

# REDOX REACTIONS

## Single Correct Answer Type

- Which among the following shows maximum oxidation state?  
a) V                                      b) Fe                                      c) Mn                                      d) Cr
- 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
- In the reaction,  $\text{CH}_3\text{OH} \rightarrow \text{HCOOH}$ , the number of electrons that must be added to the right is:  
a) 4                                      b) 3                                      c) 2                                      d) 1
- A solution of  $\text{KMnO}_4$  is reduced to  $\text{MnO}_2$ . 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
- In the reaction of  $\text{O}_3$  and  $\text{H}_2\text{O}_2$ , the later acts as :  
a) Oxidising agent  
b) Reducing agent  
c) Bleaching agent  
d) Both oxidising and bleaching agent
- Of the following reactions, only one is a redox reaction. Identify this reaction.  
a)  $\text{Ca}(\text{OH})_2 + 2\text{HCl} \rightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}$                                       b)  $2\text{S}_2\text{O}_7^{2-} + 2\text{H}_2\text{O} \rightarrow 2\text{SO}_4^{2-} + 4\text{H}^+$   
c)  $\text{BaCl}_2 + \text{MgSO}_4 \rightarrow \text{BaSO}_4 + \text{MgCl}_2$                                       d)  $\text{Cu}_2\text{S} + 2\text{FeO} \rightarrow 2\text{Cu} + 2\text{Fe} + \text{SO}_2$
- 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
- In the equation,  $\text{SnCl}_2 + 2\text{HgCl}_2 \rightarrow \text{Hg}_2\text{Cl}_2 + \text{SnCl}_4$ . The equivalent weight of stannous chloride (molecular weight = 190) will be :  
a) 190                                      b) 95                                      c) 47.5                                      d) 154.5
- The oxoacid which acts both as oxidising and reducing agent is :  
a)  $\text{H}_2\text{SO}_4$                                       b)  $\text{H}_3\text{PO}_4$                                       c)  $\text{HNO}_2$                                       d)  $\text{HClO}_4$
- Oxidation state of oxygen is  $-1$  in the compound :  
a)  $\text{NO}_2$                                       b)  $\text{MnO}_2$                                       c)  $\text{PbO}_2$                                       d)  $\text{Na}_2\text{O}_2$
- When sulphur dioxide is passed in an acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  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
- 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
- The number of electrons lost or gained during the change  $\text{Fe} + \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + \text{H}_2$  is  
a) 2                                      b) 4                                      c) 6                                      d) 8
- 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
- Which one of the following reaction is possible at anode?







- 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<sub>3</sub>                      d) KClO<sub>4</sub>
36. The number of Fe<sup>2+</sup> ion oxidised by one mole of MnO<sub>4</sub><sup>-</sup> 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<sub>8</sub>) 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<sub>2</sub>O<sub>3</sub> 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<sub>4</sub> 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<sub>2</sub>O<sub>2</sub> is  
 a) -1                      b) +2                      c) + $\frac{1}{2}$                       d) -2
42. Which reaction indicates the oxidising behavior of H<sub>2</sub>SO<sub>4</sub>?  
 a) 2PCl<sub>5</sub> + H<sub>2</sub>SO<sub>4</sub> → 2POCl<sub>3</sub> + 2HCl + SO<sub>2</sub>Cl<sub>2</sub>  
 b) 2NaOH + H<sub>2</sub>SO<sub>4</sub> → Na<sub>2</sub>SO<sub>4</sub> + 2H<sub>2</sub>O  
 c) NaCl + H<sub>2</sub>SO<sub>4</sub> → NaHSO<sub>4</sub> + HCl  
 d) 2HI + H<sub>2</sub>SO<sub>4</sub> → I<sub>2</sub> + SO<sub>2</sub> + 2H<sub>2</sub>O
43. HCO<sub>3</sub><sup>-</sup> contains carbon in the oxidation state:  
 a) +5                      b) +1                      c) +4                      d) zero
44. Oxidation state of oxygen atom in potassium superoxide (KO<sub>2</sub>) is :  
 a) -1/2                      b) Zero                      c) +1/2                      d) -2
45. Which of the following reaction involves oxidation and reduction?  
 a) NaBr + HCl → NaCl + HBr                      b) HBr + AgNO<sub>3</sub> → AgBr + HNO<sub>3</sub>  
 c) H<sub>2</sub> + Br<sub>2</sub> → 2HBr                      d) Na<sub>2</sub>O + H<sub>2</sub>SO<sub>4</sub> → Na<sub>2</sub>SO<sub>4</sub> + H<sub>2</sub>O
46. The number of mole of oxalate ions oxidized by one mole of MnO<sub>4</sub><sup>-</sup> ion is:  
 a) 1/5                      b) 2/5                      c) 5/2                      d) 5
47. The number of mole of KMnO<sub>4</sub> 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<sub>4</sub><sup>-</sup> when it is converted to I<sub>2</sub> in acid medium :  
 a) M/6                      b) M/7                      c) M/5                      d) M/4
49. The eq. wt. of Fe<sub>3</sub>O<sub>4</sub> in , Fe<sub>3</sub>O<sub>4</sub> + KMnO<sub>4</sub> → Fe<sub>2</sub>O<sub>3</sub> + MnO<sub>2</sub> is:  
 a) M/6                      b) M                      c) 2M                      d) M/3
50. What volume of 3 molar HNO<sub>3</sub> is needed to oxidise 8 g of Fe<sup>2+</sup> to Fe<sup>3+</sup>? HNO<sub>3</sub>, 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<sub>3</sub>, NO, NH<sub>4</sub>Cl, N<sub>2</sub>                      b) HNO<sub>3</sub>, NO, N<sub>2</sub>, NH<sub>4</sub>Cl                      c) HNO<sub>3</sub>, NH<sub>4</sub>Cl, NO, N<sub>2</sub>                      d) NO, HNO<sub>3</sub>, NH<sub>4</sub>Cl, N<sub>2</sub>
52. The oxidation states of iodine in HIO<sub>4</sub>, H<sub>3</sub>IO<sub>5</sub> and H<sub>5</sub>IO<sub>6</sub> are respectively  
 a) +1,+3,+7                      b) +7,+7,+3                      c) +7,+7,+7                      d) +7,+5,+3
53. In which reaction H<sub>2</sub>O<sub>2</sub> acts as a reducing agent?  
 a) Ag<sub>2</sub>O + H<sub>2</sub>O<sub>2</sub> → 2Ag + H<sub>2</sub>O + O<sub>2</sub>  
 b) 2KI + H<sub>2</sub>O<sub>2</sub> → 2KOH + I<sub>2</sub>  
 c) PbS + 4H<sub>2</sub>O<sub>2</sub> → PbSO<sub>4</sub> + 4H<sub>2</sub>O  
 d) H<sub>2</sub>O<sub>2</sub> + SO<sub>2</sub> → H<sub>2</sub>SO<sub>4</sub>



54. In the reaction ;  $2\text{Ag} + 2\text{H}_2\text{SO}_4 \rightarrow \text{Ag}_2\text{SO}_4 + 2\text{H}_2\text{O} + \text{SO}_2$ ,  $\text{H}_2\text{SO}_4$  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)  $\text{CO}$ ,  $\text{Cl}_2$       b)  $\text{H}_2\text{S}$ ,  $\text{Br}_2$       c)  $\text{SO}_2$ ,  $\text{Cl}_2$       d)  $\text{NH}_3$ ,  $\text{SO}_3$
57. 5 g of a sample of bleaching powder is treated with excess acetic acid and KI solution. The liberated  $\text{I}_2$  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%  $\text{Cl}_2$
58. The oxidation number of iodine in  $\text{IF}_5$  is :  
 a) +5      b) -5      c) -1      d) +1
59. The eq. wt. of  $\text{FeC}_2\text{O}_4$  in ,  $\text{FeC}_2\text{O}_4 \rightarrow \text{Fe}^{3+} + 2\text{CO}_2$  is :  
 a) its mol. wt.      b) mol. wt./3      c) mol. wt./4      d) None of these
60. Moles of  $\text{H}_2\text{O}_2$  required for decolorizing 1 mole of acidified  $\text{KMnO}_4$  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) Eq. wt. =  $\frac{\text{mol. weight of reductant or oxidant}}{\text{no. of electrons lost or gained by 1 molecule of reductant or oxidant}}$   
 b) Eq. wt. =  $\frac{\text{mol. wt.}}{\text{valence}}$   
 c) Eq. wt. =  $\frac{\text{mol. wt.}}{\text{total charge on cation or anion}}$   
 d) All of the above
63. In presence of dil.  $\text{H}_2\text{SO}_4$ . The equivalent weight of  $\text{KMnO}_4$  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.  $a\text{K}_2\text{Cr}_2\text{O}_7 + b\text{KCl} + c\text{H}_2\text{SO}_4 \rightarrow x\text{CrO}_2\text{Cl}_2 + y\text{KHSO}_4 + z\text{H}_2\text{O}$ .  
 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  $\text{H}_2\text{S}_2\text{O}_8$  is :  
 a) +2      b) +6      c) +7      d) +14
68. In the following reaction  

$$\text{M}^{x+} + \text{MnO}_4 \rightarrow \text{MO}_3 + \text{Mn}^{2+} + \frac{1}{2}\text{O}_2$$
 If one mole of  $\text{MnO}_4$  oxidises 2.5 moles of  $\text{M}^{x+}$  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 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  
 $Cr_2O_7^{2-} + 14H^+ + nFe^{2+} \rightarrow 2Cr^{3+} + nFe^{3+} + 7H_2O$   
 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,  
 $CrO_4^{2-} + SO_3^{2-} \rightarrow Cr(OH)_4 + SO_4^{2-}$   
 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,  
 $2KMnO_4 + 2KOH \rightarrow 2K_2MnO_4 + H_2O + O$   
 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)  $N_2O_5 + H_2O \rightarrow 2HNO_3$   
 b)  $AgNO_3 + KI \rightarrow AgI + KNO_3$   
 c)  $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$   
 d)  $SnCl_2 + HgCl_2 \rightarrow SnCl_4 + Hg$



83. In which of the following compounds, the oxidation number of iodine is fractional?  
 a)  $\text{IF}_3$                       b)  $\text{IF}_5$                       c)  $\text{I}_3^-$                       d)  $\text{IF}_7$
84. The oxidation number of Cl in  $\text{KClO}_3$  is :  
 a) +5                      b) -5                      c) +3                      d) -3
85. The oxidation number of oxygen in  $\text{KO}_3, \text{Na}_2\text{O}_2$  is  
 a) 3,2                      b) 1,0                      c) 0,1                      d) -0.33,-1
86. In the reaction,  $\text{I}_2 + 2\text{S}_2\text{O}_3^{2-} \rightarrow 2\text{I}^- + \text{S}_4\text{O}_6^{2-}$ , 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  $\text{H}_2\text{S}$  needed to precipitate all the metal ions from 100 mL 1M  $\text{AgNO}_3$  and 100 mL of 1M  $\text{CuSO}_4$  is :  
 a) 1 : 2                      b) 2 : 1                      c) Zero                      d) infinite
89. Oxidation state of sulphur in  $\text{Na}_2\text{S}_2\text{O}_3$  and  $\text{Na}_2\text{S}_4\text{O}_6$   
 a) 4 and 6                      b) 3 and 5                      c) 2 and 2.5                      d) 6 and 6
90. Number of  $\text{K}^+$  ions and mole of  $\text{K}^+$  ions present in 1 litre of  $\frac{N}{5}$   $\text{KMnO}_4$  acidified solution respectively are :  
 a) 0.04 and  $2.4 \times 10^{22}$   
 b)  $2.4 \times 10^{22}$  and 0.04  
 c) 200 and  $6.023 \times 10^{23}$   
 d)  $6.023 \times 10^{23}$  and 200
91. Conversion of  $\text{PbSO}_4$  to  $\text{PbS}$  is :  
 a) Reduction of S                      b) Oxidation of S                      c) Dissociation                      d) None of these
92. Which change requires a reducing agent?  
 a)  $\text{CrO}_4^{2-} \rightarrow \text{CrO}_7^{2-}$                       b)  $\text{BrO}_3^- \rightarrow \text{BrO}^-$                       c)  $\text{H}_2\text{O}_2 \rightarrow \text{O}_2$                       d)  $\text{Al}(\text{OH})_3 \rightarrow \text{Al}(\text{OH})_4^-$
93. In the reaction,  $\text{N}_2 \rightarrow \text{NH}_3$ . The eq.wt. of  $\text{N}_2$  and  $\text{NH}_3$  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)  $\text{O}_3$                       b)  $\text{ClO}_4^-$                       c)  $\text{F}_2$                       d)  $\text{MnO}_4^-$
95. When  $\text{Cl}_2$  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)  $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$                       b)  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$   
 c)  $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$                       d)  $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$
97. The difference in the oxidation numbers of the two types of sulphur atoms in  $\text{Na}_2\text{S}_4\text{O}_6$  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)  $\text{XY}_1\text{Z}_2$                       b)  $\text{Y}_2(\text{XZ}_3)_2$                       c)  $\text{X}_3(\text{YZ}_4)_2$                       d)  $\text{X}_3(\text{Y}_4\text{Z})_2$
99. The equivalent weight of  $\text{SnCl}_2$  in the reaction,  $\text{SnCl}_2 + \text{Cl}_2 \rightarrow \text{SnCl}_4$  is :  
 a) 49                      b) 95                      c) 45                      d) 59
100. What is the ox. no. of Mn in  $\text{K}_2\text{MnO}_4$  ?  
 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  $\text{H}_2\text{O}_2$  solution is added to 50 mL of 0.20 M  $\text{KMnO}_4$  in acidic solution. Which of the following statements is true?  
 a) 0.010 mole of oxygen is liberated  
 b) 0.005 mole of  $\text{KMnO}_4$  are left  
 c) 0.030 g atom of oxygen gas is evolved  
 d) 0.0025 mole  $\text{H}_2\text{O}_2$  does not react with  $\text{KMnO}_4$
103. Oxidation number of carbon in KCN is :  
 a) +2                      b) -2                      c) +1                      d) +3
104. The oxidation state of Ni in  $\text{Ni}(\text{CO})_4$  is :  
 a) Zero                      b) +4                      c) +8                      d) +2
105.  $M$  is the molecular weight of  $\text{KMnO}_4$ . The equivalent weight of  $\text{KMnO}_4$  when it is converted into  $\text{K}_2\text{MnO}_4$  is :  
 a)  $M$                       b)  $M/3$                       c)  $M/5$                       d)  $M/7$
106. Oxidation number of Mn in  $\text{K}_2\text{MnO}_4$  and  $\text{MnSO}_4$  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?  
 $\text{H}_2\text{O} + \text{Br}_2 \rightarrow \text{HBr} + \text{HOBr}$   
 a) Proton accepted only                      b) Both oxidised and reduced  
 c) Oxidised only                      d) Reduced only
108. The oxidation number of P in  $\text{KH}_2\text{PO}_2$  is :  
 a) +1                      b) +3                      c) -3                      d) +5
109.  $\text{LiAlH}_4$  is used as :  
 a) Oxidising agent                      b) Reducing agent                      c) A mordant                      d) Water softner
110. The brown ring complex  $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}^+]\text{SO}_4$  has ox.no. of Fe :  
 a) +1                      b) +2                      c) +3                      d) +4
111. The oxidation state of Fe in  $\text{Fe}_3\text{O}_4$  is  
 a) +3                      b) 8/3                      c) +6                      d) +2
112. In the reactions;  $\text{As}_2\text{S}_3 + \text{HNO}_3 \rightarrow \text{H}_3\text{AsO}_4 + \text{H}_2\text{SO}_4 + \text{NO}$ , the element oxidized is/ are :  
 a) As only                      b) S only                      c) N only                      d) As and S both
113. The eq. wt. of  $\text{KMnO}_4$  in the reaction,  $\text{MnO}_4^- + \text{Mn}^{2+} + \text{H}_2\text{O} \rightarrow \text{MnO}_2 + \text{H}^+$  (unbalanced) is :  
 a) 52.7                      b) 158                      c) 31.6                      d) None of these
114.  $\text{NO}_3^-$  ions are converted to  $\text{NH}_4^+$  ions by a suitable reactant. The equivalent mass of  $\text{NO}_3^-$  and  $\text{NH}_4^+$  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  $\text{HClO}_4$  is :  
 a) +1                      b) -1                      c) -7                      d) +7
116. Iodine has +7 oxidation state in :  
 a)  $\text{HIO}_4$                       b)  $\text{H}_3\text{IO}_5$                       c)  $\text{H}_5\text{IO}_6$                       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  $\text{K}_3[\text{Fe}(\text{CN})_6]$  is :  
 a) +2                      b) +3                      c) +4                      d) +1
119. One mole of acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  on reaction with excess KI will liberate.....mole(s) of  $\text{I}_2$ .  
 a) 6                      b) 1                      c) 7                      d) 3
120. In the preparation of chlorine from HCl,  $\text{MnO}_2$  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,  
 $KMnO_4 + H_2SO_4 + H_2O_2 \rightarrow KHSO_4 + MnSO_4 + H_2O + O_2$  :
- 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,  
 $14H^+ + Cr_2O_7^{2-} + 3Ni \rightarrow 2Cr^{3+} + 7H_2O + 3Ni^{2+}$  ?
- 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)  $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$                       b)  $Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4 + 2H_2O$   
c)  $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$                       d)  $2PCl_5 + H_2SO_4 \rightarrow 2POCl_3 + 2HCl + SO_2Cl_2$
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,  $NaClO + H_2SO_3 \rightarrow NaCl + H_2SO_4$   
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)  $H_2 + Br_2 \rightarrow 2HBr$   
b)  $NH_4Cl \rightarrow NH_3 + HCl$   
c)  $NH_4NO_3 \rightarrow N_2O + 2H_2O$   
d)  $Fe + S \rightarrow FeS$
135. In  $C + H_2O \rightarrow CO + H_2$  ;  $H_2O$  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)  $M \times V_{in\ litre}$                       b)  $M \times V_{in\ mL}$                       c)  $\frac{wt.}{mol. wt.} \times 1000$                       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)  $\text{H}_3\text{PO}_3$                       b)  $\text{H}_3\text{PO}_4$                       c)  $\text{H}_3\text{PO}_2$                       d)  $\text{H}_4\text{P}_2\text{O}_7$
140. Oxidation number of S in  $(\text{CH}_3)_2\text{SO}$  is :  
 a) Zero                      b) +1                      c) +2                      d) +3
141. In which reaction the underlined substance has been reduced?  
 a) Carbon monoxide + copper oxide  $\rightarrow$  carbon dioxide + copper  
 b) Copper oxide + hydrochloric acid  $\rightarrow$  water + copper chloride  
 c) Steam + iron  $\rightarrow$  hydrogen + iron oxide  
 d) Hydrogen + iron oxide  $\rightarrow$  water + iron
142. The decomposition of  $\text{KClO}_3$  to  $\text{KCl}$  and  $\text{O}_2$  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  $\text{KMnO}_4$ .  
 a)  $\text{Fe}^{2+}$                       b)  $\text{Fe}^{3+}$                       c)  $\text{Fe}$                       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  $\text{Br}_2$  to  $\text{BrO}_3^-$ , 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  $\text{CrO}_5$  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.  $\text{CrO}_5$  reacts with  $\text{H}_2\text{SO}_4$  to give  $\text{Cr}_2(\text{SO}_4)_3$ ,  $\text{H}_2\text{O}$  and  $\text{O}_2$ . Moles of  $\text{O}_2$  liberated by 1 mole of  $\text{CrO}_5$  in this reaction are :  
 a) 2.5                      b) 1.25                      c) 4.5                      d) 1.75
149. In the following reaction,  $4\text{P} + 3\text{KOH} + 3\text{H}_2\text{O} \rightarrow 3\text{KH}_2\text{PO}_2 + \text{PH}_3$   
 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  $\text{P}_2\text{O}_7^{4-}$  is :  
 a) +3                      b) +4                      c) +5                      d) +6
151. In the conversion of  $\text{K}_2\text{Cr}_2\text{O}_7$  to  $\text{K}_2\text{CrO}_4$  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)  $\text{OF}_2 < \text{KO}_2 < \text{BaO}_2 < \text{O}_3$                       b)  $\text{BaO}_2 < \text{KO}_2 < \text{O}_3 < \text{OF}_2$   
 c)  $\text{BaO}_2 < \text{O}_3 < \text{OF}_2 < \text{KO}_2$                       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.  $\text{K}_3\text{Fe}(\text{CN})_6$  is used as ..... Indicator for  $\text{FeSO}_4$  vs.  $\text{K}_2\text{Cr}_2\text{O}_7$  titrations.  
 a) Self                      b) External                      c) Internal                      d) Not an
156. The oxidation number of N in  $\text{N}_2\text{H}_5^+$  is :



