCl_2 + \frac{1}{2}Cl_2$

422. Sulphurous acid can be used as :

a) Oxidising agent b) Reducing agent c) Bleaching agent d) All of these

: ANSWER KEY :

1)	c	2)	c	3)	a	4)	d	189)	a	190)	c	191)	a	192)	b
5)	a	6)	d	7)	d	8)	b	193)	c	194)	a	195)	a	196)	b
9)	c	10)	d	11)	c	12)	d	197)	b	198)	b	199)	c	200)	d
13)	d	14)	b	15)	d	16)	b	201)	d	202)	c	203)	d	204)	a
17)	d	18)	a	19)	c	20)	a	205)	b	206)	b	207)	a	208)	c
21)	b	22)	a	23)	b	24)	c	209)	d	210)	a	211)	d	212)	c
25)	a	26)	a	27)	d	28)	a	213)	b	214)	c	215)	d	216)	c
29)	a	30)	d	31)	c	32)	a	217)	b	218)	d	219)	c	220)	d
33)	a	34)	a	35)	d	36)	c	221)	b	222)	c	223)	a	224)	a
37)	a	38)	a	39)	b	40)	a	225)	a	226)	b	227)	b	228)	b
41)	a	42)	d	43)	c	44)	a	229)	a	230)	b	231)	c	232)	b
45)	c	46)	c	47)	a	48)	b	233)	c	234)	c	235)	a	236)	a
49)	b	50)	b	51)	b	52)	c	237)	d	238)	c	239)	c	240)	c
53)	a	54)	a	55)	d	56)	c	241)	b	242)	a	243)	d	244)	b
57)	a	58)	a	59)	b	60)	c	245)	d	246)	a	247)	d	248)	a
61)	a	62)	a	63)	a	64)	c	249)	a	250)	c	251)	b	252)	d
65)	d	66)	c	67)	b	68)	b	253)	a	254)	a	255)	c	256)	a
69)	a	70)	b	71)	a	72)	b	257)	b	258)	c	259)	a	260)	c
73)	d	74)	a	75)	c	76)	b	261)	a	262)	d	263)	b	264)	c
77)	d	78)	b	79)	b	80)	d	265)	a	266)	b	267)	c	268)	b
81)	a	82)	d	83)	c	84)	a	269)	c	270)	c	271)	b	272)	c
85)	d	86)	b	87)	c	88)	a	273)	b	274)	b	275)	c	276)	c
89)	c	90)	b	91)	a	92)	b	277)	a	278)	a	279)	d	280)	a
93)	b	94)	a	95)	d	96)	c	281)	c	282)	a	283)	a	284)	c
97)	b	98)	c	99)	b	100)	b	285)	d	286)	c	287)	a	288)	a
101)	c	102)	b	103)	a	104)	a	289)	a	290)	d	291)	d	292)	b
105)	a	106)	b	107)	b	108)	a	293)	d	294)	c	295)	a	296)	d
109)	b	110)	a	111)	b	112)	d	297)	c	298)	a	299)	d	300)	a
113)	a	114)	a	115)	d	116)	d	301)	d	302)	b	303)	a	304)	c
117)	c	118)	b	119)	d	120)	b	305)	b	306)	d	307)	c	308)	a
121)	b	122)	a	123)	b	124)	a	309)	a	310)	c	311)	c	312)	a
125)	c	126)	a	127)	a	128)	a	313)	a	314)	d	315)	d	316)	c
129)	d	130)	a	131)	a	132)	b	317)	a	318)	c	319)	b	320)	a
133)	c	134)	b	135)	a	136)	d	321)	a	322)	c	323)	b	324)	a
137)	b	138)	a	139)	c	140)	a	325)	d	326)	b	327)	a	328)	c
141)	c	142)	b	143)	b	144)	b	329)	c	330)	a	331)	a	332)	a
145)	a	146)	c	147)	a	148)	d	333)	b	334)	b	335)	d	336)	a
149)	c	150)	c	151)	b	152)	b	337)	d	338)	a	339)	c	340)	d
153)	d	154)	a	155)	b	156)	a	341)	d	342)	d	343)	c	344)	a
157)	a	158)	a	159)	c	160)	d	345)	a	346)	b	347)	c	348)	d
161)	a	162)	d	163)	a	164)	a	349)	b	350)	a	351)	d	352)	b
165)	a	166)	a	167)	d	168)	a	353)	c	354)	b	355)	b	356)	b
169)	c	170)	b	171)	a	172)	c	357)	b	358)	a	359)	a	360)	c
173)	c	174)	a	175)	b	176)	c	361)	a	362)	a	363)	b	364)	b
177)	b	178)	d	179)	c	180)	a	365)	a	366)	d	367)	a	368)	d
181)	a	182)	c	183)	d	184)	a	369)	c	370)	c	371)	a	372)	c
185)	c	186)	a	187)	c	188)	d	373)	d	374)	b	375)	a	376)	b

377)	**a**	**378)**	**b**	**379)**	**d**	**380)**	**b**
381)	**a**	**382)**	**a**	**383)**	**a**	**384)**	**d**
385)	**c**	**386)**	**c**	**387)**	**d**	**388)**	**c**
389)	**b**	**390)**	**d**	**391)**	**c**	**392)**	**a**
393)	**a**	**394)**	**b**	**395)**	**a**	**396)**	**a**
397)	**b**	**398)**	**d**	**399)**	**d**	**400)**	**b**
401)	**a**	**402)**	**c**	**403)**	**c**	**404)**	**c**
405)	**a**	**406)**	**b**	**407)**	**b**	**408)**	**a**
409)	**b**	**410)**	**b**	**411)**	**a**	**412)**	**d**
413)	**a**	**414)**	**d**	**415)**	**b**	**416)**	**a**
417)	**b**	**418)**	**d**	**419)**	**c**	**420)**	**d**
421)	**a**	**422)**	**d**				

: HINTS AND SOLUTIONS :

1 **(c)**
MN can exhibit + 7 oxidation no.

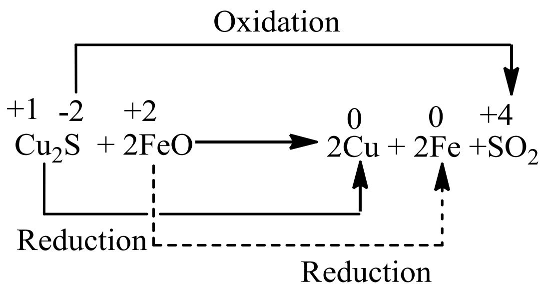
2 **(c)**
Indicators are the substances which indicates the completion of a reaction.

3 **(a)**
$CH_3OH \longrightarrow HCOOH$
Or $C^2 \longrightarrow C^{2+} + 4e$

4 **(d)**
$3e + Mn^{7+} \longrightarrow Mn^{4+}$
$\therefore M = N/\text{Valence factor} = 0.6/3 = 0.2$

5 **(a)**
$O_3 + H_2O_2 \longrightarrow H_2O + 2O_2$; H_2O_2 is reduced.

6 **(d)**



In this reaction Cu and Fe undergo reduction while sulphur undergoes oxidation. Hence, this is a redox reaction.

7 **(d)**
---do----

8 **(b)**
$Sn^{2+} \longrightarrow Sn^{4+} + 2e$
$\therefore E = M/2 = \frac{190}{2} = 95$

9 **(c)**
N has +3 ox.no. which may increase (upto +5) or decrease (upto −3)

10 **(d)**
Na_2O_2 is sodium peroxide.

11 **(c)**
Acidified $K_2Cr_2O_7$ solution oxidises SO_2 into $Cr_2(SO_4)_3$.
$$\overset{+4}{3SO_2} + K_2Cr_2O_7 + H_2SO_4 \longrightarrow \overset{+6}{K_2SO_4} + Cr_2(SO_4)_3 + H_2O$$
Hence, oxidation state of sulphur changes from +4 to +6.

12 **(d)**
Electronation is gain of electrons i.e., $A + e \longrightarrow A^-$

13 **(d)**
$3Fe \rightarrow Fe_3O_4 + 8e^-$ oxidation
$4H_2O + 8e^- \rightarrow 4H_2$
Thus, there are lose of 8 electrons in the reaction

14 **(b)**
It is definition of volumetric analysis.

15 **(d)**
Oxidation takes place at anode (c) is not feasible, *i.e.*, Cr^{3+} is not oxidised to $Cr_2O_7^{2-}$ under given conditions. Hence, option (d) is correct.

16 **(b)**
$NO_3^- \longrightarrow NH_4^+$ or $N^{5+} + 8e \longrightarrow N^{3-}$
Thus, Eq. wt. of $NO_3^- = \frac{62}{8}$

17 **(d)**
Carbon in oxalic acid has +3 oxidation state which may be increases to +4 (in CO_2) and thus, can act as reductant. Rest all have highest oxidation number. Ox.no. of N, Mn and S in HNO_3 (+5), $KMnO_4$(+7)and H_2SO_4 (+6).

18 **(a)**
Meq. of HNO_3 = Meq. of I_2
$$\frac{w}{63/3} \times 1000 = \frac{5}{254/10} \times 1000$$
$\therefore\ w_{HNO_3} = 4.13$ g

19 **(c)**
$6e + Cr_2^{6+} \longrightarrow 2Cr^{3+}$
$S^{4+} \longrightarrow S^{6+} + 2e$

20 **(a)**
CN^- is reducing and complexing agent.

21 **(b)**
$Na \xrightarrow{NH_3} Na^+ + (NH_3)x^e$ Ammonia solvated electrons are strongly reducing, impart blue colour to solution and are good conductor of current.

22 **(a)**
Fe_3O_4 is a mixture of FeO and Fe_2O_3.

23 **(b)**
VSO_4 is isomorphous to, $FeSO_4.(NH_4)_2\ SO_4.6H_2O$.

