EXERCISE - O

SINGLE CORRECT TYPE QUESTIONS

Oxidation Number

1. Which statement is incorrect :
(A) Oxidation number of oxygen is –2 in most of its compounds.
(B) Oxidation number of oxygen is +2 in Oxygen difluoride.
(C) Oxidation number of oxygen is $-\frac{1}{2}$ in superoxides.
(D) Oxidation number of oxygen is +1 in peroxides.

CRX088

2. Identify the correct statement :
(A) Halogens always have –1 oxidation state in their compounds.
(B) Oxidation number can be zero, integer or fractional.
(C) In OF_2, the oxidation number of F is +1.
(D) Hydrogen always has + 1 oxidation number in its compounds.

CRX089

3. Among the following compounds given below, what is the sum of the oxidation states of all underlined elements?
$\underline{C}O_2$, $K_2\underline{Mn}O_4$
(A) 8 (B) 9 (C) 10 (D) 12

CRX090

4. The oxidation number of Phosphorus in $Mg_2P_2O_7$ is :
(A) + 3 (B) + 2 (C) + 5 (D) – 3

CRX091

5. The oxidation number of sulphur in S_8 & S_2F_2 respectively are :
(A) 0, +1 (B) +2, +1 (C) 0, –1 (D) –2, +1

CRX092

6. Manganese achieves its maximum oxidation state in which of these compounds :
(A) MnO_2 (B) Mn_3O_4 (C) $KMnO_4$ (D) K_2MnO_4

CRX093

7. When ZnS is boiled with strong nitric acid, the products are zinc nitrate, sulphuric acid and nitrogen dioxide. What are the changes in the oxidation numbers of Zn, S and N :
(A) + 2, + 4, – 1 (B) + 2, + 6, – 2 (C) 0, + 4, – 2 (D) 0, + 8, – 1

CRX094

8. Fe shows an oxidation state of +1 in :
(A) $Fe(CO)_5$ (B) $[Fe(H_2O)_5(NO^{\oplus})]SO_4$
(C) $Fe_4[Fe(CN)_6]_3$ (D) $[FeCl_4]^{\ominus}$

CRX095

9. Consider the redox reaction $2S_2O_3^{2\ominus} + I_2 \longrightarrow S_4O_6^{2\ominus} + 2I^{\ominus}$:
(A) $2S_2O_3^{2\ominus}$ gets oxidised to $S_4O_6^{2\ominus}$ (B) I_2 gets reduced to $I^{\ominus}$
(C) I_2 gets oxidised to $I^{\ominus}$ (D) Both (A) & (B)

CRX096

10. The incorrect order of decreasing oxidation number of S in compounds is :

(A) $H_2S_2O_7 > Na_2S_4O_6 > Na_2S_2O_3 > S_8$ (B) $H_2SO_5 > H_2SO_3 > SCl_2 > H_2S$

(C) $SO_3 > SO_2 > S_8 > H_2S$ (D) $H_2SO_4 > SO_2 > H_2S > H_2S_2O_8$

CRX109

Types of Redox Reactions

11. Which of the following is/are decomposition reaction(s) ?

(A) $2HgO \longrightarrow 2Hg + O_2$ (B) $Fe_2(SO_4)_3 \longrightarrow Fe_2O_3 + SO_3$

(C) $2H_2O \longrightarrow 2H_2 + O_2$ (D) All of these

CRX097

12. Which is a displacement redox reaction :

(A) $Cr_2(SO_4)_3 + 6KOH \rightarrow 2Cr(OH)_3 + 3K_2SO_4$ (B) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(C) $NH_4Cl + NaOH \rightarrow NH_3 + NaCl + H_2O$ (D) $2AgNO_3 + Cu \rightarrow Cu(NO_3)_2 + Ag$

CRX098

13. Which reaction does not represent auto redox or disproportionation :

(A) $Cl_2 + OH^{\ominus} \longrightarrow Cl^{\ominus} + ClO_3^{\ominus} + H_2O$ (B) $2H_2O_2 \longrightarrow H_2O + O_2$

(C) $2Cu^{\oplus} \longrightarrow Cu^{2\oplus} + Cu$ (D) $(NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + 4H_2O$

CRX099

14. Which of the following is not a comproportionation redox reaction?

(A) $Na_2SO_3 + S \rightarrow Na_2S_2O_3$ (B) $2BaO + O_2 \rightarrow 2BaO_2$

(C) $CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$ (D) $SO_2 + 2H_2S \rightarrow 2H_2O + 3S$

CRX100

15. Which of the following is redox reaction?

(A) $NaOH + HCl \longrightarrow NaCl + H_2O$ (B) $AgNO_3 + KI \longrightarrow AgI + KNO_3$

(C) $BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$ (D) $SnCl_2 + HgCl_2 \longrightarrow SnCl_4 + Hg$

CRX114

16. Which of the following is a combination redox reaction ?

(A) $CaO + CO_2 \longrightarrow CaCO_3$ (B) $H_2 + Cl_2 \longrightarrow 2HCl$

(C) $CaO + 2HCl \longrightarrow CaCl_2 + H_2O$ (D) $NaOH + HCl \longrightarrow NaCl + H_2O$

CRX115

17. Which of the following is example of disproportionation reaction :

(A) $HgO \longrightarrow Hg + O_2$ (B) $KClO_3 \longrightarrow KCl + O_2$

(C) $KClO_3 \longrightarrow KClO_4 + KCl$ (D) $AgNO_3 + KI \longrightarrow AgI + KNO_3$

CRX116

Oxidation and Reduction

18. The reaction $H_2S + H_2O_2 \rightarrow S + 2H_2O$ shows :

(A) Oxidation of H_2O_2 (B) Reduction of H_2O_2

(C) Acidic nature of H_2O_2 (D) Alkaline nature of H_2O_2

CRX086

19. If in a chemical reaction, $Fe^{2\oplus}$ is converted into $Fe^{3\oplus}$, then $Fe^{2\oplus}$:
(A) Gains one electron and gets reduced
(B) Looses one electron and gets oxidized
(C) Gains one proton and gets oxidised
(D) Looses one proton and gets reduced

CRX087

20. In the reaction, $ZnO + C \rightarrow Zn + CO$:
(A) ZnO is reduced
(B) C is oxidised
(C) Above reaction is a redox reaction
(D) All of above

CRX101

21. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$
In above reaction :
(A) both CH_4 and O_2 are oxidised
(B) both CH_4 and O_2 are reduced
(C) CH_4 is oxidised and O_2 is reduced
(D) CH_4 is reduced and O_2 is oxidized

CRX102

22. In the reaction, $Zn + CuCl_2 \rightarrow ZnCl_2 + Cu$:
(A) Zn is getting reduced
(B) $CuCl_2$ is getting oxidized
(C) Both (A) and (B) are correct
(D) None of (A) and (B) are correct