- a) -2                      b) +3                      c) +2                      d) -3
157. Which can act as oxidant?  
a)  $\text{H}_2\text{O}_2$                       b)  $\text{H}_2\text{S}$                       c)  $\text{NH}_3$                       d) None of these
158. What weight of  $\text{HNO}_3$  is needed to convert 5 g of iodine into iodic acid according to the reaction,  $\text{I}_2 + \text{HNO}_3 \rightarrow \text{HIO}_3 + \text{NO}_2 + \text{H}_2\text{O}$  ?  
a) 12.4 g                      b) 24.8 g                      c) 0.248 g                      d) 49.6 g
159. In which  $\text{SO}_2$  acts as oxidant, while reacting with :  
a) Acidified  $\text{KMnO}_4$                       b) Acidified  $\text{K}_2\text{Cr}_2\text{O}_7$                       c)  $\text{H}_2\text{S}$                       d) Acidified  $\text{C}_2\text{H}_5\text{OH}$
160.  $\text{HBr}$  and  $\text{HI}$  reduce  $\text{H}_2\text{SO}_4$ ,  $\text{HCl}$  can reduce  $\text{KMnO}_4$  and  $\text{HF}$  can reduce:  
a)  $\text{H}_2\text{SO}_4$                       b)  $\text{K}_2\text{Cr}_2\text{O}_7$                       c)  $\text{KMnO}_4$                       d) None of these
161. Equivalent mass of  $\text{Na}_2\text{S}_2\text{O}_3$  in its reaction with  $\text{I}_2$  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)  $\text{Cl}_2 + 2\text{OH}^- \rightarrow \text{ClO}^- + \text{Cl}^- + \text{H}_2\text{O}$   
b)  $\text{Cu}_2\text{O} + 2\text{H}^+ \rightarrow \text{Cu} + \text{Cu}^{2+} + \text{H}_2\text{O}$   
c)  $2\text{HCuCl}_2 \xrightarrow[\text{water}]{\text{Dilution with}} \text{Cu} + \text{Cu}^{2+} + 4\text{Cl}^- + 2\text{H}^+$   
d) All of the above
163. Oxidation number of 'N' in  $\text{N}_3\text{H}$ (hydrazoic acid) is  
a)  $-\frac{1}{3}$                       b) +3                      c) 0                      d) -3
164. Ceric ammonium sulphate and potassium permanganate are used as oxidising agents in acidic medium for oxidation of ferrous ammonium sulphate to ferric sulphate. The ratio of number of moles of ceric ammonium sulphate required per mole of ferrous ammonium sulphate to the number of moles of  $\text{KMnO}_4$  required per mole of ferrous ammonium sulphate, is  
a) 5.0                      b) 0.2                      c) 0.6                      d) 2.0
165. Eq.wt. of  $\text{NH}_3$  in,  $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$  is :  
a) 3.4                      b) 17                      c) 8.5                      d) None of these
166. Carbon is in the lowest oxidation state in :  
a)  $\text{CH}_4$                       b)  $\text{CCl}_4$                       c)  $\text{CO}_2$                       d)  $\text{CF}_4$
167. When the ion  $\text{Cr}_2\text{O}_7^{2-}$  acts as an oxidant in acidic aqueous solution the ion  $\text{Cr}^{3+}$  is formed. How many mole of  $\text{Sn}^{2+}$  would be oxidised to  $\text{Sn}^{4+}$  by one of  $\text{Cr}_2\text{O}_7^{2-}$  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  $\text{H}_2\text{S}$  is passed through an acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  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  $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]^+$  is :  
a) +3                      b) +2                      c) +1                      d) zero
172. In the reaction,  $\text{VO} + \text{Fe}_2\text{O}_3 \rightarrow \text{FeO} + \text{V}_2\text{O}_5$ . The eq.wt. of  $\text{V}_2\text{O}_5$  is equal to its :  
a) mol. wt.                      b) mol. wt./8                      c) mol. wt./6                      d) None of these
173. The eq. wt. of  $\text{K}_2\text{CrO}_4$  as an oxidising agent in acid medium is :  
a) (mol. wt.)/2                      b)  $(2 \times \text{mol. wt.})/3$                       c) (mol. wt.)/3                      d) (mol. wt.)/6
174. Which reaction involves neither oxidation nor reduction?  
a)  $\text{CrO}_4^{2-} \rightarrow \text{Cr}_2\text{O}_7^{2-}$                       b)  $\text{Cr} \rightarrow \text{CrCl}_3$                       c)  $\text{Na} \rightarrow \text{Na}^+$                       d)  $2\text{S}_2\text{O}_3^{2-} \rightarrow \text{S}_4\text{O}_6^{2-}$



175. The number of equivalent per mole of  $\text{H}_2\text{S}$  used in its oxidation to  $\text{SO}_2$  is :  
 a) 3                                      b) 6                                      c) 4                                      d) 2
176. Oxidation number of sulphur in  $\text{Na}_2\text{SO}_4$  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)  $Mz_{\text{eq.}} = M \times V_{\text{in mL}}$   
 b)  $M_{\text{eq.}} = N \times V_{\text{in mL}}$   
 c)  $Mz_{\text{eq.}} = \frac{\text{wt}}{\text{Eq.wt.}} \times 1000$   
 d) Both (b) and (c)
179.  $\text{H}_2\text{S}$  is passed through an acidified solution of copper sulphate and a black precipitate is formed. This is due to :  
 a) Oxidation of  $\text{Cu}^{2+}$   
 b) Reduction of  $\text{Cu}^{2+}$   
 c) Double decomposition  
 d) Reduction and oxidation
180. Iodine has highest oxidation number in the compound :  
 a)  $\text{KIO}_4$                                       b)  $\text{IF}_5$                                       c)  $\text{KI}_2$                                       d)  $\text{KI}$
181. Oxidation number of S in  $\text{S}_2\text{O}_3^{2-}$  is :  
 a) +2                                      b) -2                                      c) 4                                      d) zero
182. In the reaction,  $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{I}^- \rightarrow 2\text{Cr}^{3+} + 3\text{H}_2\text{O} + 3\text{I}_2$ , The eq.wt. of  $\text{Cr}^{3+}$  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,  $\text{H}_2\text{O}_2 + \text{Na}_2\text{CO}_3 \rightarrow \text{Na}_2\text{O}_2 + \text{CO}_2 + \text{H}_2\text{O}$  the substance undergoing oxidation is  
 a)  $\text{H}_2\text{O}_2$                                       b)  $\text{Na}_2\text{CO}_3$                                       c)  $\text{Na}_2\text{O}_2$                                       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  $\text{NH}_3$ ,  $\text{HNO}_3$ ,  $\text{NaN}_3$  and  $\text{Mg}_3\text{N}_2$ ; 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)  $\text{Fe}(\text{CO})_5$   
 b)  $\text{Fe}_2\text{O}$   
 c)  $\text{K}_4\text{Fe}(\text{CN})_6$   
 d)  $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
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  $\text{NaCl}$  is dissolved in water, the sodium ion becomes :  
 a) Oxidized                                      b) Reduced                                      c) Hydrolysed                                      d) hydrated
189. Which is not a redox reaction?  
 a)  $\text{BaO}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + \text{H}_2\text{O}_2$   
 b)  $2\text{BaO} + \text{O}_2 \rightarrow 2\text{BaO}_2$   
 c)  $4\text{KClO}_3 \rightarrow 4\text{KClO}_2 + 2\text{O}_2$   
 d)  $\text{SO}_2 + 2\text{H}_2\text{S} \rightarrow 2\text{H}_2\text{O} + 3\text{S}$
190. When  $\text{BrO}_3^-$  ion reacts with  $\text{Br}^-$  ion in acidic solution  $\text{Br}_2$  is liberated. The equivalent weight of  $\text{KBrO}_3$  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  $\text{Fe}^{2+}$  ions against  $\text{MnO}_4^-$  in the presence of excess of  $\text{H}^+$  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)  $\text{HClO}$                                       b)  $\text{HClO}_2$                                       c)  $\text{HClO}_3$                                       d)  $\text{HClO}_4$
194. In the reaction,  $\text{Zn} + 2\text{H}^+ + 2\text{Cl}^- \rightarrow \text{Zn}^{2+} + 2\text{Cl}^- + \text{H}_2$ , the spectator ion is :  
 a)  $\text{Cl}^-$                                       b)  $\text{Zn}^{2+}$                                       c)  $\text{H}^+$                                       d) All of these
195. Turn bull's blue is :  
 a)  $\text{Fe}_3[\text{Fe}(\text{CN})_6]_2$                                       b)  $\text{K}_4\text{Fe}(\text{CN})_6$                                       c)  $\text{K}_3\text{Fe}(\text{CN})_6$                                       d)  $\text{Na}_4\text{Fe}(\text{CN})_6$
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)  $\text{KMnO}_4$                                       b)  $\text{H}_2\text{O}_2$                                       c)  $\text{Fe}_2(\text{SO}_4)_3$                                       d)  $\text{K}_2\text{Cr}_2\text{O}_7$
198. An element  $A$  in a compound  $ABD$  has oxidation number  $A^{n-}$ . It is oxidized by  $\text{Cr}_2\text{O}_7^{2-}$  in acidic medium. In the experiment  $1.68 \times 10^{-3}$  mole of  $\text{K}_2\text{Cr}_2\text{O}_7$  were used for  $3.26 \times 10^{-3}$  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)  $\text{Cl}^- > \text{Br}^- > \text{I}^- > \text{F}^-$   
 b)  $\text{Cl}^- > \text{I}^- > \text{Br}^- > \text{F}^-$   
 c)  $\text{Br}^- > \text{Cl}^- > \text{I}^- > \text{F}^-$   
 d)  $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$
202. The reaction,  $3\text{ClO}^-(aq) \rightarrow \text{ClO}_3^-(aq) + 2\text{Cl}^-(aq)$  is an example of :  
 a) Oxidation reaction  
 b) Reduction reaction  
 c) Disproportionation reaction  
 d) Decomposition reaction
203. The ox.no. of S in  $\text{Na}_2\text{S}_4\text{O}_6$  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)  $\text{H}_2\text{SO}_4$                                       b)  $\text{H}_2\text{S}$                                       c)  $\text{SO}_2$                                       d)  $\text{H}_2\text{SO}_3$
207.  $\text{KMnO}_4$  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)  $\text{H}_2\text{SO}_5$ ,  $\text{H}_2\text{S}_2\text{O}_8$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{SF}_6$   
b)  $\text{K}_2\text{Cr}_2\text{O}_7$ ,  $\text{K}_2\text{CrO}_4$ ,  $\text{CrO}_5$ ,  $\text{CrO}_2\text{Cl}_2$   
c)  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{N}_3\text{H}$ ,  $\text{NO}_2^-$   
d)  $\text{CaH}_2$ ,  $\text{NaH}$ ,  $\text{LiH}$ ,  $\text{MgH}_2$
213. 0.2 g of a sample of  $\text{H}_2\text{O}_2$  required 10 mL of  $N$   $\text{KMnO}_4$  in a titration in the presence of  $\text{H}_2\text{SO}_4$ . Purity of  $\text{H}_2\text{O}_2$  is :  
a) 25%                      b) 85%                      c) 65%                      d) 95%
214. When  $\text{KMnO}_4$  as oxidising agent and ultimately forms  $\text{MnO}_4^{2-}$ ,  $\text{Mn}_2\text{O}_3$  and  $\text{Mn}^{2+}$ , the number of electrons transferred per mole of  $\text{KMnO}_4$  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  $\text{H}_2\text{O}_2$  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)  $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$                       -3  
b)  $\text{NH}_2\text{OH}$                       -1  
c)  $(\text{N}_2\text{H}_5)_2\text{SO}_4$                       +2  
d)  $\text{Mg}_3\text{N}_2$                       -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 ( $\text{Na}_2\text{S}_4\text{O}_6$ ) is  
a) 2                      b) 0                      c) 2.5                      d) 3.5
220. Which is strongest oxidising agent?  
a)  $\text{O}_3$                       b)  $\text{O}_2$                       c)  $\text{Cl}_2$                       d)  $\text{F}_2$
221. Sulphur has the highest oxidation state in :  
a)  $\text{SO}_2$                       b)  $\text{SO}_3$                       c)  $\text{H}_2\text{SO}_3$                       d)  $\text{H}_2\text{S}$
222. Nitrogen has fractional oxidation number in :  
a)  $\text{N}_2\text{H}_4$                       b)  $\text{NH}_4$                       c)  $\text{HN}_3$                       d)  $\text{N}_2\text{F}_2$
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  $\text{NH}_4^+$  ion according to the reaction  
 $\text{Zn} + \text{NO}_3 \rightarrow \text{Zn}^{2+} + \text{NH}_4^+ + \text{H}_2\text{O}$  (unbalanced)  
How many moles of HCl are required to reduce half a mole of  $\text{NaNO}_3$  completely? Assume the availability of sufficient Zn.