24 **(c)**
$MnO_4^- = Mn = +7$
$MnO_4^{2-} = Mn = +6$
$MnO_2 = Mn = +4$
$Mn_2O_3 = Mn = +3$
Hence, changes in oxidation number are 5,1,3,4.

25 **(a)**
Alkaline earth metals have only +2 ox.no. in

combined state.

26 **(a)**
Alkali metals are strongest reducing agents.

27 **(d)**
$S_2^{2+} \longrightarrow 2S^{6+} + 8e$

28 **(a)**
$2Fe^0 \longrightarrow Fe_2^{3+} + 6e.$

29 **(a)**
$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$

30 **(d)**
$a + (-2) = 0$
$\therefore a = +2$

31 **(c)**
$Mn^{7+} + 5e \longrightarrow Mn^{2+}$
$FeC_2O_4 \longrightarrow Fe^{3+} + 2CO_2 + 3e$

32 **(a)**
Meq. of oxidant = Meq. of reductant
$0.5 \times V = 2 \times 2000$
$\therefore V = 8$ litre

33 **(a)**
Oxygen shows − 1 oxidation state in H_2O_2.
$2(+1) + 2x = 0$
$2x = -2$
$x = -1$

34 **(a)**

$$I^- + (\overset{+5}{I}O_3)^{-1} + H^+ \longrightarrow \overset{0}{I_2} + H_2O$$

$$2I^- \longrightarrow I_2 + 2e^- \qquad \ldots \text{(i)} \times 5$$

$$10e^- + 2(\overset{+5}{I}O_3)^{-1} \longrightarrow \overset{0}{I_2} \qquad \ldots \text{(ii)}$$

On adding Eq. (i) and (ii), we get
$10I^- + 2IO_3^- \rightarrow 6I_2$
To balance O atom, add $6H_2O$ molecules on RHS and $12H^+$ on LHS, then
$10I^- + 2IO_3^- + 12H^+ \rightarrow 6I_2 + 6H_2O$
or $5I^- + IO_3^- + 6H^+ \rightarrow 3I_2 + 3H_2O$

35 **(d)**
Cl has +7 ox.no. in $KClO_4$.

36 **(c)**
$Mn^{7+} + 5e \longrightarrow Mn^{2+}$;
$Fe^{2+} \longrightarrow Fe^{3+} + e$

37 **(a)**
Oxidation number in elemental form is zero. Co-valency is two because of S—S—S—S—chain.

38 **(a)**
Fe_2O_3
∴ Total charge on cation or anion = +6
$Fe_2^{3+}\ O_3^{2-}$
$\therefore E = \frac{112}{6}$ or $\frac{56}{3}$

39 **(b)**
C_3O_2 is carbon sub-oxide.
Thus, $3a - (2 \times 2) = 0$
$a = +\frac{4}{3}$

40 **(a)**
$Cu^{2+} + 2I^- \longrightarrow CuI_2 \longrightarrow Cu_2I_2 + I_2$
$I_2 + Na_2S_2O_3 \longrightarrow Na_2S_4O_6 + 2NaI$ (Redox change)

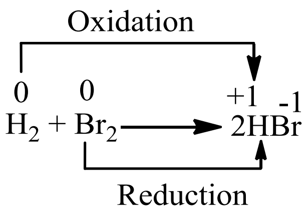
41 **(a)**
Oxidation state of oxygen in H_2O_2 is −1. −1 is the intermediate oxidation state of oxygen.

42 **(d)**
$2e + S^{6+} \longrightarrow S^{4+}$
S of H_2SO_4 is reduced.

43 **(c)**
$1 + a + 3 \times (-2) = -1$
$\therefore a = +4$

44 **(a)**
$1 + a \times 2 = 0$
$\therefore a = -\frac{1}{2}$
Ox.no. of alkali metals is always + 1.

45 **(c)**



Only this reaction involves oxidation and reduction.

46 **(c)**
$[Mn^{7+} + 5e \longrightarrow Mn^{2+}] \times 2$
$[C_2^{3+} \longrightarrow 2C^{4+} + 2e] \times 5$

47 **(a)**
$Mn^{7+} + 5e \longrightarrow Mn^{2+}$
$Fe^{2+} \longrightarrow Fe^{3+} + e$
$C_2^{3+} \longrightarrow 2C^{4+} + 2e$
∴ 3 mole of $KMnO_4$ = 5 mole of FeC_2O_4

48 **(b)**
$2I^{7+} + 14e \longrightarrow (I^0)_2$
$E_{IO_4^-} = \frac{M}{7}$

49 **(b)**
$2e + 2Fe_3^{(8/3)+} \longrightarrow 3Fe_2^{3+}$
$\therefore E_{Fe_3O_4}$
$= \frac{M}{\text{No. of electrons lost or gained by one molecule}}$
$= \frac{M}{1}$

50 **(b)**
Meq. of HNO_3 = Meq. of Fe^{2+}
(Eq. wt. of $HNO_3 = M/3$)
Or $3 \times 3 \times V = \frac{8}{56} \times 1000$
$\therefore V = 15.87$ mL

51 **(b)**
The oxidation state of N are +5, +2, 0 and −3 in HNO_3, NO, N_2 and NH_4Cl respectively.

52 **(c)**
The oxidation state of iodine in HIO_4 is + 7 as
$1 + x + 4(-2) = 0$
$x = +7$
The oxidation state of iodine in H_3IO_5 is +7 as
$3 + x + 5(-2) = 0$
$x = +7$
The oxidation state of iodine in H_5IO_6 is +7 as
$5 + x + 6(-2) = 0$
$x = +7$

53 **(a)**
Ag^+ is reduced to Ag.

54 **(a)**
$2e + S^{6+} \longrightarrow S^{4+}$
S of H_2SO_4 is reduced.

55 **(d)**
The characteristics of oxidant. Note these.

56 **(c)**
$SO_2 + H_2O \longrightarrow SO_3 + 2H$;
$Cl_2 + H_2O \longrightarrow 2HCl + O$

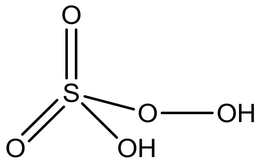
57 **(a)**
Meq. of bleaching powder = Meq. of Cl_2 = Meq. of hypo
$\frac{w}{35.5} \times 1000 = 50 \times \frac{1}{10}$ $\quad \therefore w_{Cl_2}$
$= 0.1775$ g
$\therefore$ Per cent $Cl_2 = \frac{0.1775}{5} \times 100 = 3.55$ %

58 **(a)**
$a + 5 \times (-1) = 0$
$\therefore a = +5$

59 **(b)**
$Fe^{2+} \longrightarrow Fe^{3+} + e$
$(C^{3+})_2 \longrightarrow 2C^{4+} + 2e$
$Fe^{2+} + C_2O_4^{2-} \longrightarrow CO_2 + Fe^{3+} + 3e$
$\therefore E = M/3$

60 **(c)**
$(O^{-1})_2 \longrightarrow O_2^0 + 2e$
$Mn^{7+} + 5e \longrightarrow Mn^{2+}$
5 mole $H_2O_2 \equiv$ 2 mole $KMnO_4$

61 **(a)**
Caro's acid is H_2SO_5. It has a peroxide linkage so, oxidation state of S is



Let the oxidation state of S is x.
H_2SO_5(one peroxide bond)
$+2 + x + 3(-2) + 1(-2) = 0$
$2 + x - 6 - 2 = 0$
$x - 6 = 0$
$x = 6$

62 **(a)**
The formula for Eq. wt. of reductant or oxidant.

63 **(a)**
$Mn^{7+} + 5e \longrightarrow Mn^{2+}$
$\therefore E = M/5$

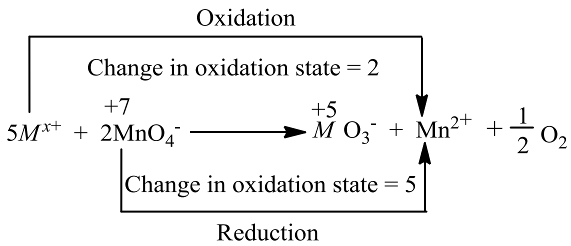
64 **(c)**
No doubt oxygen is taken in respiration, but oxidant-reduction occur simultaneously.

65 **(d)**
$aK_2Cr_2O_7 + bKCl + cH_2SO_4$
1 4 6
$\longrightarrow xCrO_2Cl_2 + yKHSO_4 + zH_2O$
2 6 3

66 **(c)**
Both Os and Ru show + 8 ox.no.

67 **(b)**
Two oxygen atom have peroxide linkage, ($i.e.$, −1 oxidation number) and six have −2 ox.no.
Thus, $2 \times 1 + 2 \times a + 6 \times (-2) + 2 \times (-1) = 0$
$\therefore a = +6$

68 **(b)**



$x + 2 = 5$
$\therefore \quad x = 5 - 2 = +3$

69 **(a)**
Meq. of $K_2Cr_2O_7$ = Meq. of $FeSO_4$
$1 \times V = \frac{10}{152/1} \times 1000$
$\therefore V = 65.78$ mL

70 **(b)**
$Cl_2 + H_2O \longrightarrow 2HCl + O$; thus, matter is oxidised by liberated oxygen.

72 **(b)**

$SnCl_2 + 2HgCl_2 \longrightarrow Hg_2Cl_2 + SnCl_4$

73 **(d)**

Addition of KI to $CuSO_4$ makes it dark brown.

74 **(a)**

Mn is stronger oxidising agent in +7 oxidation state. *e.g.*, $KMnO_4$.

75 **(c)**

$$Cr_2O_7^{2-} + 14H^+ + nFe^{2+} \longrightarrow 2Cr^{3+} + nFe^{3+} + 7H_2O$$

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

(reduction)...(i)

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

(oxidation)...(ii)

Eq.(ii)is multiplied by 6

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

Thus, balanced equation is

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

Hence, the value of 'n' is 6.