CRX103

23. In the reaction, $Mg + F_2 \rightarrow MgF_2$, correct statement(s) is/are :
(A) Both oxidation and reduction take place in above reaction
(B) Mg is oxidized
(C) F_2 is Reduced
(D) All of the above

CRX104

24. In the reaction, $3Mg + N_2 \rightarrow Mg_3N_2$, incorrect statement is :
(A) Mg is reduced (B) Mg is oxidised (C) N_2 is oxidised (D) Both (A) and (C)

CRX105

25. $FeCl_2 + \frac{1}{2}Cl_2 \rightarrow FeCl_3$
In above reaction :
(A) Fe is oxidised
(B) Cl_2 is reduced
(C) both (A) and (B) are true
(D) both (A) and (B) are false

CRX106

26. In the half reaction, $2S_2O_3^{2\ominus} \longrightarrow S_4O_6^{2\ominus} + 2e^{\ominus}$:
(A) $S_2O_3^{2\ominus}$ gets oxidized
(B) $S_2O_3^{2\ominus}$ gets reduced
(C) $S_2O_3^{2\ominus}$ gets both oxidised and reduced
(D) $S_2O_3^{2\ominus}$ gets neither oxidised nor reduced

CRX107

27. Identify the oxidant in the following reaction :
$KMnO_4 + KCl + H_2SO_4 \longrightarrow MnSO_4 + K_2SO_4 + H_2O + Cl_2$
(A) $KMnO_4$ (B) KCl (C) H_2SO_4 (D) H_2O

CRX110

28. Identify the reductant in the following reaction :
$FeCl_2 + H_2O_2 + HCl \longrightarrow FeCl_3 + H_2O$
(A) $FeCl_2$ (B) H_2O_2 (C) HCl (D) $Cl^{\ominus}$

CRX111

29. H_2O_2 acts as a oxidising agent in :
(A) $FeCl_2 + HCl + H_2O_2 \longrightarrow FeCl_3 + H_2O$ (B) $HI + H_2O_2 \longrightarrow I_2 + H_2O$
(C) $H_2SO_3 + H_2O_2 \longrightarrow H_2SO_4 + H_2O$ (D) All of these

CRX112

30. (A) $S^{2\ominus} + 4H_2O_2 \longrightarrow SO_4^{2\ominus} + 4H_2O$
(B) $Cl_2 + H_2O_2 \longrightarrow 2HCl + O_2$
The true statement regarding the above reactions is :
(A) H_2O_2 acts as reductant in both the reactions.
(B) H_2O_2 acts as oxidant in reaction (A) and reductant in reaction (B).
(C) H_2O_2 acts as an oxidant in both the reactions.
(D) H_2O_2 acts as reductant in reaction (A) and oxidant in reaction (B).

CRX113

Balancing of Redox Reaction

31. The number of electrons to balance the following equation, $NO_3^{\ominus} + 4H^{\oplus} + e^{\ominus} \rightarrow 2H_2O + NO$ is :
(A) 5 (B) 4 (C) 3 (D) 2

CRX249

32. Number of moles of electrons taken up when 1 mole of $NO_3^{\ominus}$ ions is reduced to 1 mole of NH_2OH is
(A) 2 (B) 4 (C) 5 (D) 6

CRX250

33. In the reaction, $xHI + yHNO_3 \longrightarrow NO + I_2 + H_2O$:
(A) x = 3, y = 2 (B) x = 2, y = 3 (C) x = 6, y = 2 (D) x = 6, y = 1

CRX251

34. For the redox reaction, $Cr_2O_7^{2\ominus} + C_2O_4^{2\ominus} + H^{\oplus} \longrightarrow Cr^{3\oplus} + CO_2 + H_2O$,
the correct whole number stoichiometric coefficients of $Cr_2O_7^{2\ominus}$, $C_2O_4^{2\ominus}$ and $H^{\oplus}$ are respectively :
(A) 1, 3, 14 (B) 14, 3, 1 (C) 3, 14, 1 (D) 1, 14, 3

CRX252

35. For the redox reaction $xP_4 + yHNO_3 \longrightarrow H_3PO_4 + NO_2 + H_2O$, upon balancing with whole number coefficients :
(A) x = 1, y = 5 (B) x = 2, y = 10 (C) x = 1, y = 20 (D) x = 1, y = 15

CRX253

36. $xNO_3^{\ominus} + yI^{\ominus} + zH^{\oplus} \rightarrow 2NO + 3I_2 + 4H_2O$; x, y, z respectively in the above equation are :
(A) 2, 6, 8 (B) 1, 6, 4 (C) 0, 6, 8 (D) 2, 3, 4

CRX254

37. In the reaction $X^{\ominus} + XO_3^{\ominus} + H^{\oplus} \longrightarrow X_2 + H_2O$, the molar ratio in which $X^{\ominus}$ and $XO_3^{\ominus}$ react is :
(A) 1 : 5 (B) 5 : 1 (C) 2 : 3 (D) 3 : 2

CRX255

38. In the reaction $P_4 + OH^{\ominus} \longrightarrow PH_3 + H_2PO_2^{\ominus}$, ratio of coefficients of PH_3 and $H_2PO_2^{\ominus}$ in balanced equation is :

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

CRX256

39. Balance the following equation and choose the quantity which is the sum of the coefficients of reactants and products :

..... $KMnO_4$ +..... H_2O_2 +..... H_2SO_4 ..... $\longrightarrow$ $MnSO_4$ +..... O_2 +..... H_2O +..... K_2SO_4

(A) 26 (B) 23 (C) 28 (D) 22

CRX257

40. When arsenic sulphide is boiled with NaOH, sodium arsenite and sodium thioarsenite are formed according to reaction :

$xAs_2S_3 + y\ NaOH \longrightarrow xNa_3AsO_3 + xNa_3AsS_3 + \frac{y}{2}H_2O$. What are the values of x and y?

(A) 1, 6 (B) 2, 8 (C) 2, 6 (D) 1, 4

CRX258

41. $CN^{\ominus}$ is oxidised by $NO_3^{\ominus}$ in presence of acid :

$a\ CN^{\ominus} + b\ NO_3^{\ominus} + c\ H^{\oplus} \longrightarrow (a + b)\ NO + a\ CO_2 + \frac{C}{2}H_2O$

What are the whole number values of a, b, c in that order :

(A) 3, 7, 7 (B) 3, 10, 7 (C) 3, 10, 10 (D) 3, 7, 10

CRX259

Equivalent weight & n-factor

42. The equivalent weight of metal (Atomic Mass = 24 u), if 40 g metal oxide contains 60% metal by mass, is :

(A) 8 (B) 12 (C) 16 (D) 24

CRX118

43. Equivalent mass of H_3PO_4 in below reaction is :

$H_3PO_4 + 2\ NaOH \longrightarrow Na_2HPO_4 + 2H_2O$

(A) 98 (B) 49 (C) 32.67 (D) 196

CRX119

44. In acidic medium, potassium dichromate acts as an oxidant according to the equation :

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

What is the equivalent weight of $K_2Cr_2O_7$ (mol. wt.= M) ?