- a) 5                                      b) 4                                      c) 3                                      d) 2
225. Weight of  $\text{FeSO}_4$  (mol. wt. = 152) oxidized by 200 mL of 1 N  $\text{KMnO}_4$  solution is :  
 a) 30.4 g                                      b) 15.2 g                                      c) 60.8 g                                      d) 158 g
226. In the ionic equation,  
 $\text{BiO}_3^- + 6\text{H}^+ + xe^- \rightarrow \text{Bi}^{3+} + 3\text{H}_2\text{O}$   
 The values of  $x$  is  
 a) 6                                      b) 2                                      c) 4                                      d) 3
227. The reaction,  $5\text{H}_2\text{O}_2 + \text{XClO}_2 + 2\text{OH}^- \rightarrow \text{XCl}^- + \text{YO}_2 + 6\text{H}_2\text{O}$  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  $\text{Na}_2\text{S}_2\text{O}_3$  would be required to react with the  $\text{I}_2$  liberated by adding excess of KI to 50 mL of 0.20 M  $\text{CuSO}_4$  solution?  
 a) 12.5 mL                                      b) 25 mL                                      c) 50 mL                                      d) 2.5 mL
229. For the reaction,  $2\text{Fe}^{3+} + \text{Sn}^{2+} \rightarrow 2\text{Fe}^{2+} + \text{Sn}^{4+}$  The normality of  $\text{SnCl}_2$  (mol.wt. = 189.7) solution prepared by dissolving 47.5 g in acid solution and diluting with  $\text{H}_2\text{O}$  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  $\text{Fe}_2(\text{SO}_4)_3$ , 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  $\text{KMnO}_4$  is oxidised to :  
 a) CO and  $\text{H}_2$                                       b)  $\text{CO}_2$  and  $\text{H}_2$                                       c)  $\text{CO}_2$  and  $\text{H}_2\text{O}$                                       d) CO and  $\text{H}_2\text{O}$
232. The oxidation number of N and Cl in  $\text{NOClO}_4$  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  $\text{CN}^-$  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  $\text{KMnO}_4$  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  $\text{SO}_2$  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  $\text{H}_4\text{P}_2\text{O}_5$ ,  $\text{H}_4\text{P}_2\text{O}_6$ ,  $\text{H}_4\text{P}_2\text{O}_7$  are respectively :  
 a) +3, +5, +4                                      b) +4, +3, +5                                      c) +3, +4, +5                                      d) +5, +3, +4
240. Oxidation of thiosulphate ( $\text{S}_2\text{O}_3^{2-}$ ) ions by iodine gives:  
 a)  $\text{SO}_3^-$                                       b)  $\text{SO}_4^{2-}$                                       c)  $\text{S}_4\text{O}_6^{2-}$                                       d)  $\text{S}_2\text{O}_8^{2-}$
241. 0.3 g of an oxalate salt was dissolved in 100 mL solution. The solution required 90 mL of N/20  $\text{KMnO}_4$  for complete oxidation. The % of oxalate ion in salt is:  
 a) 33%                                      b) 66%                                      c) 70%                                      d) 40%





242. How many litre of  $\text{Cl}_2$  at STP will be liberated by the oxidation of  $\text{NaCl}$  with 10 g  $\text{KMnO}_4$ ?  
 a) 3.54 litre                      b) 7.08 litre                      c) 1.77 litre                      d) None of these
243. What is the normality of a  $\text{KMnO}_4$  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  $\text{KMnO}_4$  is 158 :  
 a) 2 N                                  b) 3 N                                  c) 4 N                                  d) 5 N
244.  $\text{KMnO}_4$  in acid medium is always reduced to :  
 a)  $\text{Mn}^{4+}$                               b)  $\text{Mn}^{2+}$                               c)  $\text{Mn}^{6+}$                               d) Mn
245. In balancing the half reaction,  $\text{S}_2\text{O}_3^{2-} \rightarrow \text{S}(s)$ , 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  $\text{KMnO}_4$  is needed to oxidise 100 mg of  $\text{FeC}_2\text{O}_4$  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)  $\text{FeSO}_4$  vs.  $\text{K}_2\text{Cr}_2\text{O}_7$               b)  $\text{CuSO}_4$  vs. hypo                      c)  $\text{I}_2$  vs. hypo                      d)  $\text{AgNO}_3$  vs.  $\text{KCl}$
248. A 0.518 g sample of lime stone is dissolved in  $\text{HCl}$  and then the calcium is precipitated as  $\text{CaC}_2\text{O}_4$ . After filtering and washing the precipitate, it requires 40.0 mL of 0.250 N  $\text{KMnO}_4$ , solution acidified with  $\text{H}_2\text{SO}_4$  to titrate is as,  $\text{MnO}_4^- + \text{H}^+ + \text{C}_2\text{O}_4^{2-} \rightarrow \text{Mn}^{2+} + \text{CO}_2 + 2\text{H}_2\text{O}$ . The percentage of  $\text{CaO}$  in the sample is :  
 a) 54.0 %                                b) 27.1 %                                c) 42%                                d) 84%
249. The missing term in following equation is :  $2\text{Fe}^{3+}(aq) + \text{Sn}^{2+}(aq) \rightarrow 2\text{Fe}^{2+}(aq) + ?$   
 a)  $\text{Sn}^{4+}$                                 b)  $\text{Sn}^{2+}$                                 c) Sn                                d) None of these
250. Reaction of  $\text{Br}_2$  with  $\text{Na}_2\text{CO}_3$  in aqueous solution gives sodium bromide and sodium bromate with evolution of  $\text{CO}_2$  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  $\text{C}_3\text{O}_2$ ,  $\text{Mg}_2\text{C}_3$  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;  $\text{KI} + \text{I}_2 \rightarrow \text{KI}_3$  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  $\text{S}_2\text{Cl}_2$  is :  
 a) +1    b) +6    c) Zero    d) -1
255. In which of the following N has lowest oxidation number?  
 a) NO    b)  $\text{NO}_2$     c)  $\text{N}_2\text{O}$     d)  $\text{N}_2\text{O}_5$
256. 2 mole of  $\text{FeSO}_4$  are oxidized by 'X' mole of  $\text{KMnO}_4$  whereas 2 mole of  $\text{FeC}_2\text{O}_4$  are oxidized by 'Y' mole of  $\text{KMnO}_4$ . The ration f 'X' and 'Y' is :  
 a) 1 : 3    b) 1 : 2    c) 1 : 4    d) 1 : 5
257.  $\text{H}_2\text{S}$  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 :  
 $\text{SO}_3^{2-}(aq) + \text{H}_2\text{O}(l) \rightarrow \text{SO}_4^{2-}(aq) + 2\text{H}^+(aq) + 2e^-$   
 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  $\text{PH}_3$  and  $\text{NaH}_2\text{PO}_2$ . 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



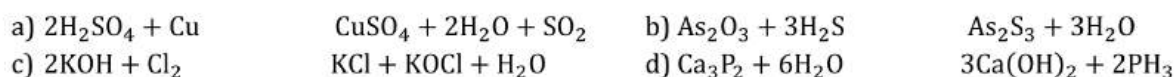
- b) The mass number changes  
 c) There is no change in the composition of atom  
 d) None of the above
262. Titre value is the volume of titrant used for a definite amount of unknown reagent at its :  
 a) Equivalence point      b) End point      c) Neutralization point      d) All of these
263. Oxidation states of X, Y, Z are +2, +5 and -2 respectively. Formula of the compound formed by these will 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,  $2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$ , 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  $I_2 \rightarrow IO_3^-$  is :  
 a) 12.7      b) 63.5      c) 25.4      d) 2.54
276. Equivalent mass of oxidizing agent in the reaction is.  
 $SO_2 + 2H_2S \rightarrow 3S + 2H_2O$   
 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 :

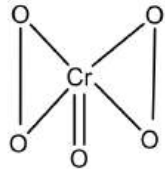




- a) 2                                      b) 1                                      c) 1.5                                      d) 4
281.  $\text{Co}(s) + \text{Cu}^{2+}(aq) \rightarrow \text{Co}^{2+}(aq) + \text{Cu}(s)$ . This reaction is :  
 a) Oxidation reaction      b) Reduction reaction      c) Redox reaction      d) None of these
282. The oxidation state of I in  $\text{H}_4\text{IO}_6^-$  is :  
 a) +7                                      b) -1                                      c) +5                                      d) +1
283. The oxidation number of N in  $\text{NH}_3$  is :  
 a) -3                                      b) +3                                      c) Zero                                      d) 5
284.  $\text{Mn}^{2+}$  can be converted into  $\text{Mn}^{7+}$  by reacting with  
 a)  $\text{SO}_2$                                       b)  $\text{Cl}_2$                                       c)  $\text{PbO}_2$                                       d)  $\text{SnCl}_2$
285. The oxidation number of Ni in  $\text{K}_4[\text{Ni}(\text{CN})_4]$  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  $\text{MnO}_4^-$  ion in alkaline medium to  $\text{MnO}_3^-$ ?  
 a) 2                                      b) 1                                      c) 3                                      d) 4
288. The oxidation number of Fe in  $\text{K}_4\text{Fe}(\text{CN})_6$  is :  
 a) +2                                      b) +3                                      c) +4                                      d) +6
289. For the reaction,  $\text{NH}_3 + \text{OCl}^- \rightarrow \text{N}_2\text{H}_4 + \text{Cl}^-$  occurring in basic medium, the coefficient of  $\text{N}_2\text{H}_4$  in the balanced equation will be  
 a) 1                                      b) 2                                      c) 3                                      d) 4
290. In the reaction  $\text{H}_2\text{O} + \text{H}_2\text{O}_2 \rightarrow \text{S} + 2\text{H}_2\text{O}$   
 a)  $\text{H}_2\text{S}$  is an acid and  $\text{H}_2\text{O}_2$  is a base  
 b)  $\text{H}_2\text{S}$  is a base and  $\text{H}_2\text{O}_2$  is an acid  
 c)  $\text{H}_2\text{S}$  is an oxidising agent and  $\text{H}_2\text{O}_2$  is a reducing agent  
 d)  $\text{H}_2\text{S}$  is a reducing agent and  $\text{H}_2\text{O}_2$  is an oxidising agent
291. When  $\text{H}_2\text{SO}_3$  is converted into  $\text{H}_2\text{SO}_4$  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  $\text{NH}_2\text{OH}$  is :  
 a) +1                                      b) -1                                      c) -3                                      d) -2
293. In the reaction,  $2\text{CuSO}_4 + 4\text{KI} \rightarrow \text{Cu}_2\text{I}_2 + 2\text{K}_2\text{SO}_4 + \text{I}_2$  The ratio of equivalent weight of  $\text{CuSO}_4$  to its molecular weight is :  
 a) 1/8                                      b) 1/4                                      c) 1/2                                      d) 1
294. In the reaction between acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  and iron (II) ions shown by the equation :  $\text{Cr}_2\text{O}_7^{2-}(aq) + 6\text{Fe}^{2+}(aq) + 14\text{H}^+(aq) \rightarrow 2\text{Cr}^{3+}(aq) + 7\text{H}_2\text{O}(l) + 6\text{Fe}^{3+}(aq)$   
 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,  $8\text{H}^+ + 4\text{NO}_3^- + 6\text{Cl}^- + \text{Sn}(s) \rightarrow \text{SnCl}_6^{2-} + 4\text{NO}_2 + 4\text{H}_2\text{O}$ ?  
 a)  $\text{Sn}(s)$                                       b)  $\text{Cl}^-$                                       c)  $\text{NO}_3^-$                                       d)  $\text{NO}_2(g)$
296. Which is a redox reaction?  
 a)  $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$   
 b)  $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$   
 c)  $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightarrow \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$   
 d)  $2\text{FeCl}_3 + \text{SnCl}_2 \rightarrow 2\text{FeCl}_2 + \text{SnCl}_4$
297. Which one of the following reactions involves disproportionation?