76 **(b)**

$4e + N^{5+} \longrightarrow N^+$

∴ Possible product is N_2O.

77 **(d)**

Find oxidation number of P in each.

78 **(b)**

$CrO_4^{2-} + SO_3^{2-} \longrightarrow Cr(OH)_4^- + SO_4^{2-}$

Let the oxidation number of Cr is x in CrO_4^{2-}

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

$x = 6$

and in $Cr(OH)_4^-$ the oxidation number of Cr is y

$y + 4(-2) + 4(1) = -1$

$y - 8 + 4 = -1$

$y = 3$

Hence, oxidation number of Cr changes from +6 to +3.

79 **(b)**

Find oxidation no.in each.

80 **(d)**

$Mn^{7+} + e \longrightarrow Mn^{6+}$

$\therefore E = M/1$

81 **(a)**

The sum of oxidation states of all elements in an ion is equal to charge on it.

Let the oxidation state of S in $SO_4^{2-} = x$

$\therefore x + (-2 \times 4) = -2$

Or $x = +6$

82 **(d)**

$Sn^{2+} \longrightarrow Sn^{4+} + 2e; 2e + Hg^{2+} \longrightarrow Hg^0$

83 **(c)**

Oxidation number of iodine in given species is as follows

O.N. of iodine in IF_3=+3

O.N. of iodine in $I_3^- = -\frac{1}{3}$

O.N. of iodine in IF_5=+5

O.N. of iodine in $IF_7 = +7$

84 **(a)**

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

$\therefore a = +5$

85 **(d)**

KO_3	**Na_2O_2**
Suppose O.N. of O $= x$	suppose O.N. of O $= x$
$+1 + 3x = 0$	$2 \times 1 + 2x = 0$
$3x = -1$	$2 + 2x = 0$
$x = -\frac{1}{3}$	$2x = -2$
$x = -0.33$	$x = -\frac{2}{2}$
	$x = -1$

86 **(b)**

$I_2^0 \longrightarrow 2I^- + 2e$

87 **(c)**

Os and Ru show +8 oxidation number.

88 **(a)**

Meq. of $AgNO_3 = 100 \times 1 - 100$

Meq. of $CuSO_4 = 100 \times 1 \times 2 = 200$

Thus, H_2S is needed in the same Meq. ratio.

89 **(c)**

$Na_2S_2O_3$,

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

$2 + 2x - 6 = 0$

$x = +2$

$Na_2S_4O_6$

$2(+1) + 4(x) + 6(-2) = 0$

$2 + 4x - 12 = 0$

$4x = +10$

$x = +2.5$

90 **(b)**

Meq. of K^+ = Meq. of $KMnO_4$

$= \frac{1}{5} \times 1000 = 200$

$\therefore$ Eq. of $K^+ = \frac{200}{1000} = 0.2$

Also, mole of $K^+ = \frac{0.2}{5}\left[\overset{\text{Valence factor = 5}}{Mn^{7+} + 5e \longrightarrow Mn^{2+}}\right] = 0.04$

$\therefore$ No. of $K^+ = \frac{0.2}{5} \times 6.023 \times 10^{23} = 2.4 \times 10^{22}$

92 **(b)**
$4e + Br^{5+} \longrightarrow Br^{1+}$; Thus, BrO_3^- is to be reduced by a reducing agent.

93 **(b)**
$6e + (N^0)_2 \longrightarrow 2N^{-3}$

$\therefore E_{N_2} = \frac{28}{6}; E_{NH_3} = \frac{17}{3}$

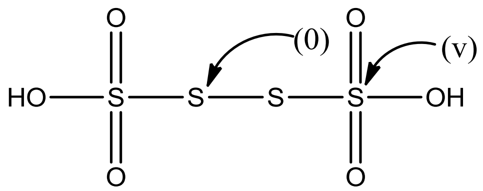
94 **(a)**
F_2 is oxidant; ClO_4^- and MnO_4^- are also oxidant.

96 **(c)**
None of elements in reaction (c) undergoes a change in oxidation number, therefore reaction (c) is not a redox reaction

$\overset{+1\ +5\ -2}{Ag\,NO_3} + \overset{+1\ -1}{NaCl} \longrightarrow \overset{+1\ -1}{Ag\,Cl} + \overset{+1\ +5\ -2}{Na\,NO_3}$

It is a double decomposition reaction

97 **(b)**
$Na_2S_4O_6$ is salt of $H_2S_4O_6$ which has the following structure



$\Rightarrow$ Difference in oxidation number of two types of sulphur = 5

98 **(c)**
Sum of oxidation no. of atoms in it is zero.

99 **(b)**
$Sn^{2+} \longrightarrow Sn^{4+} + 2e$

$\therefore E = M/2 = \frac{119 + 71}{2} = 95$

100 **(b)**
$2 \times 1 + a + 4 \times (-2) = 0$

$\therefore a = +6$

101 **(c)**
Electronic configuration of

Mn : $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^5, 4s^2$ } More stable due to

$Mn^{2+}: 1s^2, 2s^2 2p^6, 3s^2 3p^6\ 3d^5$ half filled d

$Mn^{7+}: 1s^2, 2s^2 2p^6, 3s^2\ 3p^6$

102 **(b)**
Meq. of $H_2O_2 = 25 \times 0.5 \times 2 = 25$;
Meq. of $KMnO_4 = 50 \times 0.2 \times 5 = 50$;
$\therefore$ 25 Meq. or 5 milli mole of $KMnO_4$ are left.

103 **(a)**
$K - C \equiv N$
N is more electronegative and thus, has -3 oxidation number as it involves three covalent bonds.
Thus, $1 + a + (-3) = 0$
$\therefore a = +2$

104 **(a)**
Ox.no.of Ni is equal to zero.

105 **(a)**
$Mn^{7+} + 1e \longrightarrow Mn^{6+}$
$\therefore\ E = M/1$

106 **(b)**
Mn has $+6$ ox.no. in K_2MnO_4 and $+2$ ox.no. in $MnSO_4$.

107 **(b)**

In reaction

$H_2O + \overset{0}{Br_2} \longrightarrow \overset{+1}{HOBr} + \overset{-1}{HBr}$

The oxidation number of bromine increases from 0 to +1 and decreases from 0 to -1, so due to this reason bromine is both oxidised as well as reduced in the above reaction.

108 **(a)**
$1 + 2 \times (+1) + a + 2 \times (-2) = 0$
$\therefore a = +1$

109 **(b)**
H in $LiAlH_4$ has -1 ox.no. and thus, easily oxidized.

110 **(a)**
NO in iron complex has +1 ox.no.
Thus, $a + 5 \times (0) + 1 + 1 \times (-2) = 0$
$\therefore a = +1$

111 **(b)**
Let the oxidation state of Fe in $Fe_3O_4 = x$
$\therefore 3x + 4 \times (-2) = 0$
Or $\quad 3x - 8 = 0$

$\therefore \quad x = \frac{8}{3}$

112 **(d)**

$As^{3+} \longrightarrow As^{5+} + 2e$

$S^{2-} \longrightarrow S^{6+} + 8e$

113 **(a)**

$3e + Mn^{7+} \longrightarrow Mn^{4+}; E = \frac{158}{3} = 52.66$

114 **(a)**

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

$E_{NO_3^-} = \frac{M}{8} = \frac{62}{8}$

$E_{NH_4^+} = \frac{M}{8} = \frac{18}{8}$

115 **(d)**

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

$\therefore a = +7$

116 **(d)**

Find oxidation number of iodine in each.

117 **(c)**

$Na + H_2O \longrightarrow NaOH + (1/2)H_2$.

118 **(b)**

$3 \times 1 + a + 6 \times (-1) = 0$

$\therefore a = +3$

119 **(d)**

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

$(2I^- \longrightarrow I_2 + 2e^-) \times 3$

$Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 7H_2O + 3I_2$

Hence, number of moles of I_2produced =3

120 **(b)**

$Mn^{4+} + 2e \longrightarrow Mn^{2+}$;

MnO_2 is itself reduced.

121 **(b)**

Meq. of O_2 = Meq. of $KMnO_4 = 100 \times 0.5$

$\frac{w}{8} \times 1000 = 50$

$\therefore w_{O_2} = 0.4$ g

$\therefore V_{O_2} = \frac{224 \times 0.4}{32} = 0.28$ litre

122 **(a)**

Oxidation involves loss of electrons and reduction involves gain of electrons, hence in case of oxidation-reduction reactions(redox reactions)charge remains conserved

123 **(b)**

$Ni \longrightarrow Ni^{2+} + 2e$; Ni is oxidized and thus, reductant.

124 **(a)**

$2\overset{-1}{HI} + H_2\overset{+6}{S}O_4 \longrightarrow \overset{0}{I_2} + \overset{+4}{S}O_2 + 2H_2O$

H_2SO_4 – Reduced to $\longrightarrow SO_2$

oxidising agent

125 **(c)**

$Cr_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Cr$.

126 **(a)**

$H_2\overset{-2}{S} \longrightarrow \overset{0}{S}$

The oxidation number of S increases from −2 to 0 in elemental sulphur and hence, H_2S gets oxidized

127 **(a)**

S_8has zero oxidation state of S.

In S_2F_2: $2 \times a + 2 \times (-1) = 0$; $\therefore a = +1$

In H_2S: $2 \times 1 + a = 0$; $\therefore a = -2$

128 **(a)**

Cr in CrO_2Cl_2 has +6 and Mn in MNO_4^- has +7 oxidation number respectively, the highest value for them.

129 **(d)**

F is more electronegative than oxygen.

130 **(a)**

Oxidation number of Cl in ClO_3^-.

$ClO_3 = -1$

$x + 3(-2) = -1$

$x = +6 - 1$

$x = +5$

131 **(a)**

$2e + Cl^+ \longrightarrow Cl^-$

$N = \frac{15}{74.5/2 \times 1} = 0.40$

132 **(b)**

In ionic hydrides, H has −1 ox.no.