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

CRX120

45. The equivalent weight of $Na_2S_2O_3$ (Mol. wt. = M) in the reaction, $2Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$ is :

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

CRX121

46. Equivalent mass of oxidising agent in the reaction, $SO_2 + 2H_2S \longrightarrow 3S + 2H_2O$ is :

(A) 32 (B) 64 (C) 16 (D) 8

CRX122

47. In the change, $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$

if the atomic weight of iron is 56 u, then its equivalent weight will be :

(A) 42 (B) 21 (C) 63 (D) 84

CRX123

48. Equivalent weight of FeC_2O_4 in the change : $FeC_2O_4 \longrightarrow Fe^{3\oplus} + CO_2$ is : (mol. wt.= M)
(A) M/3 (B) M/6 (C) M/2 (D) M/1
CRX124

49. The valence factor of Cu_2S in below change is :
$Cu_2S \longrightarrow Cu^{2\oplus} + SO_4^{2\ominus}$
(A) 2 (B) 4 (C) 8 (D) 10
CRX125

50. An ion is reduced to the element when it absorbs 6.022×10^{20} electrons. The number of equivalents of the ion is :
(A) 0.1 (B) 0.01 (C) 0.001 (D) 0.0001
CRX126

51. The mass of oxalic acid crystals ($H_2C_2O_4.2H_2O$) that would contain it's 0.01 equivalents is :
(A) 4.5 g (B) 6.3 g (C) 0.63 g (D) 0.45 g
CRX127

52. In the reaction, $VO + Fe_2O_3 \rightarrow FeO + V_2O_5$, the eq. wt. of V_2O_5 is equal to its :
(A) Mol. wt. (B) Mol. wt./8 (C) Mol.wt./6 (D) Mol. wt./2
CRX128

53. In the reaction : $A^{n_2\ominus} + xe^{\ominus} \longrightarrow A^{n_1\ominus}$, here x will be
(A) $n_1 + n_2$ (B) $n_2 - n_1$ (C) $n_1 - n_2$ (D) $n_1 . n_2$
CRX129

54. 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
CRX130

55. 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) $MnO_4^{\ominus}$ (D) $MnO_4^{2\ominus}$
CRX131

56. $Cr_2O_7^{2\ominus} + I^{\ominus} + H^{\oplus} \rightarrow Cr^{3\oplus} + I_2 + H_2O$
The equivalent weight of the reductant in the above equation is :–(At. wt. of Cr = 52, I = 127)
(A) 26 (B) 127 (C) 63.5 (D) 10.4
CRX132

Equivalent Concept

57. The number of milliequivalents in 1.58 g of $KMnO_4$ in a reaction where it gets reduced to $Mn^{2\oplus}$ is :(At. wt. : K = 39 u, Mn = 55 u)
(A) 50 (B) 2 (C) 5 (D) 10
CRX192

58. What volume in litre of 0.1 N $K_2Cr_2O_7$ solution should be taken to have 1 equivalent of $K_2Cr_2O_7$ in a reaction where it is reduced to $Cr^{3\oplus}$?
(A) 1 L (B) 0.1 L (C) 100 L (D) 10 L
CRX193

59. The milliequivalents of H_3PO_4 in 120 mL of 1.5 M H_3PO_4 solution in a reaction where it undergoes complete neutralization is :
(A) 180 (B) 360 (C) 540 (D) 60
CRX194

60. In the redox reaction, $MnO_4^{\ominus} + C_2O_4^{2\ominus} + H^{\oplus} \longrightarrow Mn^{2\oplus} + CO_2 + H_2O$, 20 mL of 0.1 M $KMnO_4$ react quantitatively with :

(A) 20 mL of 0.1 M oxalate (B) 40 mL of 0.1 M oxalate

(C) 50 mL of 0.25 M oxalate (D) 50 mL of 0.1 M oxalate

CRX195

61. One mole of acidified $K_2Cr_2O_7$ on reaction with sufficient KI will liberate ..... mole(s) of I_2, along with $Cr^{3\oplus}$.

(A) 6 (B) 1 (C) 7 (D) 3

CRX196

62. 1 mole of N_2H_4 loses ten moles of electrons to form a new compound Y. Assuming that all the nitrogen appears in the new compound, what is the oxidation state of nitrogen in Y? (There is no change in the oxidation state of hydrogen).

(A) – 1 (B) – 3 (C) + 3 (D) + 5

CRX197

63. 1 mol each of H_3PO_2, H_3PO_3 and H_3PO_4 will neutralise respectively x mol of NaOH, y mol of $Ca(OH)_2$ and z mol of $Al(OH)_3$ (assuming all as strong electrolytes). x, y, z are in the ratio :

(A) 3 : 1.5 : 1 (B) 1 : 2 : 3 (C) 3 : 2 : 1 (D) 1 : 1 : 1

CRX199

64. 125 mL of 63% (w/v) $H_2C_2O_4.2H_2O$ solution is made to react with 125 mL of a 40%(w/v) NaOH solution. The resulting solution is: (ignoring hydrolysis of ions)

(A) neutral (B) acidic (C) strongly acidic (D) alkaline

CRX200

65. A substance which participates readily in both acid-base and oxidation-reduction reactions is :

(A) Na_2CO_3 (B) KOH (C) $KMnO_4$ (D) $H_2C_2O_4$

CRX201

66. 10 g $CaCO_3$ were dissolved in 250 mL of 1 M HCl. What volume of 2 M KOH would be required to neutralise excess HCl ?