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)  $\text{Na}_2\text{O}$       b)  $\text{Na}_2\text{O}_2$       c)  $\text{NaNO}_3$       d)  $\text{NaNO}_2$
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)  $\text{C}_6\text{H}_6$       b)  $\text{CH}_3$       c)  $\text{C}_2\text{H}_4$       d)  $\text{C}_6\text{H}_{12}\text{O}_6$
302. In the reaction,  $2\text{KMnO}_4 + 16\text{HCl} \rightarrow 2\text{KCl} + 2\text{MnCl}_2 + 8\text{H}_2\text{O} + 5\text{Cl}_2$ , the reduction product is :  
 a)  $\text{Cl}_2$       b)  $\text{MnCl}_2$       c)  $\text{KCl}$       d)  $\text{H}_2\text{O}$
303. The oxidation number of phosphorus in  $\text{Mg}_2\text{P}_2\text{O}_7$  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  $\text{K}_2\text{Cr}_2\text{O}_7$  changes from red-orange to lemon-yellow on treatment with  $\text{KOH}(\text{aq})$  because of :  
 a) Reduction of  $\text{Cr}(\text{VI})$  to  $\text{Cr}(\text{III})$   
 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  $\text{KMnO}_4$  in basic medium?  
 a) 1      b) 2      c) 5      d) 3
309. The oxidation state of nitrogen in  $\text{NH}_4\text{NO}_3$  is :  
 a) -3 and +5      b) +3 and +5      c) +5      d) +3
310. When  $\text{Sn}(\text{IV})$  chloride is treated with excess  $\text{HCl}$ , the complex  $[\text{SnCl}_6]^{2-}$  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  $\text{HOCl}$  is :  
 a) Zero      b) -1      c) +1      d) +2
312. In the reaction,  $\text{C} + 4\text{HNO}_3 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O} + 4\text{NO}_2$ ,  $\text{HNO}_3$  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  $\text{SO}_2$  which is oxidised by  $\text{Cl}_2$  water. The solution is treated with  $\text{BaCl}_2$  solution. The amount of  $\text{BaSO}_4$  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  $\text{KMnO}_4$  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  $\text{NaOH}$  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)  $\text{H}_2\text{O}_2$
320. For the reaction :  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$  ; if  $E_1$  and  $E_2$  are equivalent masses of  $\text{NH}_3$  and  $\text{N}_2$  respectively, then  $E_1 - E_2$  is :  
a) 1                      b) 2                      c) 3                      d) 4
321. Bleaching action of  $\text{SO}_2$  is due to :  
a) Reduction                      b) Oxidation                      c) Hydrolysis                      d) Acidic nature
322. In  $\text{N}_2 + 2\text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{NO}_2^-$ ; 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,  $\text{NaH} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$  :  
a)  $\text{H}^-$  is oxidised  
b)  $\text{Na}^+$  is reduced  
c) Both  $\text{NaH}$  and  $\text{H}_2\text{O}$  are reduced  
d) None of the above
325. Which of the following acts as an oxidizing agent?  
a)  $\text{HNO}_3$                       b)  $\text{Cl}_2$                       c)  $\text{FeCl}_3$                       d) All of these
326. How many gram of  $\text{I}_2$  are present in a solution which requires 40 mL, of 0.11 N  $\text{Na}_2\text{S}_2\text{O}_3$  to react with it,  $\text{S}_2\text{O}_3^{2-} + \text{I}_2 \rightarrow \text{S}_4\text{O}_6^{2-} + 2\text{I}^-$ ?  
a) 12.7 g                      b) 0.558 g                      c) 25.4 g                      d) 11.4 g
327. The number of mole of  $\text{KMnO}_4$  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  $\text{HNO}_3$  is required to make 1 litre of 2 N solution to be used as an oxidising agent in the reaction?  $3\text{Cu} + 8\text{HNO}_3 \rightarrow 3\text{Cu}(\text{NO}_3)_2 + 2\text{NO} + 4\text{H}_2\text{O}$   
a) 63 g                      b) 21 g                      c) 42 g                      d) 84 g
329. The oxidation state of two sulphur atoms in  $\text{H}_2\text{S}_2\text{O}_8$   
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,  $\text{H}_2\text{S} + 2\text{HNO}_3 \rightarrow 2\text{H}_2\text{O} + 2\text{NO}_2 + \text{S}$ . 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)  $\text{MnO}_4^- \rightarrow \text{Mn}^{2+}$                       b)  $\text{CrO}_4^{2-} \rightarrow \text{Cr}^{3+}$                       c)  $\text{MNO}_4^- \rightarrow \text{MnO}_2$                       d)  $\text{Cr}_2\text{O}_7^{2-} \rightarrow 2\text{Cr}^{3+}$
333. Oxidation number of nitrogen is highest in  
a)  $\text{N}_3\text{H}$                                       b)  $\text{N}_2\text{O}_4$                                       c)  $\text{NH}_2\text{OH}$                                       d)  $\text{NH}_3$
334. Starch gives blue colour with :  
a) KI                                      b)  $\text{I}_2$                                       c)  $\text{Cl}_2$                                       d) None of these
335. The number of mole of potassium salt, *i. e.*,  $\text{KHC}_2\text{O}_4 \cdot \text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$  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  $\text{KMnO}_4$  solution, the ion which is oxidised is :  
a)  $\text{Fe}^{2+}$                                       b)  $\text{SO}_4^{2-}$                                       c)  $\text{NH}_4^+$                                       d)  $\text{MnO}_4^-$
337. Oxidation number of N in  $\text{N}_3\text{H}$  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,  $2\text{H}_2\text{O}_2(aq) \rightarrow 2\text{H}_2\text{O}(l) + \text{O}_2(g)$  under conditions where one mole of gas occupies  $24 \text{ dm}^3$ ,  $100 \text{ cm}^3$  of  $\text{XM}$  solution of  $\text{H}_2\text{O}_2$  produces  $3 \text{ dm}^3$  of  $\text{O}_2$ . Thus, X is :  
a) 2.5                                      b) 1                                      c) 0.5                                      d) 0.25
339.  $\text{CuSO}_4$  and KI on mixing gives :  
a)  $\text{CuI}_2 + \text{K}_2\text{SO}_4$                       b)  $\text{Cu}_2\text{I}_2 + \text{K}_2\text{SO}_4$                       c)  $\text{Cu}_2\text{I}_2 + \text{K}_2\text{SO}_4 + \text{I}_2$                       d)  $\text{CuI}_2 + \text{K}_2\text{SO}_4 + \text{I}_2$
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  $\text{Al}^{3+}$  in solution by losing :  
a)  $18 \times 10^{23}$  electrons  
b)  $6.023 \times 10^{23}$  electrons  
c)  $3.01 \times 10^{23}$  electrons  
d)  $9 \times 10^{23}$  electrons
343. In  $\text{CH}_2\text{Cl}_2$ , the oxidation number of C is :  
a) -4                                      b) +2                                      c) Zero                                      d) +4
344. In the compounds  $\text{KMnO}_4$  and  $\text{K}_2\text{Cr}_2\text{O}_7$ , 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  $\text{CaH}_2$  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  $\text{XeF}_4$  and  $\text{XeO}_2$  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,  
 $\text{Ag}^{+2}(\text{aq}) + \text{Ag}(\text{s}) \rightleftharpoons 2\text{Ag}^{+}(\text{aq})$   
 is an example of  
 a) Reduction                      b) Oxidation                      c) Disproportionation                      d) None of these
352. During the presence of  $\text{SO}_3^{2-}$  and  $\text{S}^{2-}$  in a mixture, on addition of dil.  $\text{H}_2\text{SO}_4$ , one notice that:  
 a)  $\text{SO}_2$  and  $\text{H}_2\text{S}$  are not formed  
 b)  $\text{SO}_2$  and  $\text{H}_2\text{S}$  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)  $\text{KClO}_3$                       b)  $\text{O}_2$                       c)  $\text{C}_6\text{H}_{12}\text{O}_6$                       d)  $\text{K}_2\text{Cr}_2\text{O}_7$
354. The charge on cobalt in  $[\text{Co}(\text{CN})_6]^{3-}$  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)  $\text{Mn}^{2+}$                       (ii)  $\text{MnO}_2$   
 (iii)  $\text{KMnO}_4$                       (iv)  $\text{K}_2\text{MnO}_4$   
 a) (i)>(ii)>(iii)>(iv)                      b) (i)<(ii)<(iv)<(iii)                      c) (ii)<(iii)<(i)<(iv)                      d) (iii)>(i)>(iv)>(ii)
357. What mass of  $\text{MnO}_2$  is reduced by 35 mL of 0.16 N oxalic acid in acidic solution? The skeleton equation is,  
 $\text{MnO}_2 + \text{H}^+ + \text{H}_2\text{C}_2\text{O}_4 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{Mn}^{2+}$  :  
 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  $\text{KMnO}_4$  are needed to prepare 3.75 litre of 0.850 N solution if  $\text{KMnO}_4$  is reduced as,  $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$  ?  
 a) 101 g                      b) 202 g                      c) 50.5 g                      d) 303.0 g  $\text{KMnO}_4$
360. When  $\text{KMnO}_4$  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  $\text{CuSO}_4$  solution precipitates copper due to :  
 a) Reduction of  $\text{Cu}^{2+}$                       b) Reduction of  $\text{SO}_4^{2-}$                       c) Reduction of Zn                      d) Hydrolysis of  $\text{CuSO}_4$
362. Titrations in which liberated  $\text{I}_2$  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  $\text{KMnO}_4$  reacts as follows :  
 $2\text{KMnO}_4 + 2\text{KOH} \rightarrow 2\text{K}_2\text{MnO}_4 + \text{H}_2\text{O} + \text{O}$ . The eq. wt. of  $\text{KMnO}_4$  is :  
 a) 52.7                      b) 158                      c) 31.6                      d) 79
365. Oxidation number of nitrogen in  $\text{AgNO}_3$  is:  
 a) +5                      b) -3                      c) +3                      d) -2
366. Total number of  $\text{AlF}_3$  molecules in a sample of  $\text{AlF}_3$  containing  $3.01 \times 10^{23}$  ions of  $\text{F}^-$  is :  
 a)  $9 \times 10^{24}$                       b)  $3 \times 10^{24}$                       c)  $7 \times 10^{23}$                       d)  $10^{23}$
367. Oxidation number of N in  $\text{NOCl}$  is :  
 a) +3                      b) +2                      c) +1                      d) +4
368. The oxidation state of chlorine is highest in the compound :



- a)  $\text{Cl}_2$                                       b)  $\text{HCl}$                                       c)  $\text{Cl}_2\text{O}$                                       d)  $\text{Cl}_2\text{O}_7$
369. How many gram of  $\text{KMnO}_4$  are contained in 4 litre of 0.05 N solution? The  $\text{KMnO}_4$  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;  $\text{H}_2\text{S} + \text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{S}$  shows :
- a) Acidic nature of  $\text{H}_2\text{O}_2$   
 b) Alkaline nature of  $\text{H}_2\text{O}_2$   
 c) Oxidising action of  $\text{H}_2\text{O}_2$   
 d) Reducing action of  $\text{H}_2\text{O}_2$
371. For redox reaction,  
 $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \rightarrow \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$   
 coefficient of reactants in balanced states are  
 $\text{MnO}_4^-$      $\text{C}_2\text{O}_4^{2-}$      $\text{H}^+$
- a) 2                                      5                                      16                                      b) 16                                      5                                      2  
 c) 5                                      16                                      2                                      d) 2                                      16                                      5
372. Chlorine has +1 oxidation state in :
- a)  $\text{HCl}$                                       b)  $\text{HClO}_3$                                       c)  $\text{Cl}_2\text{O}$                                       d)  $\text{ICl}_3$
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  $\text{Na}_2\text{S}_2\text{O}_3$  using  $\text{K}_2\text{Cr}_2\text{O}_7$  by iodometry, the equivalent weight of  $\text{K}_2\text{Cr}_2\text{O}_7$  is :
- a) (molecular weight)/2  
 b) (molecular weight)/6  
 c) (molecular weight)/3  
 d) Same as molecular weight
375. When  $\text{SO}_2$  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)  $\text{I}_2$                                       b)  $\text{F}_2$                                       c)  $\text{Cl}_2$                                       d)  $\text{Br}_2$
377. The reaction,  
 $\text{P}_4 + 3\text{NaOH} + 3\text{H}_2\text{O} \rightarrow 3\text{NaH}_2\text{PO}_2 + \text{PH}_3$   
 is an example of
- a) Disproportionation reaction                                      b) Neutralisation reaction  
 c) Double-decomposition reaction                                      d) Pyrolytic reaction
378. Titrations in which  $\text{I}_2$  solution is used as intermediate are known as ....titrations.
- a) Iodometric                                      b) Iodimetric                                      c) Acidimetric                                      d) alkalimetric
379. In the reaction,  $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{I}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O} + 3\text{I}_2$ , which element is reduced?
- a) I                                      b) O                                      c) H                                      d) Cr
380. Carbon reacts with oxygen to form two oxides, CO and  $\text{CO}_2$ . 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  $\text{SnCl}_2$  solution will reduce 600 mL of 0.1 N  $\text{HgCl}_2$  to  $\text{Hg}_2\text{Cl}_2$ ?
- a) 120 mL                                      b) 60 mL                                      c) 30 mL                                      d) 240 mL
382. What weight of  $\text{FeSO}_4$  (mol. wt. =152) will be oxidised by 200 mL of normal  $\text{KMnO}_4$  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 ( $\text{Fe}^{2+}$ ) are equal to 1 mL of 0.1055 N  $\text{K}_2\text{Cr}_2\text{O}_7$  equivalent?  
 a) 5.9 mg                      b) 0.59 mg                      c) 59 mg                      d)  $59 \times 10^{-3}$  mg
384. Number of moles of  $\text{MnO}_4^-$  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  $M_1 \rightarrow M_1^{n+} + ne$ , 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)  $\text{CH}_3\text{CH}_2\text{OH} + \text{Cl}_2 \rightarrow \text{CH}_3\text{CHO} + \text{HCl}$   
 (ii)  $\text{CH}_3\text{CHO} + \text{Cl}_2 \rightarrow \text{CCl}_3\text{CHO} + \text{HCl}$   
 (iii)  $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$   
 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  $\text{K}_2\text{Cr}_2\text{O}_7$  is always reduced to :  
 a)  $\text{Cr}^{5+}$                       b)  $\text{Cr}^{4+}$                       c)  $\text{Cr}^{3+}$                       d)  $\text{Cr}^{2+}$
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)  $\text{SO}_4^{2-} \rightarrow \text{SO}_3^{2-}$                       b)  $\text{Cu}^{2+} \rightarrow \text{Cu}$                       c)  $\text{H}^+ \rightarrow \text{H}$                       d)  $\text{H}^- \rightarrow \text{H}$
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  $\text{K}_2\text{Cr}_2\text{O}_7$  is converted into  $\text{K}_2\text{CrO}_4$ , 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)  $\text{HNO}_3$                       b)  $\text{HNO}_2$                       c) HI                      d)  $\text{H}_2\text{SO}_4$
395. In which of the following compounds, nitrogen exhibits highest oxidation state?  
 a)  $\text{N}_3\text{H}$                       b)  $\text{NH}_2\text{OH}$                       c)  $\text{N}_2\text{H}_4$                       d)  $\text{NH}_3$
396. 1 mole of  $\text{MnO}_4^{2-}$  in neutral aqueous medium disproportionates to :  
 a)  $\frac{2}{3}$  mole of  $\text{MnO}_4^-$  and  $\frac{1}{3}$  mole of  $\text{MnO}_2$   
 b)  $\frac{1}{3}$  mole of  $\text{MnO}_4^-$  and  $\frac{2}{3}$  mole of  $\text{MnO}_2$   
 c)  $\frac{1}{3}$  mole of  $\text{Mn}_2\text{O}_7$  and  $\frac{1}{3}$  mole of  $\text{MnO}_2$   
 d)  $\frac{2}{3}$  mole of  $\text{Mn}_2\text{O}_7$  and  $\frac{1}{3}$  mole of  $\text{MnO}_2$
397. Which one of the compound does not decolourised an acidified solution of  $\text{KMnO}_4$ ?  
 a)  $\text{SO}_2$                       b)  $\text{FeCl}_3$                       c)  $\text{H}_2\text{O}_2$                       d)  $\text{FeSO}_4$
398. When one mole of  $\text{KMnO}_4$  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  $\text{H}_2\text{O}_2$  is added to a solution of  $\text{FeSO}_4$ ?  
 a) Colour disappears







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,  $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$ . 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)  $CaCO_3 \rightarrow CaO + CO_2$   
 b)  $2H_2 + O_2 \rightarrow 2H_2O$   
 c)  $Na + H_2O \rightarrow NaOH + \frac{1}{2}H_2$   
 d)  $MnCl_3 \rightarrow MnCl_2 + \frac{1}{2}Cl_2$
422. Sulphurous acid can be used as :  
 a) Oxidising agent                      b) Reducing agent                      c) Bleaching agent                      d) All of these



# REDOX REACTIONS

## : ANSWER KEY :

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





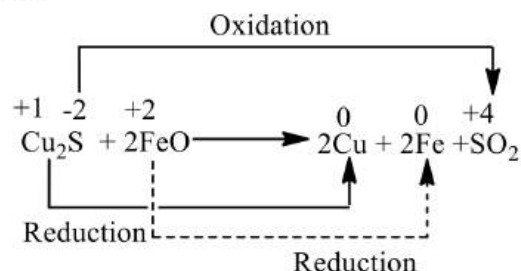
329) c	330) a	331) a	332) a	381) a	382) a	383) a	384) d
333) b	334) b	335) d	336) a	385) c	386) c	387) d	388) c
337) d	338) a	339) c	340) d	389) b	390) d	391) c	392) a
341) d	342) d	343) c	344) a	393) a	394) b	395) a	396) a
345) a	346) b	347) c	348) d	397) b	398) d	399) d	400) b
349) b	350) a	351) d	352) b	401) a	402) c	403) c	404) c
353) c	354) b	355) b	356) b	405) a	406) b	407) b	408) a
357) b	358) a	359) a	360) c	409) b	410) b	411) a	412) d
361) a	362) a	363) b	364) b	413) a	414) d	415) b	416) a
365) a	366) d	367) a	368) d	417) b	418) d	419) c	420) d
369) c	370) c	371) a	372) c	421) a	422) d		
373) d	374) b	375) a	376) b				
377) a	378) b	379) d	380) b				



# REDOX REACTIONS

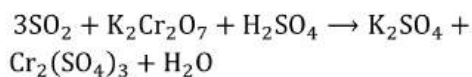
## : HINTS AND SOLUTIONS :

- 1 **(c)**  
MN can exhibit + 7 oxidation no.
- 2 **(c)**  
Indicators are the substances which indicates the completion of a reaction.
- 3 **(a)**  
 $\text{CH}_3\text{OH} \rightarrow \text{HCOOH}$   
Or  $\text{C}^2 \rightarrow \text{C}^{2+} + 4e$
- 4 **(d)**  
 $3e + \text{Mn}^{7+} \rightarrow \text{Mn}^{4+}$   
 $\therefore M = N/\text{Valence factor} = 0.6/3 = 0.2$
- 5 **(a)**  
 $\text{O}_3 + \text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + 2\text{O}_2$ ;  $\text{H}_2\text{O}_2$  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)**  
 $\text{Sn}^{2+} \rightarrow \text{Sn}^{4+} + 2e$   
 $\therefore E = M/2 = \frac{190}{2} = 95$
- 9 **(c)**  
N has +3 ox.no. which may increase (upto +5) or decrease (upto -3)
- 10 **(d)**  
 $\text{Na}_2\text{O}_2$  is sodium peroxide.
- 11 **(c)**  
Acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  solution oxidises  $\text{SO}_2$  into  $\text{Cr}_2(\text{SO}_4)_3$ .