133 **(c)**

Let the oxidation number of Xe is x in $XeOF_2$.

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

$x - 2 - 2 = 0$

$x = +4$

134 **(b)**

No change in ox.no. of any species.

135 **(a)**

$H_2^{1+} + 2e \longrightarrow H_2^0$

136 **(d)**

Both are same.

137 **(b)**

$2 \times 1 + 2 \times 1 + 4 \times (-2) = 0$

$\therefore a = +3$

138 **(a)**

Let oxidation state of P in $Ba(H_2PO_2)_2$ is x, then

$2(+1) + 2[2(+1) + x + 2(-2)] = 0$

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

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

$2 + 2x - 4 = 0$

$2x = 2$

$x = +1$

139 **(c)**

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

$\therefore a = +1$

140 **(a)**

Calculate ox.no. of S by assuming $(CH_3)^+$ and SO^{2-}.

141 **(c)**

$H_2^{1+}O \longrightarrow H_2^0$; Steam is reduced.

142 **(b)**

$2KClO_3 \longrightarrow 2KCl + 3O_2$. An intramolecular redox change is one in which one element of a compound is oxidized ($O^{2-}$to O_2^0) and one element is reduced ($Cl^{5+}$to Cl^{1-})

143 **(b)**

$Mn^{7+} + 5e \longrightarrow Mn^{2+}$

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

144 **(b)**

Due to smallest halogen, it possesses maximum tendency for accepting electron in aqueous medium.

$(1/2)\ F_2 + e + aq \longrightarrow F^-, \Delta H = -\text{ve(max. for } F_2)$

145 **(a)**

Bromine has zero oxidation state because it is in free state.

$\overset{0}{Br_2} \longrightarrow BrO_3^-$

Let the oxidation number of Br in BrO_3^- is x.

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

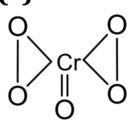
$x + (-6) = -1$

$x = +6 - 1$

$x = +5$

So, oxidation number changes from 0 to +5.

146 **(c)**



ie, it has four peroxide bonds each having an oxidation number of −1 and one double bond in which oxidation number of O is −2

Therefore, $x + 4 \times (-1) + 1 \times (-2) = 0$

$\therefore x = \times 6$

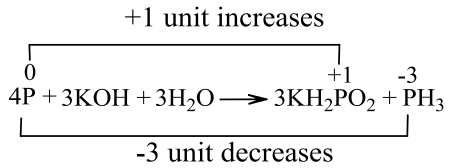
147 **(a)**

Indicator then only can show redox change with either of the titre species to indicate end point.

148 **(d)**

$4CrO_5 + 6H_2SO_4 \longrightarrow 2Cr_2(SO_4)_3 + 6H_2O + 7O_2$

149 **(c)**



Hence, P is both oxidized as well as reduced

150 **(c)**

$2 \times a + 7 \times (-2) = -4$

$\therefore a = +5$

151 **(b)**

$6e + Cr_2^{6+} \longrightarrow 2Cr^{3+}$.

152 **(b)**

Let the oxidation number of oxygen in following compounds is x.

In OF_2

$x + (-1)2 = 0$

$x = +2$

In KO_2

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

$2x = -1$

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

In BaO_2

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

$2x = -2$

$x = -1$

In

O_3, oxidation number of oxygen is zero because oxi free state or in any of its allotropic form is always zero.

Thus, the increasing order of oxidation number is

$BaO_2 < KO_2 < O_3 < OF_2$

$-1 \quad -\frac{1}{2} \quad 0 \quad +2$

153 **(d)**

Na−Hg is uncombined state of sodium.

154 **(a)**

A measuring flask has a definite volume.

155 **(b)**

Since, $K_3Fe(CN)_6$ reacts with $FeSO_4$ (if added internally) to give blue colour of iron complex.

156 **(a)**

$2 \times a + 5 \times 1 = +1$

$\therefore a = -2$

157 **(a)**

Oxygen of H_2O_2 gets reduced from − 1 to −2.

158 **(a)**

Meq. of HNO_3 = Meq. of I_2

$\frac{w}{63/1} \times 1000 = \frac{5}{254/10} \times 1000$

$\therefore w = 12.4$ g

159 **(c)**

$SO_2 + 2H_2S \longrightarrow 2H_2O + 3S$

160 **(d)**

F^- can be oxidized to F_2 only by electrolysis.

161 **(a)**

$2S_2^{2+} \longrightarrow S_4^{(5/2)+} + 2e$ ∴ Eq. wt. of $Na_2S_2O_3 = \frac{M}{1}$

$I_2^0 + 2e \longrightarrow 2I^-$

162 **(d)**

The same species in each reaction is oxidized and reduced as well to give disproportionation reaction.

163 **(a)**

N_3H (hydrazoic acid)

$+3(x) + 1 = 0$

$3x + 1 = 0$

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

164 **(a)**

$Fe^{2+} + Ce^{4+} \longrightarrow Fe^{3+} + Ce^{3+}$

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

$\therefore \frac{\text{Moles of cerric ammonium sulphate}}{\text{Moles of potassium permanganate}} = \frac{1}{1/5}$

$= 5.0$

165 **(a)**

$N^{3-} \longrightarrow N^{2+} + 5e$

$\therefore E_{NH_3} = \frac{17}{5}$

166 **(a)**

C has -4 ox.no. in CH_4,

In rest all it has $+4$ ox.no.

167 **(d)**

$[Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}] \times 1; [Sn^{2+} \longrightarrow Sn^{4+} + 2e] \times 3$

168 **(a)**

Milliequivalent $[(W/\text{Eq. wt.}) \times 1000]$ or millimole $\left[\left(\frac{W}{M}\right) \times 1000\right]$ do not change on dilution.

169 **(c)**

Cr^{3+} ion is green; $Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}$.

170 **(b)**

$Hg + O_3 \longrightarrow HgO + O_2$

171 **(a)**

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

$\therefore a = +3$

172 **(c)**

$2V^{2+} \longrightarrow V_2^{5+} + 6e$

173 **(c)**

$Cr^{6+} + 3e \longrightarrow Cr^{3+}$

$\therefore E = M/3$

174 **(a)**

Ox.no. of Cr on both side is $+6$

175 **(b)**

$S^{2-} \longrightarrow S^{4+} + 6e$

∴ Eq. = mole × 6

176 **(c)**

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

$\therefore a = +6$

177 **(b)**

Iodine has -1 (minimum ox.no.) and $+7$ (maximum ox.no.).

178 **(d)**

These are formulae of Meq.

179 **(c)**

$CuSO_4 + H_2S \longrightarrow CuS + H_2SO_4$

180 **(a)**

I in KIO_4 has $+7$ ox.no.

181 **(a)**

$2 \times a + 3 \times (-2) = -2$

$\therefore a = +2$

182 **(c)**

$6e + Cr_2^{6+} \longrightarrow 2Cr^{3+}$;

Eq. wt. of Cr $= \frac{\text{at. wt.}}{3}$

183 **(d)**

$\overset{-1}{H_2O_2} + \overset{+2}{Na_2}\overset{+4}{C}\overset{-2}{O_3} \longrightarrow \overset{+1}{Na_2}\overset{-1}{O_2} + \overset{+4}{C}\overset{-2}{O_2} + H_2\overset{-2}{O}$

None of the elements changes its oxidation number

184 **(a)**

Usually burettes have least count of 0.1 mL.

185 **(c)**

The oxidation state of N in NH_3 is

$x + 3(+1) = 0$

$x = -3$

The oxidation state of N in HNO_3 is

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

$x = 5$

The oxidation state in N in NaN_3 is

$+1 + 3x = 0$

$x = -1/3$

The oxidation state of N in Mg_3N_2 is

$3(2) + 2x = 0$

$6 + 2x = 0$

$x = -3$

Hence, three molecules ($i.e.$, NH_3, NaN_3, Mg_3N_2) have negative oxidation state.

186 **(a)**

Fe in Fe $(CO)_5$ has zero oxidation no., *i.e.*, the lowest for metals.

187 **(c)**

The weight of rider used is 0.0002 g.

188 **(d)**

Ions are hydrated on dissolution of salt in water.

189 **(a)**

Ox.no. of each element on two sides is same.

190 **(c)**

$10e + 2Br^{5+} \longrightarrow Br_2^0 \quad \therefore$ Eq. wt. of $KBrO_3 = \frac{M}{5}$

$2Br^- \longrightarrow Br_2 + 2e$

191 **(a)**

Corrosion involves oxidation of species.

192 **(b)**

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$$
$$[Fe^{2+} \longrightarrow Fe^{3+} + e^-]^5$$
$$MnO_4^- + 8H^+ + 5Fe^{2+} \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$$

$\therefore$ Five electrons gets transferred.

193 **(c)**

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

$\therefore a = +5$

194 **(a)**

The species present in solution but does not take part in the reaction and are also omitted while writing the potential redox change are called spectator ion.

195 **(a)**

It is the formula of turns bull's blue.

196 **(b)**

Si has 4 electrons in its valence shell. When it reacts with strongly electropositive metal like Na, Mg, K etc., it gives 4 electrons and its oxidation state in this case is -4.

197 **(b)**

Oxygen in H_2O_2 has ox.no. -1 which can increase or decrease.

198 **(b)**

$A^{n-} \longrightarrow A^{a+} + (a+n)e$

$Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}$

Also, Meq of A = Meq. of $K_2Cr_2O_7$

$3.26 \times 10^{-3}(a+n) = 1.68 \times 10^{-3} \times 6$

Or $a + n = 3$

$\therefore \quad a = 3 - n$

199 **(c)**

$H_2^0 \longrightarrow H_2^+ + 2e$ (H_2O is formed)

200 **(d)**

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

$\therefore a = +7$

201 **(d)**

Due to higher E^0_{OP} order.