(A) 75 mL (B) 25 mL (C) 15 mL (D) 50 mL

CRX202

67. What mass of MnO_2 is reduced by 35 ml of 0.16 N oxalic acid ($H_2C_2O_4$) in acidic solution? The skeleton equation is :-

$MnO_2 + H^{\oplus} + H_2C_2O_4 \rightarrow CO_2 + H_2O + Mn^{2\ominus}$

(A) 8.7 g (B) 0.24 g (C) 0.84 g (D) 43.5 g

CRX203

Concentration Terms

68. Unit of %w/w is :-

(A) $\frac{g}{litre}$ (B) $\frac{g}{ml}$ (C) $\frac{mol}{litre}$ (D) Unit less

CRX133

69. 20 gm of $CaCO_3$ present in 80 gm of water, then find %w/w :

(A) 10% (B) 20% (C) 25% (D) 50%

CRX134

70. 20 gm of NaCl present in 80 gm of solution of solution then find %w/w

(A) 20% (B) 25% (C) 50% (D) 40%

CRX135

71. 58.5% w/w NaCl solution present in a vessel calculate mole of NaCl.
(A) 2 (B) 2.5 (C) 1.5 (D) 1
CRX136

72. 200 gm solution of glucose by mass 25% is available in a vessel then find weight of glucose in a solution.
(A) 50 gm (B) 180 gm (C) 360 gm (D) 45 gm
CRX137

73. 20 gm $CaCO_3$ present in 80 ml of solution. Find % $\frac{w}{V}$ of $CaCO_3$ solution :-
(A) 20% (B) 50% (C) 25% (D) None of these
CRX138

74. 40 ml of water (density = 1 $\frac{g}{ml}$) present in 160 ml of C_2H_5OH. Calculate% $\frac{w}{V}$ of solution :-
(A) 20% (B) 25% (C) 50% (D) 10%
CRX139

75. 500 ml solution having strength 20 $\frac{g}{litre}$. Find mole of solute in solution ($M_{w_{solute}} = 40$) :-
(A) 0.20 (B) 0.25 (C) 2.0 (D) 2.5
CRX140

76. 2 mole of urea present in 360 ml of solution. Calculate % $\frac{w}{V}$ of urea solution :-
(A) 30% (B) 25% (C) 33.33% (D) None of these
CRX141

77. 1 litre 20% $\frac{w}{V}$ solution of NaOH is taken in a container. Find Moles of NaOH in a container :-
(A) 10 mole (B) 2.5 mole (C) 5 mole (D) 20 mole
CRX142

78. 30 ml of methyl alcohol present in 70 ml of water, calculate % $\frac{v}{V}$:-
(A) 20% (B) 30% (C) $\frac{300}{7}$% (D) 10%
CRX143

79. 20 ml H_2SO_4 present in 180 ml of solution calculate % $\frac{v}{V}$:-
(A) 10% (B) 11.11% (C) 15% (D) None
CRX144

80. Consider a sanitizer bottle of 1 litre listed as 70 % $\frac{v}{V}$ of alcohol. Find volume of alcohol in a bottle of sanitizer :-
(A) 70 ml (B) 700 ml (C) 100 ml (D) 150 ml
CRX145

81. 20 % $\frac{v}{V}$ H_2SO_4 solution present in a vessel. Find mole of H_2SO_4 in 100 ml solution.
(Density of H_2SO_4 = 1.8 $\frac{g}{ml}$)
(A) 0.367 (B) 0.50 (C) 0.20 (D) 0.10
CRX146

82. 15 ml of acetic acid present in 75 ml of water calculate $\%\frac{v}{V}$ of solution :-

(A) 16.66% (B) 20% (C) 25% (D) 10%

CRX147

83. 0.25 g of NaCl present in 999.75 g of water. Calculate ppm of NaCl solution :-

(A) 250 (B) 25 (C) 0.25 (D) 2.5

CRX148

84. How much chlorine should be added to a 30000 litre capacity of pool in order to obtain 2.5 ppm of chlorine.

(A) 25 ml (B) 50 ml (C) 75 ml (D) 100 ml

CRX149

85. The Molarity of a solution of sodium chloride in water containing 5.85 g of sodium chloride in 500 ml of solution is:

(A) 0.25 M (B) 2.0 M (C) 1.0 M (D) 0.2 M

CRX150

86. Molarity of liquid HCl, if density is 1.17 g/cc.:

(A) 36.5 M (B) 18.25 M (C) 32.05 M (D) 42.10 M

CRX151

87. Find % (w/v) of 20% (w/w) H_2SO_4 solution, if density of solution is 1.2 gram / ml.

(A) 24% (B) 12% (C) 20% (D) 16.6%

CRX152

88. 30 ml, 50% (v/v) HCl added into 70 ml, 20% (v/v) HCl solution. Find % (v/v) of resultant solution

(A) 14 (B) 29 (C) 15 (D) 70

CRX153

89. 100 ml. aqueous solution (density = $\frac{5}{3}$ gm/ml) contain 40 % by weight NaOH. The number of molecules of NaOH dissolved in the above solution is :

(Use $N_A = 6 \times 10^{23}$)

(A) 2×10^{22} (B) 3.33×10^{22} (C) 10^{24} (D) 3.33×10^{23}

CRX154

90. Calculate molality of the solution obtained by dissolving 11.7 g NaCl in 500 g water

(A) 0.1 m (B) 0.3 m (C) 0.2m (D) 0.4m

CRX155

91. If 18 g of glucose is present in 1000 g of solvent, the solution is said to be :

(A) 1 molal (B) 0.2 molal (C) 0.5 molal (D) 0.1 molal

CRX156

92. Molality of 720 g of pure water is :-

(A) 40 m (B) 4 m (C) 55.5 m (D) Can't be determine

CRX157

93. A solution of $KMnO_4$ is reduced to MnO_2. The normality of solution is 0.6. The molarity is :

(A) 1.8M (B) 0.6M (C) 0.1M (D) 0.2M

CRX158

94. The normality of 0.3 M phosphorous acid (H_3PO_3) is :
(A) 0.1 (B) 0.9 (C) 0.3 (D) 0.6
CRX159

95. Which amongst the following has the highest normality ?
(A) 16 g of NaOH in 200 mL solution (B) 1 N oxalic acid
(C) 2 M sulphuric acid (D) 1.5 mole hydrochloric acid in 1 L solution
CRX160

96. Mole fraction of glycerine ($C_3H_5(OH)_3$) in a solution of 36 g of water and 46 g of glycerine is :
(A) 0.46 (B) 0.36 (C) 0.20 (D) 0.40
CRX161

97. The mole fraction of oxygen in a mixture of 7g of nitrogen and 8g of oxygen is :
(A) $\frac{8}{15}$ (B) 0.5 (C) 0.25 (D) 1.0
CRX162

98. 18 gm of glucose present in 162 gm of H_2O. Calculate mass fraction of glucose :-
(A) 0.2 (B) 0.1 (C) 0.3 (D) 0.5
CRX163

99. Density of a solution containing 13% by mass of sulphuric acid is 0.98 g/ml. Then molarity of solution will be
(A) 1.1 M (B) 1.5 M (C) 1.3 M (D) 1.7 M
CRX164

100. The mole fraction of solute in aqueous urea solution is 0.2. The mass percent of solute is :
(A) 42.40 (B) 10.52 (C) 40.30 (D) 45.45
CRX165

101. The molarity of 98% by wt. H_2SO_4 (Density = 1.8 g/ml) is
(A) 6 M (B) 18 M (C) 10 M (D) 4 M
CRX166

102. Molality of 20% (w/w) aq. glucose solution is :
(A) $\frac{25}{18}$ m (B) $\frac{10}{9}$ m (C) $\frac{25}{9}$ m (D) $\frac{5}{18}$ m
CRX167