Hence, oxidation state of sulphur changes from +4 to +6.

- 12 **(d)**  
Electronation is gain of electrons i.e.,  $A + e \rightarrow A^-$
- 13 **(d)**  
 $3\text{Fe} \rightarrow \text{Fe}_3\text{O}_4 + 8e^-$  oxidation  
 $4\text{H}_2\text{O} + 8e^- \rightarrow 4\text{H}_2$   
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.,  $\text{Cr}^{3+}$  is not oxidised to  $\text{Cr}_2\text{O}_7^{2-}$  under given conditions. Hence, option (d) is correct.
- 16 **(b)**  
 $\text{NO}_3^- \rightarrow \text{NH}_4^+ \text{ or } \text{N}^{5+} + 8e \rightarrow \text{N}^{3-}$   
Thus, Eq. wt. of  $\text{NO}_3^- = \frac{62}{8}$
- 17 **(d)**  
Carbon in oxalic acid has +3 oxidation state which may be increases to +4 (in  $\text{CO}_2$ ) and thus, can act as reductant. Rest all have highest oxidation number. Ox.no. of N, Mn and S in  $\text{HNO}_3$  (+5),  $\text{KMnO}_4$  (+7) and  $\text{H}_2\text{SO}_4$  (+6).
- 18 **(a)**  
Meq. of  $\text{HNO}_3 = \text{Meq. of I}_2$   
 $\frac{w}{63/3} \times 1000 = \frac{5}{254/10} \times 1000$   
 $\therefore w_{\text{HNO}_3} = 4.13 \text{ g}$
- 19 **(c)**  
 $6e + \text{Cr}_2^{6+} \rightarrow 2\text{Cr}^{3+}$   
 $\text{S}^{4+} \rightarrow \text{S}^{6+} + 2e$
- 20 **(a)**  
 $\text{CN}^-$  is reducing and complexing agent.
- 21 **(b)**  
 $\text{Na} \xrightarrow{\text{NH}_3} \text{Na}^+ + (\text{NH}_3)_x^e$  Ammonia solvated electrons are strongly reducing, impart blue colour to solution and are good conductor of current.
- 22 **(a)**



- 23 **(b)**  
 $\text{Fe}_3\text{O}_4$  is a mixture of  $\text{FeO}$  and  $\text{Fe}_2\text{O}_3$ .  
 $\text{VSO}_4$  is isomorphous to,  $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ .
- 24 **(c)**  
 $\text{MnO}_4^- = \text{Mn} = +7$   
 $\text{MnO}_4^{2-} = \text{Mn} = +6$   
 $\text{MnO}_2 = \text{Mn} = +4$   
 $\text{Mn}_2\text{O}_3 = \text{Mn} = +3$   
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)**  
 $\text{S}_2^{2+} \rightarrow 2\text{S}^{6+} + 8e$
- 28 **(a)**  
 $2\text{Fe}^0 \rightarrow \text{Fe}_2^{3+} + 6e$ .
- 29 **(a)**  
 $\text{MnO}_4^- + 8\text{H}^+ + 5e^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$
- 30 **(d)**  
 $a + (-2) = 0$   
 $\therefore a = +2$
- 31 **(c)**  
 $\text{Mn}^{7+} + 5e \rightarrow \text{Mn}^{2+}$   
 $\text{FeC}_2\text{O}_4 \rightarrow \text{Fe}^{3+} + 2\text{CO}_2 + 3e$
- 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  $\text{H}_2\text{O}_2$ .  
 $2(+1) + 2x = 0$   
 $2x = -2$   
 $x = -1$
- 34 **(a)**  

$$\text{I}^- + (\text{IO}_3)^{-1} + \text{H}^+ \rightarrow \text{I}_2 + \text{H}_2\text{O}$$

$$2\text{I}^- \rightarrow \text{I}_2 + 2e^- \quad \dots \text{(i)} \times 5$$

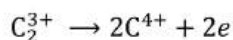
$$10e^- + 2(\text{IO}_3)^{-1} \rightarrow \text{I}_2 \quad \dots \text{(ii)}$$
On adding Eq. (i) and (ii), we get  
 $10\text{I}^- + 2\text{IO}_3^- \rightarrow 6\text{I}_2$   
To balance O atom, add  $6\text{H}_2\text{O}$  molecules on RHS and  $12\text{H}^+$  on LHS, then  
 $10\text{I}^- + 2\text{IO}_3^- + 12\text{H}^+ \rightarrow 6\text{I}_2 + 6\text{H}_2\text{O}$   
or  $5\text{I}^- + \text{IO}_3^- + 6\text{H}^+ \rightarrow 3\text{I}_2 + 3\text{H}_2\text{O}$
- 35 **(d)**  
Cl has +7 ox.no. in  $\text{KClO}_4$ .

- 36 **(c)**  
 $\text{Mn}^{7+} + 5e \rightarrow \text{Mn}^{2+};$   
 $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + e$
- 37 **(a)**  
Oxidation number in elemental form is zero. Covalency is two because of S-S-S-S-chain.
- 38 **(a)**  
 $\text{Fe}_2\text{O}_3$   
 $\therefore$  Total charge on cation or anion = +6  
 $\text{Fe}_2^{3+} \text{O}_3^{2-}$   
 $\therefore E = \frac{112}{6} \text{ or } \frac{56}{3}$
- 39 **(b)**  
 $\text{C}_3\text{O}_2$  is carbon sub-oxide.  
Thus,  $3a - (2 \times 2) = 0$   
 $a = +\frac{4}{3}$
- 40 **(a)**  
 $\text{Cu}^{2+} + 2\text{I}^- \rightarrow \text{CuI}_2 \rightarrow \text{Cu}_2\text{I}_2 + \text{I}_2$   
 $\text{I}_2 + \text{Na}_2\text{S}_2\text{O}_3 \rightarrow \text{Na}_2\text{S}_4\text{O}_6 + 2\text{NaI}$  (Redox change)
- 41 **(a)**  
Oxidation state of oxygen in  $\text{H}_2\text{O}_2$  is -1. -1 is the intermediate oxidation state of oxygen.
- 42 **(d)**  
 $2e + \text{S}^{6+} \rightarrow \text{S}^{4+}$   
S of  $\text{H}_2\text{SO}_4$  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)**  

Oxidation  

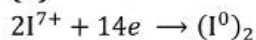
$$\begin{array}{ccc} 0 & 0 & +1 \quad -1 \\ \text{H}_2 + \text{Br}_2 & \longrightarrow & 2\text{HBr} \end{array}$$
Reduction

Only this reaction involves oxidation and reduction.
- 46 **(c)**  
 $[\text{Mn}^{7+} + 5e \rightarrow \text{Mn}^{2+}] \times 2$   
 $[\text{C}_2^{3+} \rightarrow 2\text{C}^{4+} + 2e] \times 5$
- 47 **(a)**  
 $\text{Mn}^{7+} + 5e \rightarrow \text{Mn}^{2+}$   
 $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + e$



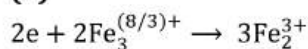
$\therefore$  3 mole of  $KMnO_4 = 5$  mole of  $FeC_2O_4$

48 (b)



$$E_{IO_4^-} = \frac{M}{7}$$

49 (b)



$$\therefore E_{Fe_3O_4}$$

$$= \frac{M}{\text{No. of electrons lost or gained by one molecule}}$$

$$= \frac{M}{1}$$

50 (b)

Meq. of  $HNO_3 =$  Meq. of  $Fe^{2+}$

(Eq. wt. of  $HNO_3 = M/3$ )

$$\text{Or } 3 \times 3 \times V = \frac{8}{56} \times 1000$$

$$\therefore V = 15.87 \text{ mL}$$

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

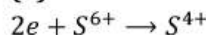
$$5 + x + 6(-2) = 0$$

$$x = +7$$

53 (a)

$Ag^+$  is reduced to  $Ag$ .

54 (a)



S of  $H_2SO_4$  is reduced.

55 (d)

The characteristics of oxidant. Note these.

56 (c)



57 (a)

Meq. of bleaching powder = Meq. of  $Cl_2$  = Meq. of hypo

$$\frac{w}{35.5} \times 1000 = 50 \times \frac{1}{10} \quad \therefore w_{Cl_2}$$

$$= 0.1775 \text{ g}$$

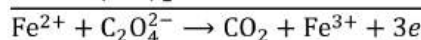
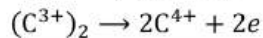
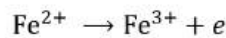
$$\therefore \text{Per cent } Cl_2 = \frac{0.1775}{5} \times 100 = 3.55 \%$$

58 (a)

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

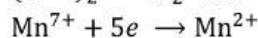
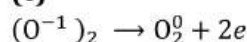
$$\therefore a = +5$$

59 (b)



$$\therefore E = M/3$$

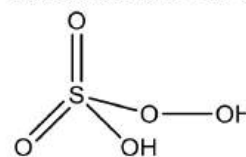
60 (c)



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)

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

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

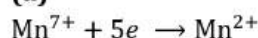
$$x - 6 = 0$$

$$x = 6$$

62 (a)

The formula for Eq. wt. of reductant or oxidant.

63 (a)

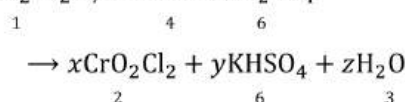
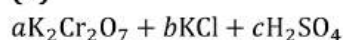


$$\therefore E = M/5$$

64 (c)

No doubt oxygen is taken in respiration, but oxidant-reduction occur simultaneously.

65 (d)



66 (c)

Both Os and Ru show +8 ox.no.

67 (b)

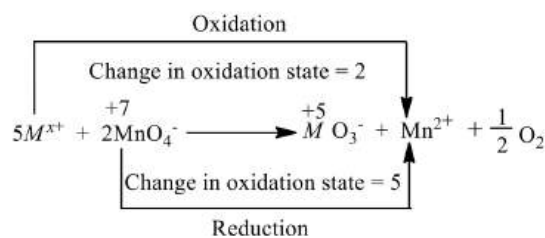
Two oxygen atom have peroxide linkage, (*i. e.*, -1 oxidation number) and six have -2 ox.no.

$$\text{Thus, } 2 \times 1 + 2 \times a + 6 \times (-2) + 2 \times (-1) = 0$$

$$\therefore a = +6$$

68 (b)





$$x + 2 = 5$$

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

69 (a)

Meq. of  $K_2Cr_2O_7$  = Meq. of  $FeSO_4$

$$1 \times V = \frac{10}{152/1} \times 1000$$

$$\therefore V = 65.78 \text{ mL}$$

70 (b)

$Cl_2 + H_2O \rightarrow 2HCl + O$ ; thus, matter is oxidised by liberated oxygen.

72 (b)



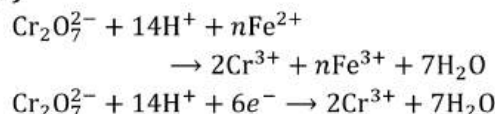
73 (d)

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

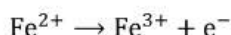
74 (a)

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

75 (c)

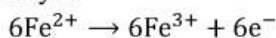


(reduction)...(i)

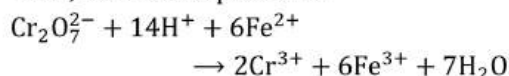


(oxidation)...(ii)

Eq.(ii) is multiplied by 6

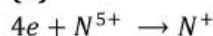


Thus, balanced equation is



Hence, the value of 'n' is 6.

76 (b)

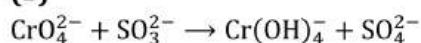


$\therefore$  Possible product is  $N_2O$ .

77 (d)

Find oxidation number of P in each.

78 (b)



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

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

$$y - 8 + 4 = -1$$

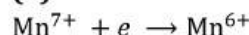
$$y = 3$$

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

79 (b)

Find oxidation no. in each.

80 (d)



$$\therefore E = M/1$$

81 (a)

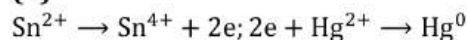
The sum of oxidation states of all elements in an ion is equal to charge on it.

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

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

$$\text{Or } x = +6$$

82 (d)



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<sub>3</sub>**  
Suppose O.N. of O = x

**Na<sub>2</sub>O<sub>2</sub>**

suppose

O.N. of O = x

$$+1 + 3x = 0$$

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

$$3x = -1$$

$$2 + 2x = 0$$

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

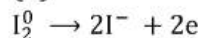
$$2x = -2$$

$$x = -0.33$$

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

$$x = -1$$

86 (b)



87 (c)

Os and Ru show +8 oxidation number.

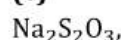
88 (a)

$$\text{Meq. of } AgNO_3 = 100 \times 1 = 100$$

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

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

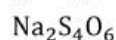
89 (c)



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

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

$$x = +2$$



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

$$2 + 4x - 12 = 0$$

$$4x = +10$$

$$x = +2.5$$

90 (b)

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

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

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

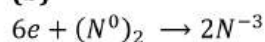
$$\text{Also, mole of } K^+ = \frac{0.2}{5} \left[ Mn^{7+} + 5e \rightarrow Mn^{2+} \right] = 0.04$$

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

92 (b)

$4e + Br^{5+} \rightarrow Br^{1+}$ ; Thus,  $BrO_3^-$  is to be reduced by a reducing agent.

93 (b)



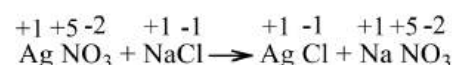
$$\therefore E_{N_2} = \frac{28}{6}; E_{NH_3} = \frac{17}{3}$$

94 (a)

$F_2$  is oxidant;  $ClO_4^-$  and  $MnO_4^-$  are also oxidant.