202 **(c)**

Cl atom is oxidised ($Cl^{1+} \longrightarrow Cl^{5+} + 4e$) as well as Cl atom is reduced ($Cl^{1+} + 2e \longrightarrow Cl^-$). Such reactions are called auto redox or disproportionation reactions.

203 **(d)**

Ox.no. of S in $Na_2S_4O_6$ is no doubt 2.5 but it is average of two values, *i.e.*,

$$\frac{2 \times (+5) + 2 \times 0}{4} = +5/2$$

204 **(a)**

De-electronation is loss of electrons, i.e. $M \longrightarrow M^{4+} + 4e$

205 **(b)**

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$; This is simple decomposition and not a redox change.

206 **(b)**

S^{2-}has minimum ox.no. and thus, can act only as reducing agent.

207 **(a)**

It imparts its colour at end point.

208 **(c)**

$Zn^0 \longrightarrow Zn^{2+} + 2e$

209 **(d)**

Oxygen has highest electron affinity in its family.

210 **(a)**

$Na_2[Fe(CN)_5NO]$

211 **(d)**

The formula is obtained by taking an account of g atoms.

$$Xe = \frac{53.3}{131} = 0.4, F = \frac{46.5}{20} = 2.325,$$

i.e., 1 : 6 *or* XeF_6

212 **(c)**

N in NH_3, NH_4^+, N_3H and NO_2^- has -3, -3, $-1/3$ and $+3$ oxidation number respectively.

213 **(b)**

Meq. of H_2O_2 = Meq. of $KMnO_4$

$$\frac{w}{34/2} \times 1000 = 10 \times 1$$

$\therefore w_{H_2O_2} = 0.17$

$$\therefore \quad \text{Per cent purity} = \frac{0.17}{0.2} \times 100 = 85\%$$

214 **(c)**

$Mn^{7+} + e \longrightarrow Mn^{6+} \quad (MnO_4^{2-})$

$Mn^{7+} + 3e \longrightarrow Mn^{4+} \quad (MnO_2)$

$2Mn^{7+} + 8e \longrightarrow (Mn^{3+})_2 \quad (Mn_2O_3)$

$Mn^{7+} + 5e \longrightarrow Mn^{2+} \quad (MnO_2)$

215 **(d)**

The reaction involves :

$H_2O_2 + 2I^- + 2H^+ \longrightarrow I_2 + 2H_2O(l)$

$2Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$

The reaction gives blue colour only after all the $Na_2S_2O_3$ is used. The reaction is carried out with adjusted amount of $Na_2S_2O_3$ so that only a fraction of H_2O_2 and KI reaction occurs before the blue colour of starch—I_2 appears, however the slow redox reaction of H_2O_2—I_2 continues. The appearance of blue colour is like clock alarm and in such reactions time for the appearance of blue colour is noticed. The phenomenon is used in studying rate of reaction. If time taken for blue colour appearance is longer, the reaction is slow and $vice - versa$.

216 **(c)**

N in $(N_2H_5)_2SO_4$ has -2 ox.no.

217 **(b)**

The $5p$ −electrons of outermost shell in iodine are unpaired during their excitation to $5d$ −subshell.

218 **(d)**

A characteristic property of transition elements.

219 **(c)**

Let the oxidation state of sulphur in $Na_2S_4O_6$ is x.

$Na_2S_4O_6$

$1\times 2 + 4 \times x + (-2) \times 6 = 0$

$2 + 4x - 12 = 0$

$4x - 10 = 0$

$4x = 10$

$x = \frac{10}{4} = 2.5$

220 **(d)**

F_2 is strongest oxidant among all the species.

221 **(b)**

S has +6 ox. no. in SO_3

222 **(c)**

$3 \times a + 1 \times 1 = 0$

$\therefore a = -1/3$

223 **(a)**

Tendency to lose more electron for cation decreases.

224 **(a)**

$\therefore 4Zn + NO_3^- + 10H^+ \longrightarrow 4Zn^{2+} + NH_4^+ + 3H_2O$(Net equation)

$4Zn + NO_3^- + 10HCl \longrightarrow 4Zn^{2+} + NH_4^+ + 5Cl_2 + 3H_2O$

$\because$ 1 mole of NO_3^- (0r $NaNO_3$) is reduced by

=10 moles of HCl

$\therefore \frac{1}{2}$ mole of No_3^- will be reduced by

$= 10 \times \frac{1}{2}$ moles of HCl

= 5 moles of HCl

225 **(a)**

Meq. of $FeSO_4$ = Meq. of $KMnO_4$

$\frac{w}{152/1} \times 1000 = 200 \times 1$

$\therefore w = 30.4$ g

226 **(b)**

$BiO_3^- + 6H^+ + 2e^- \longrightarrow Bi^{3+} + 3H_2O$

$x = 2$

227 **(b)**

$5H_2O_2 + 2ClO_2 + 2OH^- \longrightarrow 2Cl^- + 5O_2 + 6H_2O$

228 **(b)**

Meq. of $Na_2S_2O_3$ = Meq. of $CuSO_4$

$\therefore V \times 0.4 \times 1 = 50 \times 0.2 \times 1$

$\therefore V = 25$ mL

229 **(a)**

$$N = \frac{47.5}{189.7/2 \times 2.25} = 0.222\ N$$

230 **(b)**

$2e + Fe_2^{3+} \longrightarrow 2Fe^{2+}$

231 **(c)**

$Mn^{7+} + 5e \longrightarrow Mn^{2+}$

$C_2^{3+} \longrightarrow 2C^{4+} + 2e$

232 **(b)**

Oxidation no. of N in NO^+ is

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

$\therefore x = +3$

Oxidation no. of Cl in ClO_4^- is

$(1 \times x) + 4 \times (-2) = -1$

$x = +7$

233 **(c)**

1. Sulphurous acid H_2SO_3

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

$x - 4 = 0$

$\therefore x = 4$

2. Pyrosulphuric acid $(H_2S_2O_7)$

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

or $2x = 12$

$\therefore = 6$

3. Thiosulphuric acid $(H_2S_2O_3)$

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

or $2x = 4$

$x = 2$

4. Dithionous acid ($H_2S_2O_4$)

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

$$2x = 6$$

$$\therefore\ x = 3$$

234 **(c)**

$KCN + AgCN \longrightarrow KAg(CN)_2$ (Complex formation)

CN^- also acts as reducing agent.

235 **(a)**

$Mg + 2HCl \longrightarrow MgCl_2 + H_2$.

236 **(a)**

Meq. of oxalic acid = Meq. of $KMnO_4$

$V \times 0.1 \dfrac{250 \times 8}{100 \times 31.6} \times 1000 = 6.3$ litre

237 **(d)**

H_3PO_3 is phosphorous acid.

238 **(c)**

$Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}$

239 **(c)**

$H_4P_2O_5 : 4 \times 1 + 2 \times a - 5 \times 2 = 0$

$a = +3$

$H_4P_2O_6 : 4 \times 1 + 2 \times a - 6 \times 2 = 0$

$a = +4$

$H_4P_2O_7 : 4 \times 1 + 2 \times a - 7 \times 2 = 0$

$a = +5$

240 **(c)**

$2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^-$.

241 **(b)**

Meq. of oxalate = Meq. of KMnO4

$\dfrac{w}{88/2} \times 1000 = 90 \times \dfrac{1}{20}$

$\therefore w$ oxalate ion $= 0.198$ g

$\therefore$ % of oxalate ion $= \frac{0.198}{0.3} \times 100 = 66\%$

242 **(a)**

Meq. of Cl_2 = Meq. of $KMnO_4$

$\dfrac{w}{71/2} \times 1000 = \dfrac{10}{31.6} \times 1000$

$\therefore w_{Cl_2} = 11.23$ g

$\therefore V_{Cl_2} = \dfrac{22.4 \times 11.23}{71} = 3.54$ litre

243 **(d)**

$N = \dfrac{15.8 \times 1000}{158/5 \times 100} = 5$

244 **(b)**

$Mn^{7+}5e \longrightarrow Mn^{2+}$

245 **(d)**

$S_2O_3^{2-} \longrightarrow S(s)$

or $4e + S_2^{2+} \longrightarrow 2S^0$

246 **(a)**

Meq. of $KMnO_4$ = Meq. of FeC_2O_4

$Fe^{2+}C_2^{2+}O_4 \longrightarrow Fe^{3+} + 2C^{4+}O_2 + 3e$

$0.1 \times 5 \times V = \dfrac{100 \times 10^{-3}}{144/3} \times 1000$

$\therefore\ V = 4.1$ mL

247 **(d)**

It is precipitation reaction.

248 **(a)**

Meq. of lime stone = Meq. of CaC_2O_4

= Meq. of $KMnO_4$

= Meq. Of CaO

$\therefore 40 \times 0.250 = \dfrac{w}{56/2} \times 1000$

$\therefore w_{CaO} = 0.28$

$\therefore$ per cent of CaO $= \frac{0.28 \times 100}{0.518} = 54\%$

249 **(a)**

Equate charge on both side, $2 \times 3 + 2 = 2 \times 2 + a$

$\therefore a = +4$; Thus, Sn^{4+} is choice.

250 **(c)**

Br_2 is disproportionated in basic medium as

$3Br_2 + 3Na_2CO_3 \longrightarrow 5NaBr + NaBrO_3 + 3CO_2$

251 **(b)**

Carbon has negative oxidation no.in Mg_3C_2 and positive oxidation number in C_3O_2; O is more electronegative than C. Mg is more electropositive than C.

252 **(d)**

It is a complexation reaction involving reduction of I_2 and oxidation of KI.

253 **(a)**

Oxidation state of Cr in Cr_2O_3 is

Cr_2O_3,

$2x + (-2)3 = 0$

$2x - 6 = 0$

$2x = 6$

$x = +3$

254 **(a)**

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

$\therefore a = +1$

255 **(c)**

N has + 1 ox.no.