103. Molarity and Molality of a solute (Molar weight = 50 g) in aqueous solution is 9 and 18 respectively. What is the density of solution.
(A) 1 g/cc (B) 0.95 g/cc (C) 1.05 g/cc (D) 2 g/cc
CRX168

104. 3.0 molal NaOH solution has a density of 1.12 g/ml. The molarity of the solution is-
(A) 2.97 M (B) 3 M (C) 3.05 M (D) 3.5 M
CRX169

105. 100 ml of 0.3 M HCl solution is mixed with 200 ml of 0.3 M H_2SO_4 solution. What is the molarity of $H^{\oplus}$ in resultant solution ?
(A) 0.9 M (B) 0.6 M (C) 0.4 M (D) 0.5 M
CRX170

106. The molarity of a solution made by mixing 50 ml of conc. H_2SO_4 (18 M) with 50 ml of water, is:
(A) 36 M (B) 18 M (C) 9 M (D) 6M
CRX171

107. Find the % w/v of "10 V" H_2O_2 solution-
(A) 2 % (B) 1 % (C) 3 % (D) 5 %

CRX172

108. $2H_2O_2(aq) \longrightarrow 2H_2O(l) + O_2(g)$
Under conditions where 1 mole of gas occupies 24 dm^3, X L $\frac{1}{24}$M of solution of H_2O_2 produces 3 dm^3 of O_2. Thus X is :-
(A) 8 (B) 10 (C) 15 (D) 6

CRX173

109. 34 g of hydrogen peroxide is present in 1135 ml of solution. Volume strength of solution is:
(A) 10 V (B) 20 V (C) 30 V (D) 32 V

CRX174

110. 20 ml of '20 vol' H_2O_2 solution is diluted to 80 ml. The final volume strength of solution is -
(A) 80 V (B) 25 V (C) 5 V (D) 8 V

CRX175

111. The strength of 11.35 volume solution of H_2O_2 is :
[Given that molar mass of H = 1 g/mol^{-1} and O = 16 g/mol^{-1}]
(A) 13.6% (B) 3.4% (C) 34% (D) 1.7%

CRX176

Stoichiometry & Limiting Reagent

112. If 0.5 mol of $BaCl_2$ is mixed with 0.2 mol of Na_3PO_4, the maximum number of moles of $Ba_3(PO_4)_2$ that can be formed is -
$3BaCl_2 + 2Na_3PO_4 \longrightarrow Ba_3(PO_4)_2 + 6NaCl$
(A) 0.7 (B) 0.5 (C) 0.3 (D) 0.1

CRX179

113. 4 g of hydrogen is ignited with 4 g of oxygen. The weight of water formed is -
(A) 0.5 g (B) 3.5 g (C) 4.5 g (D) 2.5 g

CRX180

114. For the reaction A + 2B $\longrightarrow$ C, 5 mol of A and 8 mol of B will produce
(A) 5 mole of C (B) 4 mole of C (C) 8 mole of C (D) 13 mole of C

CRX181

115. If 1.6 g of SO_2 and 1.5×10^{22} molecules of H_2S are mixed and allowed to remain in contact in a closed vessel until the reaction $2H_2S + SO_2 \longrightarrow 3S + 2H_2O$, proceeds to completion. Which of the following statement is true ?
(A) Only 'S' and 'H_2O' remain in the reaction vessel.
(B) 'H_2S' will remain in excess
(C) 'SO_2' will remain in excess
(D) None

CRX182

POAC

116. 6 gm nitrogen on successive reaction with different compounds gets finally converted into 30 gm $[Cr(NH_3)_xBr_2]$ Value of x is [Atomic mass : Cr = 52, Br = 80]
(A) 1 (B) 2 (C) 3 (D) 4

CRX184

% Purity & % Yield

117. $CaCO_3$ is 90% pure. Volume of CO_2 collected at STP when 10 g of $CaCO_3$ is decomposed is -
(A) 2.043 L (B) 1.008 L (C) 10.08 L (D) 20.16 L

CRX183

118. 20 gm of a chalk sample is dissolved completely in excess of dilute HCl solution. If 3.36 L CO_2 gas is produced at 273K and 1atm, the percentage of pure $CaCO_3$ in chalk is (assume that the impurities are inert to HCl and CO_2 is completely insoluble in water)
(A) 25 % (B) 50 % (C) 75 % (D) 80 %

CRX185

Degree of Dissociation

119. For the reaction $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$. Degree of dissociation (α) will be :
(if observed molar mass of mixture is 10.0)
(A) 0.3 (B) 0.6 (C) 0.9 (D) 0.7

CRX206

120. The molar mass of mixture of sample of partially decomposed cyclobutene (C_4H_8) gas is 40. The degree of dissociation of C_4H_8 into C_2H_4 gas is :-
(A) 0.7 (B) 0.9 (C) 0.6 (D) 0.4

CRX207

121. In the given reaction, A → B, 5 moles of B is formed from 8 moles of A. Calculate degree of dissociation (α).
(A) 0.725 (B) 0.425 (C) 0.625 (D) 0.3

CRX208

Sequential & Parallel Reactions

122. Carbon reacts with oxygen forming carbon monoxide and/or carbon dioxide depending an availability of oxygen. The respective moles of CO_2 obtained when 160 g oxygen reacts with (a) 12 g carbon (b) 120 g carbon (c) 72 g carbon will be
(A) 1, 0, 4 (B) 2, 0, 4 (C) 1, 0, 3 (D) 1, 1, 4

CRX212

123. 2 moles carbon and 1.5 moles of oxygen gas are reacted in a container to produce CO or CO_2 or both. The respective moles of CO, CO_2 produced will be
(A) 2, 1 (B) 1, 2 (C) 1, 1 (D) 2, 2

CRX213

Mixture Problems

124. A mixture of $CuSO_4.5H_2O$ and $MgSO_4.7H_2O$ was heated until all the water was driven-off. If 5.0 g of mixture gave 3 g of anhydrous salts, what was the percentage by mass of $CuSO_4.5H_2O$ in the original mixture :
(A) 25.94 % (B) 74.06 % (C) 80 % (D) 20 %

CRX210

125. One mole of a mixture of N_2, NO_2 and N_2O_4 has a mean molar mass of 55.4. On heating to a temperature at which N_2O_4 may be dissociated : $N_2O_4 \longrightarrow 2NO_2$, the mean molar mass tends to the lower value of 39.6. What is the mole ratio of $N_2 : NO_2 : N_2O_4$ in the original mixture?
(A) 0.3 : 0.1 : 0.4 (B) 0.5 : 0.7 : 0.4 (C) 0.5 : 0.1 : 0.9 (D) 0.5 : 0.1 : 0.4

CRX211

Hardness of Water

126. Which of the following methods is/are used for removal of temporary hardness of water ?
(A) Boiling (B) Clark's method (C) Calgon's Method (D) Both (A) & (B)

CRX229

127. What must have been the concentration of $[Ca^{2\oplus}]$ in a sample of 1 litre hard water if, after treatment with washing soda, 10 g insoluble $CaCO_3$ is precipitated ?
(A) 0.2 M (B) 0.1 M (C) 0.3 M (D) 0.4 M

CRX230

128. Temporary hardness is due to $HCO_3^{\ominus}$ of $Mg^{2\oplus}$ and $Ca^{2\oplus}$. It is removed by addition of CaO.