96 (c)

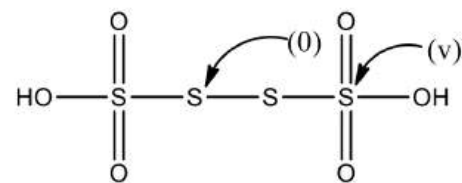
None of elements in reaction (c) undergoes a change in oxidation number, therefore reaction (c) is not a redox reaction



It is a double decomposition reaction

97 (b)

$Na_2S_4O_6$  is salt of  $H_2S_4O_6$  which has the following structure

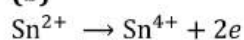


$\Rightarrow$  Difference in oxidation number of two types of sulphur = 5

98 (c)

Sum of oxidation no. of atoms in it is zero.

99 (b)



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

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)

$$\text{Meq. of } H_2O_2 = 25 \times 0.5 \times 2 = 25;$$

$$\text{Meq. of } KMnO_4 = 50 \times 0.2 \times 5 = 50;$$

$\therefore$  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.

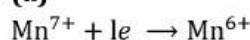
$$\text{Thus, } 1 + a + (-3) = 0$$

$$\therefore a = +2$$

104 (a)

Ox.no. of Ni is equal to zero.

105 (a)



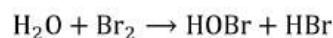
$$\therefore E = M/1$$

106 (b)

Mn has  $+6$  ox.no. in  $K_2MnO_4$  and  $+2$  ox.no. in  $MnSO_4$ .

107 (b)

In reaction  $0 \quad +1 \quad -1$



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  $\text{LiAlH}_4$  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  $\text{Fe}_3\text{O}_4 = x$   
 $\therefore 3x + 4 \times (-2) = 0$   
 Or  $3x - 8 = 0$   
 $\therefore x = \frac{8}{3}$
- 112 (d)  
 $\text{As}^{3+} \rightarrow \text{As}^{5+} + 2e$   
 $\text{S}^{2-} \rightarrow \text{S}^{6+} + 8e$
- 113 (a)  
 $3e + \text{Mn}^{7+} \rightarrow \text{Mn}^{4+}; E = \frac{158}{3} = 52.66$
- 114 (a)  
 $8e + \text{N}^{5+} \rightarrow \text{N}^{3-}$   
 $E_{\text{NO}_3^-} = \frac{M}{8} = \frac{62}{8}$   
 $E_{\text{NH}_4^+} = \frac{M}{8} = \frac{18}{8}$
- 115 (d)  
 $1 + a + 4 \times (-2) = 0$   
 $\therefore a = +7$
- 116 (d)  
 Find oxidation number of iodine in each.
- 117 (c)  
 $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + (1/2)\text{H}_2$
- 118 (b)  
 $3 \times 1 + a + 6 \times (-1) = 0$   
 $\therefore a = +3$
- 119 (d)  
 $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6e^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$   
 $(2\text{I}^- \rightarrow \text{I}_2 + 2e^-) \times 3$   

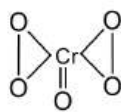

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 $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{I}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O} + 3\text{I}_2$   
 Hence, number of moles of  $\text{I}_2$  produced = 3
- 120 (b)  
 $\text{Mn}^{4+} + 2e^- \rightarrow \text{Mn}^{2+};$   
 $\text{MnO}_2$  is itself reduced.
- 121 (b)  
 Meq. of  $\text{O}_2 = \text{Meq. of KMnO}_4 = 100 \times 0.5$   
 $\frac{w}{8} \times 1000 = 50$   
 $\therefore w_{\text{O}_2} = 0.4 \text{ g}$

$$\therefore V_{\text{O}_2} = \frac{224 \times 0.4}{32} = 0.28 \text{ litre}$$

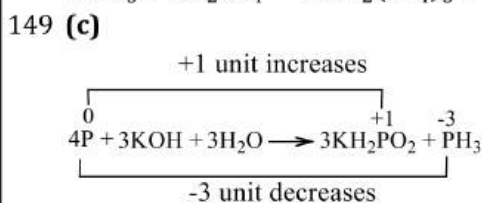
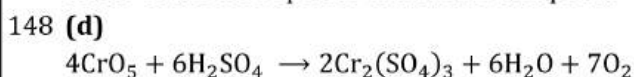
- 122 (a)  
 Oxidation involves loss of electrons and reduction involves gain of electrons, hence in case of oxidation-reduction reactions (redox reactions) charge remains conserved
- 123 (b)  
 $\text{Ni} \rightarrow \text{Ni}^{2+} + 2e^-$ ; Ni is oxidized and thus, reductant.
- 124 (a)  
 $\overset{-1}{2}\text{HI} + \overset{+6}{\text{H}_2}\overset{0}{\text{S}}\overset{+4}{\text{O}_4} \rightarrow \overset{0}{\text{I}_2} + \overset{+4}{\text{S}}\text{O}_2 + 2\text{H}_2\text{O}$   
 $\text{H}_2\text{SO}_4$  - Reduced to  $\rightarrow \text{SO}_2$   
 oxidising agent
- 125 (c)  
 $\text{Cr}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Cr}$ .
- 126 (a)  
 $\overset{-2}{\text{H}_2}\overset{0}{\text{S}} \rightarrow \overset{0}{\text{S}}$   
 The oxidation number of S increases from  $-2$  to  $0$  in elemental sulphur and hence,  $\text{H}_2\text{S}$  gets oxidized
- 127 (a)  
 $\text{S}_8$  has zero oxidation state of S.  
 In  $\text{S}_2\text{F}_2$ :  $2 \times a + 2 \times (-1) = 0$ ;  $\therefore a = +1$   
 In  $\text{H}_2\text{S}$ :  $2 \times 1 + a = 0$ ;  $\therefore a = -2$
- 128 (a)  
 Cr in  $\text{CrO}_2\text{Cl}_2$  has  $+6$  and Mn in  $\text{MnO}_4^-$  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  $\text{ClO}_3^-$ .  
 $\text{ClO}_3 = -1$   
 $x + 3(-2) = -1$   
 $x = +6 - 1$   
 $x = +5$
- 131 (a)  
 $2e^- + \text{Cl}^+ \rightarrow \text{Cl}^-$   
 $N = \frac{15}{74.5/2 \times 1} = 0.40$
- 132 (b)  
 In ionic hydrides, H has  $-1$  ox.no.
- 133 (c)  
 Let the oxidation number of Xe is  $x$  in  $\text{XeOF}_2$ .  
 $x + (-2) + 2(-1) = 0$   
 $x - 2 - 2 = 0$   
 $x = +4$

- 134 (b)  
No change in ox.no. of any species.
- 135 (a)  
 $H_2^{1+} + 2e \rightarrow H_2^0$
- 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)  
 $H_2^{1+}O \rightarrow H_2^0$ ; Steam is reduced.
- 142 (b)  
 $2KClO_3 \rightarrow 2KCl + 3O_2$ . 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)  
 $Mn^{7+} + 5e \rightarrow Mn^{2+}$   
 $Fe^{2+} \rightarrow Fe^{3+} + e$
- 144 (b)  
Due to smallest halogen, it possesses maximum tendency for accepting electron in aqueous medium.  
 $(1/2) F_2 + e + aq \rightarrow F^-, \Delta H = -ve(\text{max. for } F_2)$
- 145 (a)  
Bromine has zero oxidation state because it is in free state.  
 $Br_2 \rightarrow BrO_3^-$   
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)



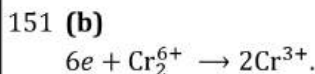
ie, it has four peroxide bonds each having an oxidation number of  $-1$  and one double bond in which oxidation number of O is  $-2$   
Therefore,  $x + 4 \times (-1) + 1 \times (-2) = 0$   
 $\therefore x = +6$

- 147 (a)  
Indicator then only can show redox change with either of the titre species to indicate end point.

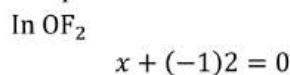


Hence, P is both oxidized as well as reduced

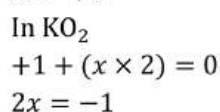
- 150 (c)  
 $2 \times a + 7 \times (-2) = -4$   
 $\therefore a = +5$



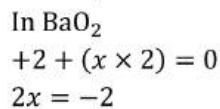
- 152 (b)  
Let the oxidation number of oxygen in following compounds is  $x$ .



$x = +2$



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



$x = -1$

In  $O_3$ , oxidation number of oxygen is zero because ox 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)  $SO_2 + 2H_2S \rightarrow 2H_2O + 3S$
- 160 (d)  $F^-$  can be oxidized to  $F_2$  only by electrolysis.
- 161 (a)  $2S_2^{2+} \rightarrow S_4^{(5/2)+} + 2e \therefore$  Eq. wt. of  $Na_2S_2O_3 = \frac{M}{1}$   
 $I_2^0 + 2e \rightarrow 2I^-$
- 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)  $Fe^{2+} + Ce^{4+} \rightarrow Fe^{3+} + Ce^{3+}$   
 $5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow 5Fe^{3+} + Mn^{2+} + 4H_2O$   
 $\therefore \frac{\text{Moles of ceric ammonium sulphate}}{\text{Moles of potassium permanganate}} = \frac{1}{1/5}$   
 $= 5.0$
- 165 (a)  $N^{3-} \rightarrow N^{2+} + 5e$   
 $\therefore E_{NH_3} = \frac{17}{5}$
- 166 (a) C has  $-4$  ox.no. in  $CH_4$ ,  
 In rest all it has  $+4$  ox.no.
- 167 (d)  $[Cr_2^{6+} + 6e \rightarrow 2Cr^{3+}] \times 1; [Sn^{2+} \rightarrow Sn^{4+} + 2e]$   
 $\times 3$
- 168 (a) Milliequivalent  $[(W/Eq. wt.) \times 1000]$  or millimole  $[(\frac{W}{M}) \times 1000]$  do not change on dilution.
- 169 (c)  $Cr^{3+}$  ion is green;  $Cr_2^{6+} + 6e \rightarrow 2Cr^{3+}$ .
- 170 (b)  $Hg + O_3 \rightarrow HgO + O_2$
- 171 (a)  $a + (4 \times 0) + 2 \times (-1) = 1$   
 $\therefore a = +3$
- 172 (c)  $2V^{2+} \rightarrow V_2^{5+} + 6e$
- 173 (c)  $Cr^{6+} + 3e \rightarrow Cr^{3+}$   
 $\therefore E = M/3$
- 174 (a) Ox.no. of Cr on both side is  $+6$
- 175 (b)  $S^{2-} \rightarrow S^{4+} + 6e$   
 $\therefore$  Eq. = mole  $\times 6$
- 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)  $CuSO_4 + H_2S \rightarrow CuS + H_2SO_4$
- 180 (a) I in  $KIO_4$  has  $+7$  ox.no.
- 181 (a)  $2 \times a + 3 \times (-2) = -2$   
 $\therefore a = +2$
- 182 (c)  $6e + Cr_2^{6+} \rightarrow 2Cr^{3+}$ ;  
 Eq. wt. of Cr =  $\frac{\text{at. wt.}}{3}$
- 183 (d)  $\begin{matrix} -1 & +2 & +4 & -2 & +1 & -1 & +4 & -2 & -2 \\ H_2O_2 & + & Na_2C & O_3 & \rightarrow & Na_2O_2 & + & CO_2 & + & H_2O \end{matrix}$   
 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  $\text{HNO}_3$  is

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

$$x = 5$$

The oxidation state in N in  $\text{NaN}_3$  is

$$+1 + 3x = 0$$

$$x = -1/3$$

The oxidation state of N in  $\text{Mg}_3\text{N}_2$  is

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

$$6 + 2x = 0$$

$$x = -3$$

Hence, three molecules

(i.e.,  $\text{NH}_3$ ,  $\text{NaN}_3$ ,  $\text{Mg}_3\text{N}_2$ ) have negative oxidation state.

186 (a)

Fe in  $\text{Fe}(\text{CO})_5$  has zero oxidation no., i.e., the lowest for metals.

187 (c)

The weight of rider used is 0.0002 g.

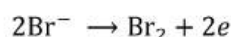
188 (d)

Ions are hydrated on dissolution of salt in water.

189 (a)

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

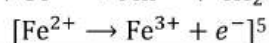
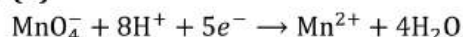
190 (c)



191 (a)

Corrosion involves oxidation of species.

192 (b)



$\therefore$  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.

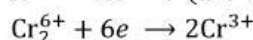
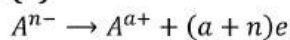
196 (b)

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  $\text{H}_2\text{O}_2$  has ox.no.  $-1$  which can increase or decrease.

198 (b)



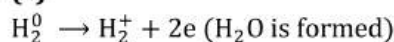
Also, Meq of A = Meq. of  $\text{K}_2\text{Cr}_2\text{O}_7$

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

$$\text{Or } a+n = 3$$

$$\therefore a = 3 - n$$

199 (c)



200 (d)

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

$$\therefore a = +7$$

201 (d)

Due to higher  $E_{OP}^0$  order.

202 (c)

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

203 (d)

Ox.no. of S in  $\text{Na}_2\text{S}_4\text{O}_6$  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.  $M \rightarrow M^{4+} + 4e$

205 (b)

$\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$ ; This is simple decomposition and not a redox change.

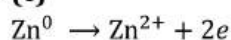
206 (b)

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

207 (a)

It imparts its colour at end point.

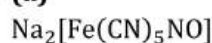
208 (c)



209 (d)

Oxygen has highest electron affinity in its family.