256 **(a)**

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

$Mn^{7+} + 5e \longrightarrow Mn^{2+}$

5 mole $FeSO_4$ = 1 mole $KMnO_4$

$'X' = \frac{2}{3}$ mole

Or $Fe^{2+} \longrightarrow Fe^{3+} + e$

$(C^{3+})_2 \longrightarrow 2C^{4+} + 2e$

$FeC_2O_4 \longrightarrow Fe^{3+} + 2C^{4+} + 3e$

$Mn^{7+} + 5e \longrightarrow Mn^{2+}$

5 mole FeC_2O_4 = 3 mole $KMnO_4$

$\therefore 'Y' = \frac{3 \times 2}{5}$

257 **(b)**

$H_2S + Cl_2 \longrightarrow 2HCl + S$

258 **(c)**

Meq. of salt = Meq. Of Na_2SO_3

$50 \times 0.1 \times n = 25 \times 0.1 \times 2$

$\therefore n = 1$ (change in ox. no.)

$\therefore \; M^{3+} + e \longrightarrow M^{2+}$

259 **(a)**

Cu^{2+} is more stable than Cu^+ although later, has $3d^{10}$configuration. In Cu^+18 electron core is not held properly by nuclear charge and thus, Cu^+ is readily converted to Cu^{2+}.

260 **(c)**

∵ In this reaction phosphorus is simultaneously oxidised and reduced.

∴ It is disproportionation reation.

$\overset{0}{P_4} + 3NaOH + 3H_2O \longrightarrow 3Na\overset{+}{H_2PO_2} + \overset{-3}{PH_3}$

261 **(a)**

$S + 2e \longrightarrow S^{2-}$.

262 **(d)**

All terms have same meaning.

263 **(b)**

The sum of the oxidation states is always zero in neutral compound.

The oxidation state of X, Y, and Z are +2, +5 and −2 respectively.

5. In X_2YZ_6

$2 \times 2 + 5 + 6(-2) \neq 0$

6. In XY_2Z_6

$2 + 5 \times 2 + 6(-2) = 0$

7. In XY_5

$2 + 5 \times 5 \neq 0$

8. In X_3YZ_4

$3 \times 2 + 5 + 4(-2) \neq 0$

Hence, the formula of the compound is XY_2Z_6.

264 **(c)**

F is most electronegative element and thus, has −1 ox.no.

Thus, $a + (-2) = 0$

$\therefore a = +2$

265 **(a)**

$Mn^{7+} + 5e \longrightarrow Mn^{2+}$

$(Cr^{6+})_2 + 6e \longrightarrow 2Cr^{3+}$

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

Meq. of Fe^{2+} = Meq. of $KMnO_4$ = Meq. of $K_2Cr_2O_7$

$1 \times 5 \times V_{KMnO_4} = 1 \times 6 \times V_{K_2Cr_2O_7}$

$\therefore V_{KMnO_4} = \frac{6}{5} V_{K_2Cr_2O_7}$

266 **(b)**

Meq. of $KMnO_4$ in 1 mL = Meq. of Fe = $\frac{5 \times 10^{-3}}{56/1} \times 10^3$

$\therefore$ Meq. if $KMnO_4$ in 250 mL = $\frac{5 \times 250}{56/1}$

Thus, $\frac{w}{31.6} \times 1000 = \frac{5 \times 250}{56/1} = 0.7$ g

267 **(c)**

Let the oxidation number of Cr in K_2CrO_4 is x.

$2(+1) + x + 4(-2) = 0$

$2 + x - 8 = 0$

$x = +6$

268 **(b)**

$2S_2^{2+} \longrightarrow S_4^{5/2} + 2e$

269 **(c)**

$Mn^{7+} + 5e \longrightarrow Mn^{2+}$

$\therefore \; E = M/5$

270 **(c)**

Let the oxidation number of Cr be x

∴ For $K_2Cr_2O_7$

$+1 \times 2 + 2x + 7(-2) = 0$

$2 + 2x - 14 = 0$

$2x = 12$

$x = 6$

271 **(b)**

$Mn^{2+} \longrightarrow Mn^{4+} + 2e$

272 **(c)**

$S^{4+} + 4e \longrightarrow S^0$; SO_2 is reduced and thus, oxidant.

273 **(b)**

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

274 **(b)**

Let the oxidation number of carbonyl carbon in methanal (HCHO) and methanoic acid (HCOOH) is x and y is respectively.

In HCHO,

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

$2 + x - 2 = 0$

$x = 0$

In HCOOH,

$2(+1) + y + 2(-2) = 0$
$2 + y - 4 = 0$
$y = 2$

275 **(c)**
$I_2^0 \longrightarrow 2I^{5+} + 10e$
$\therefore\ E = \frac{M}{10} = \frac{254}{10} = 25.4$

276 **(c)**
$4e + S^{4+} \longrightarrow S^0$
$\therefore\ E_{SO_2} = \frac{64}{4} = 16$

277 **(a)**
$M^{5+} \longrightarrow M^{7+} + 2e$; M^{5+} is reductant.

278 **(a)**
$\overset{0}{Li} + \overset{0}{H_2} \longrightarrow 2\overset{+1\ -1}{LiH}$
Oxidation number of hydrogen is decreasing from 0 to −1. So, H_2 is acting as oxidising agent in this reaction.

279 **(d)**
Mohr's salt is $FeSO_4.(NH_4)_2\,SO_4.6H_2O$
$Fe^{2+} \longrightarrow Fe^{3+} + e \times 6$
$6e + Cr_2O_7^{2-} \longrightarrow 2Cr^{3+} \times 1$

280 **(a)**
1 faraday of electricity involves change of one mole electron.
$Fe^{2+} + 2e \longrightarrow Fe$

281 **(c)**
Oxidation of Co and reduction of Cu^{2+} is taking place.

282 **(a)**
$4 \times 1 + a + 6 \times (-2) = -1$
$\therefore a = +7$

283 **(a)**
$a + 3 \times (+1) = 0$
$\therefore a = -3$

284 **(c)**
$2MnCl_2 + 5PbO_2 + 6HNO_3 \longrightarrow 2HMnO_4 + 2PbCl_2 + 3Pb(NO_3)_2 + 2H_2O$

285 **(d)**
$4 \times 1 + a + 4 \times (-1) = 0$
$\therefore a = 0$

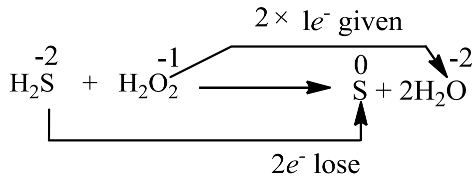
286 **(c)**
Ox. no. of each species remains same.

287 **(a)**
$Mn^{7+} + 2e \longrightarrow Mn^{5+}$.

288 **(a)**
$4 \times 1 + a + 6 \times (-1) = 0$
$\therefore a = +2$

289 **(a)**
$2NH_3 + OCl^- \longrightarrow N_2H_4 + Cl^- + H_2O$

290 **(d)**



H_2S – Oxidation, Reducing agent.
H_2O_2 – Reduction, Oxidising agent.

291 **(d)**
$S^{4+} \longrightarrow S^{6+} + 2e$.

292 **(b)**
$a + 2 \times 1 - 1 = 0$
$\therefore a = -1$

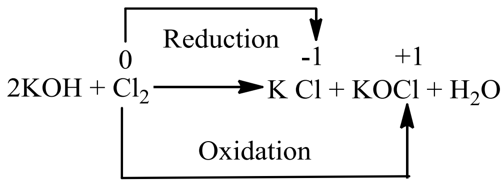
293 **(d)**
$2Cu^{2+} + 2e \longrightarrow Cu_2^{1+}$
$\therefore E = \frac{M}{1}$

294 **(c)**
$Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}$;
$Cr^2O_7^{2-}$ is reduced.

295 **(a)**
$Sn^0 \longrightarrow Sn^{4+} + 4e$

296 **(d)**
$2Fe^{3+} + Sn^{2+} \longrightarrow 2Fe^{2+} + Sn^{4+}$

297 **(c)**
The reactions, in which the same element is oxidised as well as reduced, are called disproportionation reactions.



In this reaction, the same element, *ie.*, Cl_2 is oxidised as well as reduced, so it is an example of disproportionation reaction.

298 **(a)**
$Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 7H_2O + 3I_2$
$Cr_2O_7^{2-}$ is reduced to Cr^{3+}.
Thus, final state of Cr is +3. Hence, (a)

299 **(d)**
$NaNO_2$ (Sodium nitrite) acts both as oxidising as well as reducing agent because in it N-atom is in +3 oxidation state (intermediate oxidation state).
Oxidising property
$2NaNO_2 + 2KI + 2H_2SO_4 \longrightarrow Na_2SO_4 + K_2SO_4 + 2NO + 2H_2O + I_2$
Reducing property
$H_2O_2 + NaNO_2 \longrightarrow NaNO_3 + H_2O$

300 **(a)**
Graphic is uncombined state of carbon.

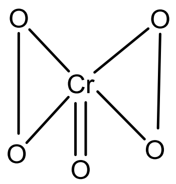
301 **(d)**
$6 \times a + 12 \times 1 + 6 \times (-2) = 0$
$\therefore a = 0$

302 **(b)**
$Mn^{7+} + 5e \longrightarrow Mn^{2+}$

303 **(a)**
$2 \times 2 + 2 \times a + 7 \times (-2) = 0$
$\therefore a = +5$

304 **(c)**
Eq. of Cl_2 = eq. of chloride
$1 \times 2 = \frac{111}{E + 35.5}$
$\therefore E = 40$
$\therefore M = 40 \times 2 = 80$ (Metal is bivalent.)

305 **(b)**



It is chromium peroxide.
Let the oxidation number of Cr is "x".
$Cr^{x+} + O_2^- + O^{2-} + O_2^- - CrO_5$
$x + (-1)2 + (-1)2 + (-2)1 = 0$
$x - 6 = 0$
$x = +6$
Hence, the oxidation state of Cr is +6.