$Ca(HCO_3)_2 + CaO \rightarrow 2CaCO_3 + H_2O$

Mass of CaO required to precipitate 2 g $CaCO_3$ is :
(A) 2 g (B) 0.56 g (C) 0.28 g (D) 1.12 g

CRX231

129. An ion exchange resin, RH_2 can replace $Ca^{2\oplus}$ in hard water as $RH_2 + Ca^{2\oplus} \longrightarrow RCa^{2\oplus} + 2H^{\oplus}$. When a 1 L hard water sample was passed through the resin, all $H^{\oplus}$ ions were replaced by $Ca^{2\oplus}$ ions and the pH of eluted water was found to be 2. The hardness of water (as ppm of $Ca^{2\oplus}$) in the sample of water treated is :
(A) 50 (B) 100 (C) 125 (D) 200

CRX241

Titration

130. Which of the following solutions will exactly oxidize 25 mL of an acidic solution of 0.1 M iron (II) oxalate:
(A) 25 mL of 0.1 M $K_2Cr_2O_7$ (B) 25 mL of 0.2 M $K_2Cr_2O_7$
(C) 25 mL of 0.6 M $K_2Cr_2O_7$ (D) 12.5 mL of 0.1 M $K_2Cr_2O_7$

CRX224

131. How many litres of Cl_2 gas at NTP will be liberated by the oxidation of NaCl with 15.8 g $KMnO_4$ in acidic medium ? (Atomic weight : Mn = 55 u and K = 39 u)
(A) 5.6 (B) 11.2 (C) 56 (D) 1.12

CRX225

132. 1.04 g of Na_3AsO_4 is boiled with excess of solid KI in presence of strong HCl. The iodine evolved is absorbed in KI solution and titrated against 0.2 N hypo solution. Assuming the reaction to be

$AsO_4^{3\ominus} + 2H^{\oplus} + 2I^{\ominus} \longrightarrow AsO_3^{3\ominus} + H_2O + I_2$

calculate the volume of hypo consumed. [Atomic weight of As = 75 u]
(A) 100 mL (B) 50 mL (C) 25 mL (D) 5 mL

CRX226

133. Dichloroacetic acid ($CHCl_2COOH$) is oxidised to CO_2, H_2O and Cl_2 by 600 m.eq. of an oxidising agent. Same amount of acid can neutralize how many moles of ammonia to form ammonium dichloroacetate :
(A) 0.0167 (B) 0.1 (C) 0.3 (D) 0.6

CRX227

134. If 9.1 g of V_2O_5 is dissolved in acid and is reduced to $V^{2\oplus}$ by zinc metal, how many mole of I_2 could be reduced by the resulting solution, if it is further oxidised to $VO^{2\oplus}$ ions :
[Assume no change in state of $Zn^{2\oplus}$ ions] (Atomic masses : V = 51 u, O = 16 u, I = 127 u)
(A) 0.1 (B) 0.2 (C) 0.05 (D) 0.4

CRX228

135. How many gram of $KMnO_4$ are contained in 4 litre of 0.05 N solution. The $KMnO_4$ is to be used as an oxidant in acidic medium ?
(A) 1.58 g (B) 15.8 g (C) 6.32 g (D) 31.6 g

CRX236

136. 40 ml, 0.5 M - $Na_2S_2O_3$ solution is required for complete reaction with 25 ml I_2 solution. The molarity of I_2 solution is -
(A) 0.4M (B) 0.8 M (C) 0.25 M (D) 0.16 M

CRX237

137. 20 ml of 0.8 M - H_2SO_4 solution is diluted to 100 ml. 25 ml of the diluted solution exactly require 30 ml NaOH solution for titration. The molarity of NaOH solution is -
(A) $\frac{2}{15}$M (B) $\frac{4}{15}$M (C) $\frac{1}{15}$M (D) $\frac{1}{60}$M

CRX238

138. 25 ml acidified of $K_2Cr_2O_7$ solution is diluted to 200 ml. If 40 ml of the diluted solution exactly required 15 ml of 0.2 N - KI solution for titration, the normality of original $K_2Cr_2O_7$ solution is -
(A) 0.3 N (B) 0.2 N (C) 0.6 N (D) 0.1 N

CRX239

139. 35 ml of 1.5 M – H_2SO_4 solution is mixed with 50 ml of 0.6 M-NaOH solution. If the resulting solution exactly requires 75 ml of KOH solution for the neutralisation of excess acid, the molarity of KOH solution is -
(A) 0.5M (B) 0.75 M (C) 2.0 M (D) 1.0 M

CRX240

Eudiometry

140. 3 Litre mixture of C_2H_6 and C_3H_8 produce 8 litre CO_2 of complete combustion. Find the volume of C_2H_6 in mixture :-
(A) 2L (B) 1L (C) 1.5L (D) 2.5L

CSM126

141. 10 mL of gaseous hydrocarbon on combustion gives 40 mL of CO_2(g) and 50 mL of H_2O(vapour). The hydrocarbon is
(A) C_4H_5 (B) C_8H_{10} (C) C_4H_8 (D) C_4H_{10}

CSM127

142. When 20 ml of mixture of O_2 and O_3 is heated, the volume becomes 29 ml and disappears in alkaline pyrogallol solution. What are the volume percent of O_2 in the original mixture?
(A) 90% (B) 10% (C) 18% (D) 2%

CSM128

143. 20 mL of a mixture of CO and H_2 were mixed with excess of O_2 and exploded & cooled. There was a volume contraction of 23 mL. All volume measurements correspond to room temperature (27°C) and one atmospheric pressure. Determine the volume ratio V_1: V_2 of CO and H_2 in the original mixture

(A) 6.5 : 13.5 (B) 5 : 15 (C) 9 : 11 (D) 7 : 13

CSM129

144. An alkene upon combustion produces $CO_2(g)$ and $H_2O(g)$. In this combustion process if there is no volume change occurs then the no. of C atoms per molecule of alkene will be :

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

CSM130

MULTIPLE CORRECT TYPE QUESTIONS

Balancing of Redox Reaction

145. In the reaction, $xZn + yHNO_3(dil) \longrightarrow aZn(NO_3)_2 + bH_2O + cNH_4NO_3$, upon balancing with simplest whole number coefficients, select the correct option(s) :

(A) The sum of the coefficients (a + b + c) is 8.