210 (a)



211 (d)

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

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

i.e., 1 : 6 or  $\text{XeF}_6$



- 212 (c)  
N in  $\text{NH}_3$ ,  $\text{NH}_4^+$ ,  $\text{N}_3\text{H}$  and  $\text{NO}_2^-$  has  $-3$ ,  $-3$ ,  $-1/3$  and  $+3$  oxidation number respectively.
- 213 (b)  
Meq. of  $\text{H}_2\text{O}_2 = \text{Meq. of KMnO}_4$   
 $\frac{w}{34/2} \times 1000 = 10 \times 1$   
 $\therefore w_{\text{H}_2\text{O}_2} = 0.17$   
 $\therefore \text{Per cent purity} = \frac{0.17}{0.2} \times 100 = 85\%$
- 214 (c)  
 $\text{Mn}^{7+} + e \rightarrow \text{Mn}^{6+} \quad (\text{MnO}_4^{2-})$   
 $\text{Mn}^{7+} + 3e \rightarrow \text{Mn}^{4+} \quad (\text{MnO}_2)$   
 $2\text{Mn}^{7+} + 8e \rightarrow (\text{Mn}^{3+})_2 \quad (\text{Mn}_2\text{O}_3)$   
 $\text{Mn}^{7+} + 5e \rightarrow \text{Mn}^{2+} \quad (\text{MnO}_2)$
- 215 (d)  
The reaction involves :  
 $\text{H}_2\text{O}_2 + 2\text{I}^- + 2\text{H}^+ \rightarrow \text{I}_2 + 2\text{H}_2\text{O}(l)$   
 $2\text{Na}_2\text{S}_2\text{O}_3 + \text{I}_2 \rightarrow \text{Na}_2\text{S}_4\text{O}_6 + 2\text{NaI}$   
The reaction gives blue colour only after all the  $\text{Na}_2\text{S}_2\text{O}_3$  is used. The reaction is carried out with adjusted amount of  $\text{Na}_2\text{S}_2\text{O}_3$  so that only a fraction of  $\text{H}_2\text{O}_2$  and  $\text{KI}$  reaction occurs before the blue colour of starch— $\text{I}_2$  appears, however the slow redox reaction of  $\text{H}_2\text{O}_2$ — $\text{I}_2$  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  $(\text{N}_2\text{H}_5)_2\text{SO}_4$  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  $\text{Na}_2\text{S}_4\text{O}_6$  is  $x$ .  
 $\text{Na}_2\text{S}_4\text{O}_6$   
 $1 \times 2 + 4 \times x + (-2) \times 6 = 0$   
 $2 + 4x - 12 = 0$   
 $4x - 10 = 0$   
 $4x = 10$   
 $x = \frac{10}{4} = 2.5$
- 220 (d)  
 $\text{F}_2$  is strongest oxidant among all the species.
- 221 (b)  
S has  $+6$  ox. no. in  $\text{SO}_3$
- 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)  
 $\therefore 4\text{Zn} + \text{NO}_3^- + 10\text{H}^+ \rightarrow 4\text{Zn}^{2+} + \text{NH}_4^+ + 3\text{H}_2\text{O}(\text{Net equation})$   
 $4\text{Zn} + \text{NO}_3^- + 10\text{HCl} \rightarrow 4\text{Zn}^{2+} + \text{NH}_4^+ + 5\text{Cl}_2 + 3\text{H}_2\text{O}$   
 $\therefore 1 \text{ mole of } \text{NO}_3^- \text{ (Or } \text{NaNO}_3) \text{ is reduced by } = 10 \text{ moles of HCl}$   
 $\therefore \frac{1}{2} \text{ mole of } \text{NO}_3^- \text{ will be reduced by}$   
 $= 10 \times \frac{1}{2} \text{ moles of HCl}$   
 $= 5 \text{ moles of HCl}$
- 225 (a)  
Meq. of  $\text{FeSO}_4 = \text{Meq. of KMnO}_4$   
 $\frac{w}{152/1} \times 1000 = 200 \times 1$   
 $\therefore w = 30.4 \text{ g}$
- 226 (b)  
 $\text{BiO}_3^- + 6\text{H}^+ + 2e^- \rightarrow \text{Bi}^{3+} + 3\text{H}_2\text{O}$   
 $x = 2$
- 227 (b)  
 $5\text{H}_2\text{O}_2 + 2\text{ClO}_2 + 2\text{OH}^- \rightarrow 2\text{Cl}^- + 5\text{O}_2 + 6\text{H}_2\text{O}$
- 228 (b)  
Meq. of  $\text{Na}_2\text{S}_2\text{O}_3 = \text{Meq. of CuSO}_4$   
 $\therefore V \times 0.4 \times 1 = 50 \times 0.2 \times 1$   
 $\therefore V = 25 \text{ mL}$
- 229 (a)  
 $N = \frac{47.5}{189.7/2 \times 2.25} = 0.222 \text{ N}$
- 230 (b)  
 $2e + \text{Fe}_2^{3+} \rightarrow 2\text{Fe}^{2+}$
- 231 (c)  
 $\text{Mn}^{7+} + 5e \rightarrow \text{Mn}^{2+}$   
 $\text{C}_2^{3+} \rightarrow 2\text{C}^{4+} + 2e$
- 232 (b)  
Oxidation no. of N in  $\text{NO}^+$  is  
 $(1 \times x) + 1 \times (-2) = +1$   
 $\therefore x = +3$   
Oxidation no. of Cl in  $\text{ClO}_4^-$  is  
 $(1 \times x) + 4 \times (-2) = -1$   
 $x = +7$
- 233 (c)  
1. Sulphurous acid  $\text{H}_2\text{SO}_3$

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

$$x - 4 = 0$$

$$\therefore x = 4$$

2. Pyrosulphuric acid ( $\text{H}_2\text{S}_2\text{O}_7$ )

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

$$\text{or } 2x = 12$$

$$\therefore x = 6$$

3. Thiosulphuric acid ( $\text{H}_2\text{S}_2\text{O}_3$ )

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

$$\text{or } 2x = 4$$

$$x = 2$$

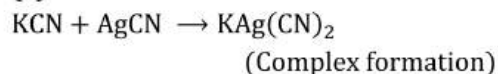
4. Dithionous acid ( $\text{H}_2\text{S}_2\text{O}_4$ )

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

$$2x = 6$$

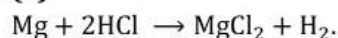
$$\therefore x = 3$$

234 (c)



$\text{CN}^-$  also acts as reducing agent.

235 (a)



236 (a)

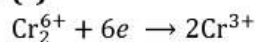
$$\text{Meq. of oxalic acid} = \text{Meq. of KMnO}_4$$

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

237 (d)

$\text{H}_3\text{PO}_3$  is phosphorous acid.

238 (c)



239 (c)

$$\text{H}_4\text{P}_2\text{O}_5 : 4 \times 1 + 2 \times a - 5 \times 2 = 0$$

$$a = +3$$

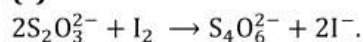
$$\text{H}_4\text{P}_2\text{O}_6 : 4 \times 1 + 2 \times a - 6 \times 2 = 0$$

$$a = +4$$

$$\text{H}_4\text{P}_2\text{O}_7 : 4 \times 1 + 2 \times a - 7 \times 2 = 0$$

$$a = +5$$

240 (c)



241 (b)

Meq. of oxalate = Meq. of  $\text{KMnO}_4$

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

$$\therefore w \text{ oxalate ion} = 0.198 \text{ g}$$

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

242 (a)

Meq. of  $\text{Cl}_2$  = Meq. of  $\text{KMnO}_4$

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

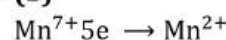
$$\therefore w_{\text{Cl}_2} = 11.23 \text{ g}$$

$$\therefore V_{\text{Cl}_2} = \frac{22.4 \times 11.23}{71} = 3.54 \text{ litre}$$

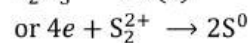
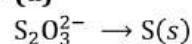
243 (d)

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

244 (b)

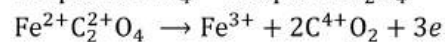


245 (d)



246 (a)

Meq. of  $\text{KMnO}_4$  = Meq. of  $\text{FeC}_2\text{O}_4$



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

$$\therefore V = 4.1 \text{ mL}$$

247 (d)

It is precipitation reaction.

248 (a)

Meq. of lime stone = Meq. of  $\text{CaC}_2\text{O}_4$   
= Meq. of  $\text{KMnO}_4$

= Meq. of  $\text{CaO}$

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

$$\therefore w_{\text{CaO}} = 0.28$$

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

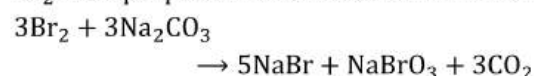
249 (a)

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

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

250 (c)

$\text{Br}_2$  is disproportionated in basic medium as



251 (b)

Carbon has negative oxidation no. in  $\text{Mg}_3\text{C}_2$  and positive oxidation number in  $\text{C}_3\text{O}_2$ ; 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



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

$$2x - 6 = 0$$

$$2x = 6$$

$$x = +3$$

254 (a)

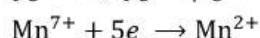
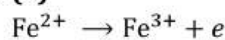
$$2 \times a + 2 \times (-1) = 0$$

$$\therefore a = +1$$

255 (c)

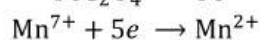
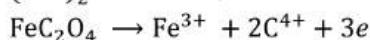
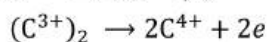
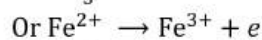
N has +1 ox.no.

256 (a)



5 mole  $FeSO_4 = 1$  mole  $KMnO_4$

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



5 mole  $FeC_2O_4 = 3$  mole  $KMnO_4$

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

257 (b)

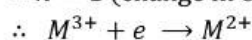


258 (c)

Meq. of salt = Meq. Of  $Na_2SO_3$

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

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



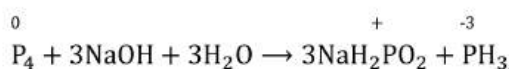
259 (a)

$Cu^{2+}$  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  $Cu^{2+}$ .

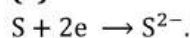
260 (c)

$\therefore$  In this reaction phosphorus is simultaneously oxidised and reduced.

$\therefore$  It is disproportionation reaction.



261 (a)



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.

$$5. \text{ In } X_2YZ_6$$

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

$$6. \text{ In } XY_2Z_6$$

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

$$7. \text{ In } XY_5$$

$$2 + 5 \times 5 \neq 0$$

$$8. \text{ In } X_3YZ_4$$

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

Hence, the formula of the compound is  $XY_2Z_6$ .

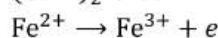
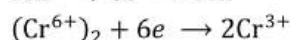
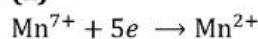
264 (c)

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

$$\text{Thus, } a + (-2) = 0$$

$$\therefore a = +2$$

265 (a)



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)

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

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

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

267 (c)

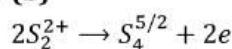
Let the oxidation number of Cr in  $K_2CrO_4$  is x.

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

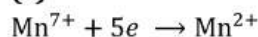
$$2 + x - 8 = 0$$

$$x = +6$$

268 (b)



269 (c)



$$\therefore E = M/5$$

270 (c)

Let the oxidation number of Cr be  $x$

$\therefore$  For  $K_2Cr_2O_7$

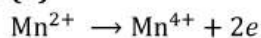
$$+1 \times 2 + 2x + 7(-2) = 0$$

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

$$2x = 12$$

$$x = 6$$

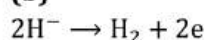
271 (b)



272 (c)

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

273 (b)



274 (b)

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

In HCHO,

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

$$2 + x - 2 = 0$$

$$x = 0$$

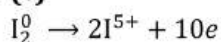
In HCOOH,

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

$$2 + y - 4 = 0$$

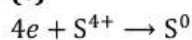
$$y = 2$$

275 (c)



$$\therefore E = \frac{M}{10} = \frac{254}{10} = 25.4$$

276 (c)

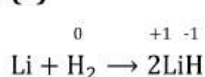


$$\therefore E_{SO_2} = \frac{64}{4} = 16$$

277 (a)

$M^{5+} \rightarrow M^{7+} + 2e$ ;  $M^{5+}$  is reductant.

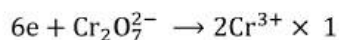
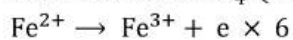
278 (a)



Oxidation number of hydrogen is decreasing from 0 to  $-1$ . So,  $H_2$  is acting as oxidising agent in this reaction.

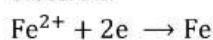
279 (d)

Mohr's salt is  $FeSO_4 \cdot (NH_4)_2 SO_4 \cdot 6H_2O$



280 (a)

1 faraday of electricity involves change of one mole electron.



281 (c)

Oxidation of Co and reduction of  $Cu^{2+}$  is taking place.

282 (a)

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

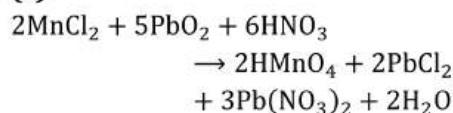
$$\therefore a = +7$$

283 (a)

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

$$\therefore a = -3$$

284 (c)



285 (d)

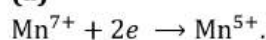
$$4 \times 1 + a + 4 \times (-1) = 0$$

$$\therefore a = 0$$

286 (c)

Ox. no. of each species remains same.

287 (a)

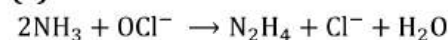


288 (a)

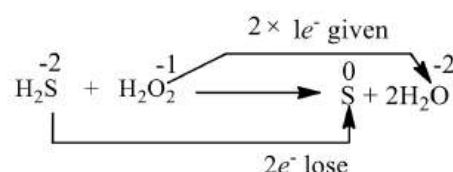
$$4 \times 1 + a + 6 \times (-1) = 0$$

$$\therefore a = +2$$

289 (a)



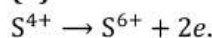
290 (d)



$H_2S$  - Oxidation, Reducing agent.

$H_2O_2$  - Reduction, Oxidising agent.

291 (d)

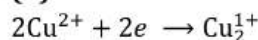


292 (b)

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

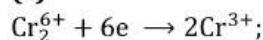
$$\therefore a = -1$$

293 (d)



$$\therefore E = \frac{M}{1}$$

294 (c)

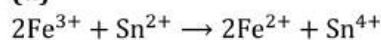


$Cr_2O_7^{2-}$  is reduced.

295 (a)



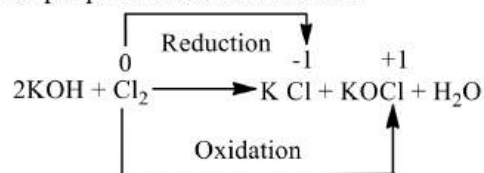
296 (d)



297 (c)

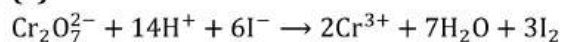


The reactions, in which the same element is oxidised as well as reduced, are called disproportionation reactions.



In this reaction, the same element, *ie.*,  $\text{Cl}_2$  is oxidised as well as reduced, so it is an example of disproportionation reaction.

298 (a)



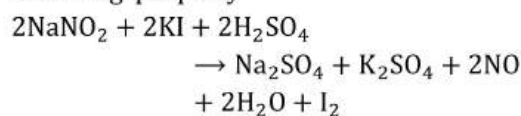
$\text{Cr}_2\text{O}_7^{2-}$  is reduced to  $\text{Cr}^{3+}$ .

Thus, final state of Cr is +3. Hence, (a)

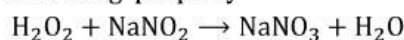
299 (d)

$\text{NaNO}_2$  (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



Reducing property



300 (a)

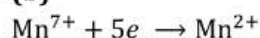
Graphic is uncombined state of carbon.

301 (d)

$$6 \times a + 12 \times 1 + 6 \times (-2) = 0$$

$$\therefore a = 0$$

302 (b)



303 (a)

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

$$\therefore a = +5$$

304 (c)

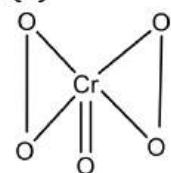
Eq. of  $\text{Cl}_2$  = eq. of chloride

$$1 \times 2 = \frac{111}{E + 35.5}$$

$$\therefore E = 40$$

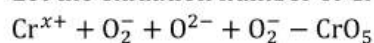
$$\therefore M = 40 \times 2 = 80 \text{ (Metal is bivalent.)}$$

305 (b)



It is chromium peroxide.

Let the oxidation number of Cr is "x".



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

$$x - 6 = 0$$

$$x = +6$$

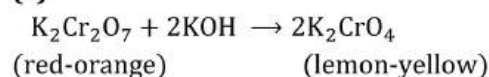
Hence, the oxidation state of Cr is +6.

306 (d)

Haematite is  $\text{Fe}_2\text{O}_3$ , in which oxidation number of iron is III.

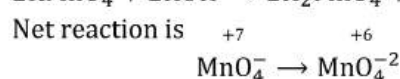
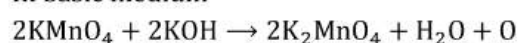
Magnetite is  $\text{Fe}_3\text{O}_4$  which is infact a mixed oxide ( $\text{FeO} \cdot \text{Fe}_2\text{O}_3$ ), hence iron is present in both II and III oxidation state.

307 (c)



308 (a)

In basic medium



Change in oxidation number

$$= 7 - 6 = +1$$

So, electrons involved =  $1e^-$

309 (a)

In  $\text{NH}_4^+$ , N has ox.no. -3 and in  $\text{NO}_3^-$ , N has ox.no. +5.