306 **(d)**
Haematite is Fe_2O_3, in which oxidation number of iron is III.
Magnetite is Fe_3O_4 which is infact a mixed oxide ($FeO.Fe_2O_3$.), hence iron is present in both II and III oxidation state.

307 **(c)**
$K_2Cr_2O_7 + 2KOH \longrightarrow 2K_2CrO_4$
(red-orange) (lemon-yellow)

308 **(a)**
In basic medium
$2KMnO_4 + 2KOH \longrightarrow 2K_2MnO_4 + H_2O + O$
Net reaction is $\overset{+7}{Mn}O_4^- \longrightarrow \overset{+6}{Mn}O_4^{-2}$
Change in oxidation number
$= 7 - 6 = +1$
So, electrons involved $= 1e^-$

309 **(a)**
In NH_4^+, N has ox.no. −3 and in NO_3^-, N has ox.no. +5.

310 **(c)**
$a + 6 \times (-1) = -2$
$\therefore a = +4$

311 **(c)**
$1 + 1 \times (-2) + a = 0$
$\therefore a = +1$

312 **(a)**
$e + N^{5+} \longrightarrow N^{4+}$; Thus, HNO_3 is oxidant.

313 **(a)**
$H^0 \longrightarrow H^{1+} + 1e$.

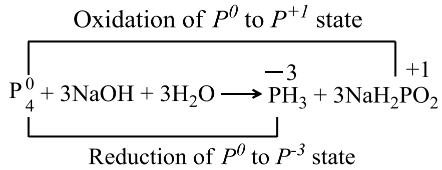
314 **(d)**
$S \xrightarrow{O_2} SO_2 \xrightarrow{Cl_2} SO_4^{2-} \xrightarrow{BaCl_2} BaSO_4$One mole of S will give one mole of $BaSO_4$. Thus, mole of $BaSO_4$ formed = mole of S $= \frac{8}{32} = \frac{1}{4}$

315 **(d)**
$[Mn^{7+} + 5e \longrightarrow Mn^{2+}] \times 3$
$[Fe^{2+}C_2^{3+}O_4 \longrightarrow Fe^{3+} + 2C^{4+}O_2 + 3e] \times 5$

316 **(c)**
Equal equivalent of species react together.

317 **(a)**
It is a fact.

318 **(c)**
The balanced disproportionation reaction involving white phosphorus with aq. NaOH is



319 **(b)**
F can have only –ve ox.no., *i.e.*, $2e + F_2^0 \longrightarrow 2F^{1-}$ or F_2 can be reduced only.

320 **(a)**
$(N^0)_2 + 6e \longrightarrow 2(N^{3-})$
$3(H^0)_2 \longrightarrow 2(H^{+1})_3 + 6e$
$E_{N_2} = \frac{28}{6}; E_{NH_3} = \frac{17}{3}$

321 **(a)**
$SO_2 + 2H_2O \longrightarrow H_2SO_4 + 2H$; thus, matter is reduced by liberated hydrogen.

322 **(c)**
N_2 undergoes oxidation and reduction as well;
$N_2^0 \longrightarrow 2N^{3+} + 6e; N_2^0 + 6e \longrightarrow 2N^{3-}$

323 **(b)**
$M^{3+} \longrightarrow M^{6+} + 3e$.

324 **(a)**
$2H^- \longrightarrow H_2 + 2e$; Thus, H^- is oxidized.

325 **(d)**
All these substances can accept electrons and can decrease their oxidation number and hence, all these act as oxidation agent

$\overset{+5}{HNO_3} \longrightarrow \overset{+4}{NO_2}$ or $\overset{+2}{NO}$

$\overset{0}{Cl_2} \longrightarrow 2Cl^-$

$\overset{+3}{FeCl_3} \longrightarrow \overset{+2}{FeCl_2}$

326 **(b)**

Meq. of I_2 = Meq. of $Na_2S_2O_3 = 40 \times 0.11$

$\therefore \frac{w}{254/2} \times 1000 = 40 \times 0.11$

$w_{I_2} = 0.558$ g

327 **(a)**

$5e + Mn^{7+} \longrightarrow Mn^{2+}$

$S^{4+} \longrightarrow S^{6+} + 2e$

328 **(c)**

Meq. of $HNO_3 = 1000 \times 2 = 2000$

$\therefore \frac{w}{63/3} \times 1000 = 2000$

$\therefore w = 42$ g

329 **(c)**

The chemical structure of $H_2S_2O_8$ is as follows

```
        O          O
        ||         ||
H – o – s – o – o – s – o – H
        ||         ||
        O          O
```

$2 \times (+1) + 2 \times x + 6 \times (-2) + 2 \times (-1) = 0$

(for H, for S, for O, for O—O)

$+2 + 2x - 12 - 2 = 0$

$2x = +12$

$x = +6$

330 **(a)**

$2e + M^{7+} \longrightarrow M^{5+}, M^{7+}$ *is* oxidation; M^{+5} is reductant.

331 **(a)**

$S^{2-} \longrightarrow S^0 + 2e$

$\therefore E = M/2 = \frac{34}{2} = 17$

332 **(a)**

$Mn^{7+} + 5e \longrightarrow Mn^{2+}$.

333 **(b)**

In N_3H

Oxidation number of N $= -\frac{1}{3}$

In N_2O_4 Oxidation number of N = +4

In NH_2OH Oxidation number of N = −1

In NH_3 Oxidation number of N =−3

Hence, in N_2O_4 the oxidation number of nitrogen is highest.

334 **(b)**

Starch + $I_2 \longrightarrow$ Blue

335 **(d)**

$[2C_2^{3+} \longrightarrow 4C^{4+} + 4e] \times 5$

$[Mn^{7+} + 5e \longrightarrow Mn^{2+}] \times 4$

336 **(a)**

$Fe^{2+} \longrightarrow Fe^{3+} + e$.

337 **(d)**

$3 \times a + (+1) = 0$

$\therefore a = -1/3$

338 **(a)**

Mole of O_2 formed $= \frac{3}{24} = \frac{1}{8}$

$\therefore$ Mole of $H_2O_2 = \frac{1}{8} \times 2 = \frac{1}{4}$

$\therefore 100 \times X = \frac{1}{4} \times 1000$ (m mole = M × V)

$\therefore X = 2.5$

339 **(c)**

$2CuSO_4 + 4KI \longrightarrow Cu_2I_2 + 2K_2SO_4 + I_2$

340 **(d)**

+2 and +3

341 **(d)**

It is a fact.

342 **(d)**

$Al \longrightarrow Al^{3+} + 3e$

Thus, 27 g Al forms Al^{3+} by losing $3N$ electrons

$\therefore$ 13.5 g Al will lose $\frac{3N \times 13.5}{27} = \frac{3}{2} N$ electrons

343 **(c)**

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

$\therefore a = 0$

344 **(a)**

Mn has +7 oxidation state in $KMnO_4$.

$1 + x + 4(-2) = 0$

$1 + x - 8 = 0$

$x = +7$

345 **(a)**

Minimum ox.no. = group no. −8.

Maximum ox.no. = group no.

346 **(b)**

H possesses negative one value of oxidation number in ionic hydrides.

347 **(c)**

Due to –ve oxidation number it should be non-metal having six electrons in outer shell.

348 **(d)**

These are characteristics of indicator.

349 **(b)**

The oxidation state of Xe in both XeO_2 and XeF_4 is 4.

XeO_2	XeF_4
$x + 2(-2) = 0$	$x + 4(-1) = 0$
$x = 4$	$x = 4$

350 **(a)**

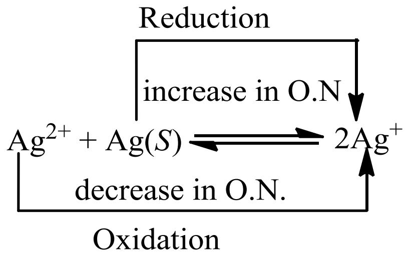
Na_3AsO_4 is sodium arsenate

Or AsO_4^{-3} is arsenate.

Thus, $a + 4 \times (-2) = -3$

$\therefore a = +5$

351 **(d)**



Hence, those reactions in which two or more species undergo oxidation as well as reduction are called comproportionation.

352 **(b)**

$SO_2 + 2H_2S \longrightarrow 2H_2O + 3S$

353 **(c)**

Glucose is reducing agent.

354 **(b)**

$a + 6 \times (-1) = -3$

$\therefore a = +3$

355 **(b)**

It is a fact.

356 **(b)**

. Oxidation state of Mn in $Mn^{2+} = +2$

0. Let oxidation state of Mn in $MnO_2 = x$

$\because \quad x + (2 \times -2) = 0$

$\therefore \quad x = +4$

iii) Let the oxidation state of Mn in $KMnO_4 = x$

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

$\therefore \quad x = +7$

iv) Let oxidation state of Mn in $K_2MnO_4 = x$

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

$\therefore \quad x = +6$

$\therefore$ Increasing order of oxidation states is

(i) < (ii) < (iv) < (iii)

357 **(b)**

Meq. of MnO_2 = Meq. of oxalic acid

$= 0.16 \times 35 = 56$

$\therefore \frac{w}{87/2} \times 1000 = 5.6$

$w_{MnO_2} = 0.24$ g

358 **(a)**

More is E^0_{RP},more is the tendency to get itself reduced or more is oxidising power.

359 **(a)**

Meq. of $KMnO_4 = 3750 \times 0.85$

$\therefore \frac{w}{31.6} \times 1000 = 3750 \times 0.85$

$\therefore \ w = 100.7$ g

360 **(c)**

$Mn^{7+} + 5e \longrightarrow Mn^{2+}$

361 **(a)**

$Cu^{2+} + 2e \longrightarrow Cu$

362 **(a)**

It is definition of iodimetric titrations.