(B) Whole of HNO_3 is reduced to $NH_4^{\oplus}$ in above reaction.

(C) Zn acts as reductant.

(D) HNO_3 acts as oxidant.

CRX260

146. For the reaction : $I^{\ominus} + ClO_3^{\ominus} + H_2SO_4 \longrightarrow Cl^{\ominus} + HSO_4^{\ominus} + I_2$

The correct statement(s) in the balanced equation is/are :

(A) Stoichiometric coefficient of $HSO_4^{\ominus}$ is 6. (B) Iodide is oxidized.

(C) Sulphur is reduced. (D) H_2O is one of the products.

CRX117

Equivalent Concept

147. Which of the following samples of reducing agents is/are chemically equivalent to 25 mL of 0.2 N $KMnO_4$ to be reduced to $Mn^{2\oplus}$ and water :

(A) 25 mL of 0.2 M $FeSO_4$ to be oxidized to $Fe^{3\oplus}$

(B) 50 mL of 0.1 M H_3AsO_3 to be oxidized to H_3AsO_4

(C) 25 mL of 0.1 M H_2O_2 to be oxidized to $H^{\oplus}$ and O_2

(D) 25 mL of 0.1 M $SnCl_2$ to be oxidized to $Sn^{4\oplus}$

CRX242

Mixing & Dilution

148. A dilute solution of H_2SO_4 is made by adding 5 mL of 3N H_2SO_4 to 245 mL of water. Find the normality and molarity of the diluted solution.

(A) Normality = 0.06 N (B) Molarity = 0.03 M

(C) Normality = 0.03 N (D) Molarity = 0.06 M

CRX232

Titration

149. 30 mL of solution containing 9.15 g of a salt $K_xH_y(C_2O_4)_z.nH_2O$ per litre required 27 mL of 0.12 N NaOH for neutralization. The same quantity of solution was also found to require 36 mL of 0.12 N $KMnO_4$ solution for complete oxidation. Calculate the value of x, y, z and n, considering them to be in simplest whole number ratio.

(A) x = 1 (B) y = 3 (C) z = 2 (D) n = 2

CRX243

MATRIX MATCH TYPE QUESTION

Oxidation Number

150. Match List-I (Compounds) with List-II (Oxidation states of Nitrogen) and select answer using the codes given below the lists :

List-I	**List-II**
(a) NaN_3	(1) +5
(b) N_2H_2	(2) +2
(c) NO	(3) –1/3
(d) N_2O_5	(4) –1

(A) (a)-3; (b)-4; (c)-2; (d)-1 (B) (a)-4; (b)-3; (c)-2; (d)-1

(C) (a)-3; (b)-4; (c)-1; (d)-2 (D) (a)-4; (b)-3; (c)-1; (d)-2

CRX108

EXERCISE - S

Oxidation Number

1. Calculate oxidation number of the underlined elements in the following compounds or ions

(a) $H_4\underline{P_2}O_7$ (b) $\underline{S_2}O_3^{2-}$ (c) $Ca\underline{O_2}$ (d) $\underline{Zn}O_2^{2-}$

(e) $\underline{Cr}O_2Cl_2$ (f) $Ca(\underline{Cl}O_2)_2$ (g) $\underline{C_3}O_2$ (h) $K\underline{I_3}$

(i) $\underline{Fe_3}O_4$ (j) $\underline{Br_3}O_8$ (k) $CaO\underline{Cl_2}$ (l) $\underline{O_2^+}$

(m) $\underline{O_2^-}$ (n) $\underline{C}N^-$

CRX264

2. Calculate oxidation number of the underlined elements in the following compounds or ions

(a) $K[\underline{Co}\ (C_2O_4)_2.(NH_3)_2]$ (b) $K\underline{Al}(\underline{S}O_4)_2.12H_2O$

(c) $[\underline{Fe}(CN)_6]^{4-}$ (d) $\underline{Fe_{0.93}}O$

(e) $H_2\underline{S_2}O_8$ (f) $\underline{Cr}O_{\underline{5}}$

(g) $H_2\underline{S}O_5$

CRX265

Oxidation Reduction

3. Classify each of the following unbalanced half–reactions as either an oxidation or a reduction :

(a) $O_2(g) \longrightarrow OH^-(aq)$ (b) $H_2O_2(aq) \longrightarrow O_2(g)$

(c) $MnO_4^-(aq) \longrightarrow MnO_4^{2-}(aq)$ (d) $CH_3OH(aq) \longrightarrow CH_2O(aq)$

(e) $MnO_2(s) \longrightarrow Mn_3O_4(s)$ (f) $FeO(s) \longrightarrow Fe_3O_4(s)$

(g) $CH_3COOH\ (aq.) \longrightarrow CH_3CH_2OH(aq)$

CRX266

4. Identify the oxidant (oxidising agent) and reductant (reducing agent) in the following reactions

(a) $Zn(s) + \frac{1}{2}O_2(g) \longrightarrow ZnO(s)$

(b) $Zn(s) + 2H^+(aq) \longrightarrow Zn^{2+}(aq) + H_2(g)$

(c) $10H^+(aq) + 4Zn(s) + NO_3^-(aq) \longrightarrow 4Zn^{2+}(aq) + NH_4^+(aq) + 3H_2O(l)$

(d) $2H_2S\ (aq) + SO_2(g) \rightarrow 3S(s) + 2H_2O\ (l)$

(e) $2MnO_4^-\ (aq) + 16H^+\ (aq) + 10\ Cl^-(aq.) \longrightarrow 2Mn^{2+}(aq.) + 8H_2O(l) + 5Cl_2(g)$

(f) $2MnO_4^-\ (aq) + 6H^+\ (aq) + 5H_2O_2(aq.) \longrightarrow 2Mn^{2+}(aq.) + 8H_2O(l) + 5O_2(g)$

CRX267

Balancing of Redox Reaction

5. Balance following half reaction in acidic medium

(i) $H_2S \rightarrow S$ (ii) $SO_3^{2\ominus} \rightarrow S^{2\ominus}$

(iii) $H_2O_2 \rightarrow O_2$ (iv) $Cl_2 \rightarrow Cl^{\ominus}$

(v) $MnO_4^{\ominus} + H^{\oplus} \rightarrow Mn^{2\oplus}$ (vi) $NH_3 \rightarrow NO$

(vii) $C_2O_4^{2\ominus} \rightarrow CO_2$ (viii) $S_2O_3^{2\ominus} \rightarrow S_4O_6^{2\ominus}$

(ix) $Cr_2O_7^{2\ominus} + H^{\oplus} \rightarrow Cr^{3\oplus}$ (x) $MnO_4^{\ominus} \rightarrow MnO_2$