310 (c)

$$a + 6 \times (-1) = -2$$

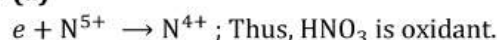
$$\therefore a = +4$$

311 (c)

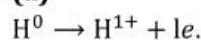
$$1 + 1 \times (-2) + a = 0$$

$$\therefore a = +1$$

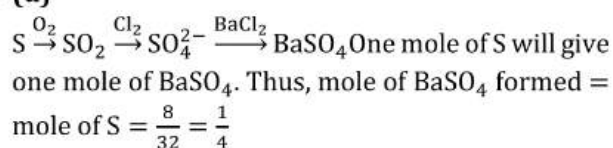
312 (a)



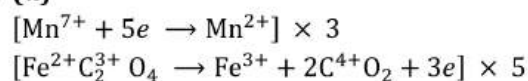
313 (a)



314 (d)



315 (d)



316 (c)

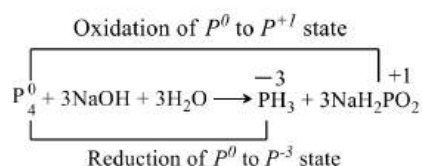
Equal equivalent of species react together.

317 (a)

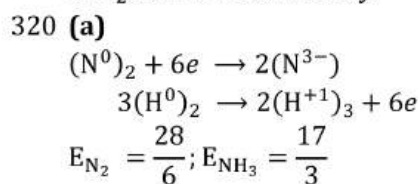
It is a fact.

318 (c)

The balanced disproportionation reaction involving white phosphorus with aq. NaOH is

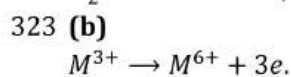


319 (b) F can have only -ve ox.no., i.e.,  $2e + F_2^0 \rightarrow 2F^{1-}$  or  $F_2$  can be reduced only.



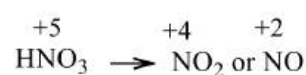
321 (a)  $SO_2 + 2H_2O \rightarrow H_2SO_4 + 2H$ ; thus, matter is reduced by liberated hydrogen.

322 (c)  $N_2$  undergoes oxidation and reduction as well;  
 $N_2^0 \rightarrow 2N^{3+} + 6e$ ;  $N_2^0 + 6e \rightarrow 2N^{3-}$

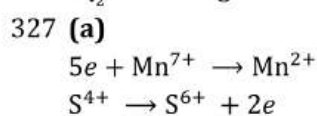


324 (a)  $2H^- \rightarrow H_2 + 2e$ ; Thus,  $H^-$  is oxidized.

325 (d) All these substances can accept electrons and can decrease their oxidation number and hence, all these act as oxidation agent

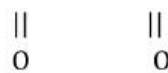
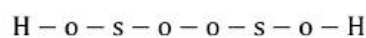


326 (b) Meq. of  $I_2 = \text{Meq. of } Na_2S_2O_3 = 40 \times 0.11$   
 $\therefore \frac{w}{254/2} \times 1000 = 40 \times 0.11$   
 $w_{I_2} = 0.558 \text{ g}$



328 (c) Meq. of  $HNO_3 = 1000 \times 2 = 2000$   
 $\therefore \frac{w}{63/3} \times 1000 = 2000$   
 $\therefore w = 42 \text{ g}$

329 (c) The chemical structure of  $H_2S_2O_8$  is as follows



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

for H          for S          for O          for O—O

$$+2 + 2x - 12 - 2 = 0$$

$$2x = +12$$

$$x = +6$$

330 (a)  $2e + M^{7+} \rightarrow M^{5+}$ ,  $M^{7+}$  is oxidation;  $M^{+5}$  is reductant.

331 (a)  $S^{2-} \rightarrow S^0 + 2e$   
 $\therefore E = M/2 = \frac{34}{2} = 17$

332 (a)  $Mn^{7+} + 5e \rightarrow Mn^{2+}$ .

333 (b) In  $N_3H$

$$\text{Oxidation number of N} = -\frac{1}{3}$$

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 +  $I_2 \rightarrow$  Blue

335 (d)  $[2C_2^{3+} \rightarrow 4C^{4+} + 4e] \times 5$   
 $[Mn^{7+} + 5e \rightarrow Mn^{2+}] \times 4$

336 (a)  $Fe^{2+} \rightarrow Fe^{3+} + e$ .

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  $\times$  V)  
 $\therefore X = 2.5$

339 (c)  $2CuSO_4 + 4KI \rightarrow Cu_2I_2 + 2K_2SO_4 + I_2$

340 (d) +2 and +3

341 (d) It is a fact.

342 (d)  $Al \rightarrow Al^{3+} + 3e$



Thus, 27 g Al forms  $\text{Al}^{3+}$  by losing 3*N* 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  $\text{KMnO}_4$ .

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

$$1 + x - 8 = 0$$

$$x = +7$$

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  $\text{XeO}_2$  and  $\text{XeF}_4$  is 4.

$$\begin{array}{cc} \text{XeO}_2 & \text{XeF}_4 \\ x + 2(-2) = 0 & x + 4(-1) = 0 \\ x = 4 & x = 4 \end{array}$$

350 (a)

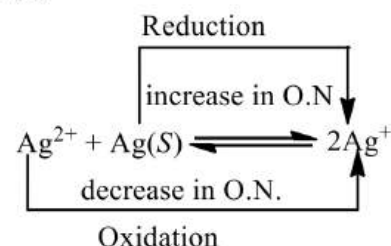
$\text{Na}_3\text{AsO}_4$  is sodium arsenate

Or  $\text{AsO}_4^{3-}$  is arsenate.

$$\text{Thus, } a + 4 \times (-2) = -3$$

$$\therefore a = +5$$

351 (d)



Hence, those reactions in which two or more species undergo oxidation as well as reduction are called comproportionation.

352 (b)



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  $\text{Mn}^{2+} = +2$

0. Let oxidation state of Mn in  $\text{MnO}_2 = x$

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

$$\therefore x = +4$$

(iii) Let the oxidation state of Mn in  $\text{KMnO}_4 = x$

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

$$\therefore x = +7$$

iv) Let oxidation state of Mn in  $\text{K}_2\text{MnO}_4 = x$

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

$$\therefore x = +6$$

$\therefore$  Increasing order of oxidation states is

(i) < (ii) < (iv) < (iii)

357 (b)

Meq. of  $\text{MnO}_2 = \text{Meq. of oxalic acid}$

$$= 0.16 \times 35 = 56$$

$$\therefore \frac{w}{87/2} \times 1000 = 56$$

$$w_{\text{MnO}_2} = 0.24 \text{ g}$$

358 (a)

More is  $E_{RP}^0$ , more is the tendency to get itself reduced or more is oxidising power.

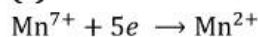
359 (a)

Meq. of  $\text{KMnO}_4 = 3750 \times 0.85$

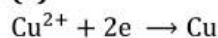
$$\therefore \frac{w}{31.6} \times 1000 = 3750 \times 0.85$$

$$\therefore w = 100.7 \text{ g}$$

360 (c)



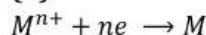
361 (a)



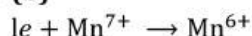
362 (a)

It is definition of iodimetric titrations.

363 (b)



364 (b)



$$\therefore E = M/1$$

365 (a)

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

$$\therefore a = +5$$

366 (d)

$\therefore$  3 ions of  $F^-$  from 1 molecule of  $AlF_3$

$\therefore 3 \times 10^{23}$  ions of  $F^-$  from  $10^{23}$  molecules of  $AlF_3$

367 (a)

Calculate ox.no. by taking  $NO^+$  in  $NOCl$

368 (d)

Cl has +7 ox.no. in  $Cl_2O_7$ .

369 (c)

$$\text{Meq. of } KMnO_4 = 4000 \times 0.05$$

$$\therefore \frac{w}{31.6} \times 1000 = 4000 \times 0.05$$

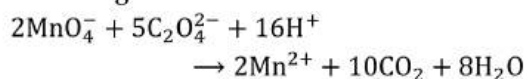
$$w = 6.32 \text{ g}$$

370 (c)

$H_2O_2$  oxidises  $S^{2-}$  to  $S^0$ .

371 (a)

Following is balanced redox reaction.



So, coefficients of

$MnO_4^-$ ,  $C_2O_4^{2-}$  and  $H^+$  are 2, 5, and 16 respectively.

372 (c)

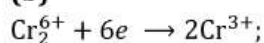
$$2 \times a + 1 \times (-2) = 0$$

$$\therefore a = +1$$

373 (d)

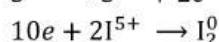
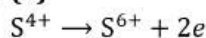
Oxidation-reduction takes place simultaneously.

374 (b)



$$\therefore \text{Eq. wt.} = \frac{\text{mol. wt.}}{6}$$

375 (a)

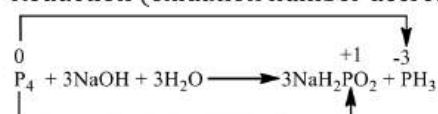


376 (b)

$F_2$  shows only  $-1$  ox.no.

377 (a)

Reduction (oxidation number decreases)



Oxidation (oxidation number increases)

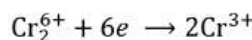
The reactions in which the same substance undergoes oxidation as well as reduction, are called disproportionation reactions.

So, the above reaction is an example of disproportionation reaction.

378 (b)

It is definition of iodimetric titrations.

379 (d)



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. of  $SnCl_2 = \text{Meq. of } HgCl_2$

$$0.5 \times V = 600 \times 0.1$$

$$\therefore V = 120 \text{ mL}$$

382 (a)

Meq. of  $FeSO_4 = \text{Meq. of } KMnO_4 = 200 \times 1$

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

$$\therefore w = 30.4 \text{ g}$$

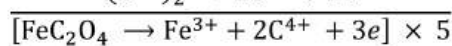
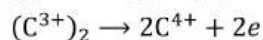
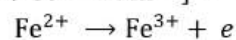
383 (a)

Meq. of  $Fe = \text{Meq. of } K_2Cr_2O_7$

$$\frac{w}{56/1} \times 1000 = 1 \times 0.1055$$

$$\therefore w = 5.9 \times 10^{-3} \text{ g} = 5.9 \text{ mg}$$

384 (d)



$$\therefore 3 \text{ mole } MnO_4^- \equiv 5 \text{ mole } FeC_2O_4$$

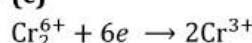
385 (c)

The sum of oxidation number is zero.

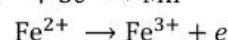
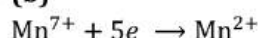
386 (c)

Electrons released at anode = Electrons used at cathode.

388 (c)



389 (b)



390 (d)

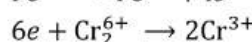
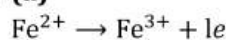
Loss of an electron or increase in oxidation number is oxidation process.



391 (c)

Due to inert pair effect which is more predominant in T1.

392 (a)



Thus, electrons involved per Cr atom = 3.

393 (a)

Let oxidation state of Cr in  $K_2Cr_2O_7 = x$



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

$$\text{or } +2 + 2x - 14 = 0$$

$$\therefore x = +6$$

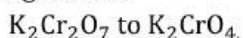
Let oxidation state of Cr in  $\text{K}_2\text{CrO}_4 = x$

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

$$2 + x - 8 = 0$$

$$x = 6$$

$\therefore$  Change in oxidation state of Cr is zero when it changes from



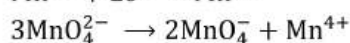
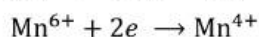
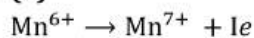
394 (b)

In  $\text{HNO}_2$ , 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  $\text{N}_3\text{H}$ ,  $\text{NH}_2\text{OH}$ ,  $\text{N}_2\text{H}_4$ ,  $\text{NH}_3$  are  $-\frac{1}{3}$ , -1, -2, -3 respectively.

396 (a)



397 (b)

$\text{FeCl}_3$  cannot be oxidised because Fe has highest oxidation state.

398 (d)

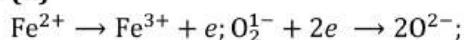
Meq. of  $\text{KMnO}_4 = \text{Meq. Of } \text{Cl}_2$

$$1 \times 5 \times 1000 = \frac{w}{(71/2)} \times 1000$$

$$\therefore w = 177.5 \text{ g}$$

$$\therefore V_{\text{Cl}_2} = 56 \text{ litre at NTP}$$

399 (d)



$\text{H}_2\text{O}_2$  acts as oxidant.

400 (b)

Let oxidation state of I in  $\text{IPO}_4 = 'x'$ .

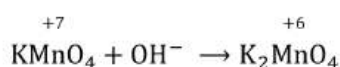
$$x + (-3) = 0$$

( $\text{PO}_4^{3-}$  ion has charge equal to -3)

$$x = +3$$

401 (a)

In alkaline medium



Change in oxidation number

$$= 7 - 6$$

$$= 1$$

Hence, moles of KI = moles of  $\text{KMnO}_4$ .

402 (c)

5 mole  $\text{I}^-$  gives 3 mole  $\text{I}_2$

403 (c)

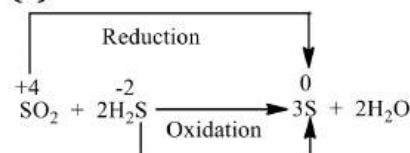
$$2 \times 1 + 2 \times a + 7 \times (-2) = 0$$

$$\therefore a = +6$$

404 (c)

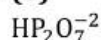
The concentration of standard solution is known.

405 (a)



$\therefore \text{H}_2\text{S}$  is oxidised in this reaction.

406 (b)



$$+1 + 2x - 2 \times 7 = -1$$

$$x = +6$$

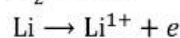
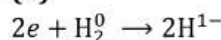
407 (b)

Iron usually shows zero, +2, +3 oxidation state.

408 (a)

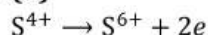
Calculate ox.no. of Cl in  $\text{NOClO}_4$  by assuming  $\text{ClO}_4^-$  and  $\text{NO}^+$ .

409 (b)



$\text{H}_2$  is reduced and thus, oxidant.

410 (b)



411 (a)

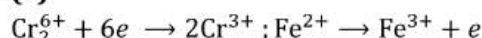
$$a + 2 \times (-2) = 0$$

$$\therefore a = +4$$

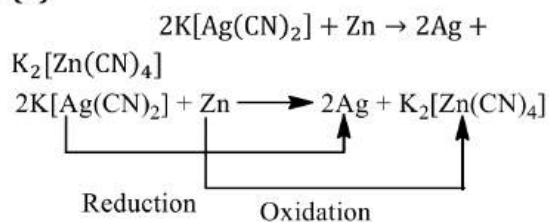
412 (d)

Ox.no. Fe in Mohr's salt,  $[\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}]$  is +2.

413 (a)



414 (d)



415 (b)

Meq. of  $\text{K}_2\text{Cr}_2\text{O}_7 = \text{Meq. of } \text{H}_2\text{S}$

$$2 \times V = \frac{0.81}{34/2} \times 1000$$

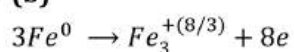
$$\therefore V = 23.8 \text{ mL}$$

416 (a)

$$3 \times 1 + a + 4 \times (-2) = 0$$

$$\therefore a = +5$$

417 (b)



$$\therefore E = \frac{M}{n} = \frac{56 \times 3}{8} = 21$$

418 (d)

Permonosulphuric acid ( $H_2SO_5$ ) has two oxygen atoms in peroxide linkage, hence,

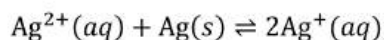
$$2(+1) + x + 2(-1) + 3(-2) = 0$$

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

$$x = +6$$

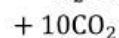
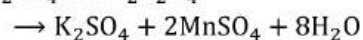
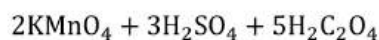
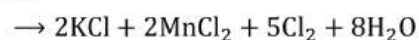
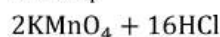
419 (c)

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.



420 (d)

HCl is also oxidised along with oxalic acid by  $KMnO_4$ .



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.