363 **(b)**

$M^{n+} + ne \longrightarrow M$

364 **(b)**

$le + Mn^{7+} \longrightarrow Mn^{6+}$

$\therefore E = M/1$

365 **(a)**

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

$\therefore a = +5$

366 **(d)**

$\because$ 3 ions of F^- from 1 molecule of AIF_3

$\therefore 3 \times 10^{23}$ ions of $F^-$from 10^{23} molecules of AIF_3

367 **(a)**

Calculate ox.no. by taking NO^+ in NOCl

368 **(d)**

Cl ha +7 ox.no. in Cl_2O_7.

369 **(c)**

Meq. of $KMnO_4 = 4000 \times 0.05$

$\therefore \frac{w}{31.6} \times 1000 = 4000 \times 0.05$

$w = 6.32$ g

370 **(c)**

H_2O_2 oxidises S^{2-} to S^0.

371 **(a)**

Following is balanced redox reaction.

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

So, coefficients of $MnO_4^-, C_2O_4^{2-}$ and $H^+$are 2,5, and 16 respectively.

372 **(c)**

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

$\therefore a = +1$

373 **(d)**

Oxidation-reduction takes place simultaneously.

374 **(b)**

$Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}$;

$\therefore$ Eq. wt. $= \frac{\text{mol. wt.}}{6}$

375 **(a)**
$S^{4+} \longrightarrow S^{6+} + 2e$
$10e + 2I^{5+} \longrightarrow I_2^0$

376 **(b)**
F_2 shows only -1 ox.no.

377 **(a)**
Reduction (oxidation number decreases)

$$\overset{0}{P_4} + 3NaOH + 3H_2O \longrightarrow 3NaH_2\overset{+1}{P}O_2 + \overset{-3}{P}H_3$$

Oxidation (oxidation number is increases)
The reactions in which the same substance undergoes oxidation as well as reduction, are called disproportionation reactions.
So, the above reaction is an example of disproportionation reaction.

378 **(b)**
It is definition of iodimetric titrations.

379 **(d)**
$Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}$

380 **(b)**
$+2$ oxidation state due to $1s^2, 2s^2, 2p^2$ configuration having 2 unpaired electrons in $2p$ –subshell. $+4$ oxidation state due to $1s^2, 2s^1 2p^3$ configuration in excited state having four unpaired electrons.

381 **(a)**
Meq. if $SnCl_2$ = Meq. of $HgCl_2$
$0.5 \times V = 600 \times 0.1$
$\therefore V = 120$ mL

382 **(a)**
Meq. of $FeSO_4$ = Meq. of $KMnO_4 = 200 \times 1$
$\therefore \frac{w}{152/1} \times 1000 = 200$
$\therefore w = 30.4$ g

383 **(a)**
Meq. of Fe = Meq. of $K_2Cr_2O_7$
$\frac{w}{56/1} \times 1000 = 1 \times 0.1055$
$\therefore \quad w = 5.9 \times 10^{-3}$ g = 5.9 mg

384 **(d)**
$[Mn^{7+} + 5e \longrightarrow Mn^{2+}] \times 3$
$Fe^{2+} \longrightarrow Fe^{3+} + e$
$(C^{3+})_2 \longrightarrow 2C^{4+} + 2e$
$[FeC_2O_4 \longrightarrow Fe^{3+} + 2C^{4+} + 3e] \times 5$
$\therefore$ 3 mole $MnO_4^- \equiv$ 5 mole FeC_2O_4

385 **(c)**
The sum of oxidation number is zero.

386 **(c)**
Electrons released at anode = Electrons used at cathode.

388 **(c)**
$Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}$

389 **(b)**
$Mn^{7+} + 5e \longrightarrow Mn^{2+}$
$Fe^{2+} \longrightarrow Fe^{3+} + e$

390 **(d)**
Loss of an electron or increase in oxidation number is oxidation process.
i.e., $\quad H^- \longrightarrow H + e^-$

391 **(c)**
Due to inert pair effect which is more predominant in T1.

392 **(a)**
$Fe^{2+} \longrightarrow Fe^{3+} + 1e$
$6e + Cr_2^{6+} \longrightarrow 2Cr^{3+}$
Thus, electrons involved per Cr atom = 3.

393 **(a)**
Let oxidation state of Cr in $K_2Cr_2O_7 = x$
$(+1 \times 2) + 2x + (-2 \times 7) = 0$
or $+2 + 2x - 14 = 0$
$\therefore \quad x = +6$
Let oxidation state of Cr in $K_2CrO_4 = x$
$+1 \times 2 + x + (-2 \times 4) = 0$
$2 + x - 8 = 0$
$x = 6$
$\therefore$ Change in oxidation state of Cr is zero when it changes from
$K_2Cr_2O_7$ to K_2CrO_4.

394 **(b)**
In HNO_2, the oxidation number of N is + 3 which is less than the maximum possible, oxidation number *ie*, + 5 and more than the minimum possible oxidation number *ie*, -3, therefore, it can act both as an oxidizing as well as reducing agent

395 **(a)**
Ox. No. of N in $N_3H, NH_2OH, N_2H_4, NH_3$ are $-\frac{1}{3}, -1, -2, -3$ respectively.

396 **(a)**
$Mn^{6+} \longrightarrow Mn^{7+} + 1e$
$Mn^{6+} + 2e \longrightarrow Mn^{4+}$
$3MnO_4^{2-} \longrightarrow 2MnO_4^- + Mn^{4+}$

397 **(b)**
$FeCl_3$ cannot be oxidised because Fe has highest oxidation state.

398 **(d)**
Meq. of $KMnO_4$ = Meq. Of Cl_2
$1 \times 5 \times 1000 = \frac{w}{(71/2)} \times 1000$

$\therefore w = 177.5$ g

$\therefore V_{Cl_2} = 56$ litre at NTP

399 **(d)**

$Fe^{2+} \longrightarrow Fe^{3+} + e; O_2^{1-} + 2e \longrightarrow 2O^{2-};$

H_2O_2 acts as oxidant.

400 **(b)**

Let oxidation state of I in $IPO_4 = 'x'$.

$x + (-3) = 0$

(PO_4^{3-} ion has charge equal to -3)

$x = +3$

401 **(a)**

In alkaline medium

$\overset{+7}{KMnO_4} + OH^- \longrightarrow \overset{+6}{K_2MnO_4}$

Change in oxidation number

$= 7 - 6$

$= 1$

Hence, moles of KI = moles of $KMnO_4$.

402 **(c)**

5 mole I^- gives 3 mole I_2

403 **(c)**

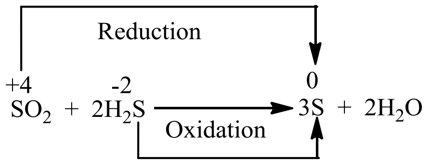
$2 \times 1 + 2 \times a + 7 \times (-2) = 0$

$\therefore a = +6$

404 **(c)**

The concentration of standard solution is known.

405 **(a)**



$\therefore H_2S$ is oxidised in this reaction.

406 **(b)**

$HP_2O_7^{-2}$

$+1 + 2x - 2 \times 7 = -1$

$x = +6$

407 **(b)**

Iron usually shows zero, +2, +3 oxidation state.

408 **(a)**

Calculate ox.no. of Cl in $NOClO_4$ by assuming ClO_4^- and NO^+.

409 **(b)**

$2e + H_2^0 \longrightarrow 2H^{1-}$

$Li \longrightarrow Li^{1+} + e$

H_2 is reduced and thus, oxidant.

410 **(b)**

$S^{4+} \longrightarrow S^{6+} + 2e$

411 **(a)**

$a + 2 \times (-2) = 0$

$\therefore a = +4$

412 **(d)**

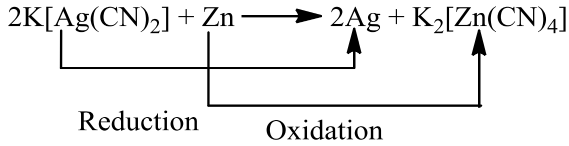
Ox.no. Fe in Mohr's salt, $[FeSO_4.(NH_4)_2SO_4.6H_2O]$ is $+2$.

413 **(a)**

$Cr_2^{6+} + 6e \longrightarrow 2Cr^{3+}; Fe^{2+} \longrightarrow Fe^{3+} + e$

414 **(d)**

$2K[Ag(CN)_2] + Zn \rightarrow 2Ag + K_2[Zn(CN)_4]$



415 **(b)**

Meq. of $K_2Cr_2O_7$ = Meq. of H_2S

$2 \text{ x } V = \frac{0.81}{34/2} \text{ x } 1000$

$\therefore V = 23.8$ mL

416 **(a)**

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

$\therefore a = +5$

417 **(b)**

$3Fe^0 \longrightarrow Fe_3^{+(8/3)} + 8e$

$\therefore E = \frac{M}{8/3} = \frac{56 \times 3}{8} = 21$

418 **(d)**

Permonosulphuric acid (H_2SO_5) has two oxygen atoms in peroxide linkage, hence,

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

$2 + x - 2 - 6 = 0$

$x = +6$

419 **(c)**

The reaction, in which two or more species undergo reduction as well as oxidation to give a single species are called comproportionation reaction. This is reverse of disproportionation reaction.

$Ag^{2+}(aq) + Ag(s) \rightleftharpoons 2Ag^+(aq)$

420 **(d)**

HCl is also oxidised along with oxalic acid by $KMnO_4$.

$2KMnO_4 + 16HCl \longrightarrow 2KCl + 2MnCl_2 + 5Cl_2 + 8H_2O$

$2KMnO_4 + 3H_2SO_4 + 5H_2C_2O_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10CO_2$

421 **(a)**

No change in oxidation no.in any of the species.

422 **(d)**

S in H_2SO_3 is in +4 oxidation state. It lies in between its maximum and minimum oxidation state, *i.e*, +6 and -2 and thus, S can increase or decrease its ox.no.as the case may be.