CRX261

6. Balance the following redox reactions by oxidation number method :

(i) $N_2H_4(l) + ClO_3^{\ominus}(aq.) \longrightarrow NO(g) + Cl^{\ominus}(aq.)$ (Basic medium)

(ii) $Cl_2O_7(g) + H_2O_2(aq.) \longrightarrow ClO_2^{\ominus}(aq.) + O_2(g) + H^{\oplus}(aq.)$ (Acidic medium)

(iii) $Cr_2O_7^{2\ominus} + SO_3^{2\ominus} + H^{\oplus} \longrightarrow Cr^{3\oplus} + SO_4^{2\ominus} + H_2O$ (Acidic medium)

(iv) $MnO_4^{\ominus}(aq.) + Br^{\ominus}(aq.) + H_2O(l) \longrightarrow MnO_2(s) + BrO_3^{\ominus}(aq.) + OH^{\ominus}(aq.)$ (Basic medium)

(v) $H_2S(g) + Cl_2(g) \longrightarrow HCl(aq.) + S(s)$ (Acidic medium)

(vi) $Fe_3O_4(s) + Al(s) \longrightarrow Fe(s) + Al_2O_3(s)$

(vii) $I_2(s) + Na_2S_2O_3(aq.) \longrightarrow NaI(aq.) + Na_2S_4O_6(aq.)$

CRX262

7. Balance the following redox reactions by half-reaction method (Ion electron method):

(i) $Cr_2O_7^{2\ominus}(aq.) + Fe^{2\oplus}(aq.) + H^{\oplus}(aq.) \rightarrow Cr^{3\oplus}(aq.) + Fe^{3\oplus}(aq.) + H_2O(l)$

(ii) $XeO_6^{4\ominus}(aq.) + F^{\ominus}(aq.) + H^{\oplus}(aq.) \rightarrow XeO_3(g) + F_2(g) + H_2O(l)$

(iii) $CuSO_4 + KI \rightarrow Cu_2I_2 + K_2SO_4 + I_2$

(iv) $NO_3^{\ominus}(aq.) + Mg(s) + H_2O(l) \rightarrow Mg(OH)_2(s) + OH^{\ominus}(aq.) + NH_3(g)$

(v) $H_3PO_2(aq.) + AgNO_3(aq.) + H_2O(l) \rightarrow H_3PO_4(aq.) + Ag(s) + HNO_3(aq.)$

(vi) $Sn^{2\oplus} + Fe^{3\oplus} \rightarrow Sn^{4\oplus} + Fe^{2\oplus}$

(vii) $H_2SO_3(aq.) + Sn^{4\oplus}(aq.) + H_2O(l) \rightarrow Sn^{2\oplus}(aq.) + HSO_4^{\ominus} + H^{\oplus}(aq.)$

CRX263

Equivalent Concept

8. 1.12 litre dry chlorine gas at NTP was passed over a heated metal when 5.56 g of chloride of the metal was formed. What is the equivalent weight of the metal ?

CRX204

9. 0.98 g of the metal sulphate was dissolved in water and excess of barium chloride was added. The precipitated barium sulphate weighted 0.95 g. Calculate the equivalent weight of the metal.

CRX205

10. Find the n-factor of underlined species in the following non redox reaction.

(1) $NaOH + \underline{H_3PO_4} \longrightarrow NaH_2PO_4 + H_2O$

(2) $NaOH + \underline{H_2SO_4} \longrightarrow NaHSO_4 + H_2O$

(3) $\underline{Ca(OH)_2} + HCl \longrightarrow Ca(OH)Cl + H_2O$

(4) $\underline{Na_2CO_3} + HCl \longrightarrow NaHCO_3 + NaCl$

(5) $\underline{Na_2CO_3} + HCl \longrightarrow NaCl + H_2O + CO_2$

CRX268

11. What is the equivalent weight of HNO_3 in following reaction ?

$HNO_3 + H_2S \longrightarrow H_2O + NO + S$

CRX269

12. Find out the equivalent weight of the underlined species in the following reaction :

(i) $\underline{ClO_3^-} + Fe^{2+} + H^+ \longrightarrow Cl^- + Fe^{3+} + H_2O$

(ii) $CuO + \underline{NH_3} \longrightarrow Cu + N_2 + H_2O$

CRX270

13. Find out the n_{factor} of IO_3^- in the following disproportionation reaction.

$$I_2 \xrightarrow{OH^-} IO_3^- + I^-$$

CRX271

Mixing & Dilution

14. Find out the volume (L) of 98 % $\frac{w}{W}$ H_2SO_4 (density = 1.8 g/ml), must be diluted to prepare 12.6 litres of 2.0 M sulphuric acid solution.

CRX177

15. What volume (in ml) of 0.8 M $AlCl_3$ solution should be mixed with 50 ml of 0.2M $CaCl_2$ solution to get solution of chloride ion concentration equal to 0.6 M ?

CRX233

16. 500 ml of 2 M NaCl solution was mixed with 200 ml of 1/4 M NaCl solution. Calculate the molarity of NaCl in final solution.

CRX234

17. A solution containing 200 ml 0.5 M KCl is mixed with 50 ml 19 % $\frac{w}{V}$ $MgCl_2$ and resulting solution is diluted 8 times. Molarity of chloride ion is final solution is :

CRX235

18. A mixture containing equimolar amounts of $Ca(OH)_2$ and $Al(OH)_3$ requires 0.5 L of 4.0 M HCl to react with it completely. Total moles of the mixture is :

CRX272

19. When V ml of 2.2 M H_2SO_4 solution is mixed with 10 V ml of water, the volume contraction of 2% take place. Calculate the molarity of diluted solution ?

CRX273

POAC

20. A 5.00 gm sample of a natural gas, consisting of methane (CH_4), and ethylene, (C_2H_4) was burned in excess oxygen, yielding 44/3 gm of CO_2 and some H_2O as products. What mole percent of the sample was ethylene?

CRX187

21. 3 moles of S_8 was treated by a series of reagents so as to convert all of its S to H_2SO_4. Calculate weight of product.

CRX188

22. All carbon atom present in $KH_3(C_2O_4)2.2H_2O$ weighing 7.62 gm is converted to CO_2. How many gm of CO_2 were obtained. (K = 39)

CRX274

% Purity & % Yield

23. 245 gm of $KClO_3$ on heating yielded 64 gm O_2. Find % yield of reaction. (K = 39, Cl = 35.5)

CRX189

24. A 2000 gm sample of $CaCO_3$ is 80% pure. Find weight (in gm) of pure $CaCO_3$.

CRX190

25. An impure sample (having 60% purity) of $KClO_3$ contains 30 gm of pure $KClO_3$. Find weight of impure sample.

CRX191

Stoichiometry & Limiting Reagent

26. Potassium superoxide, KO_2, is used in rebreathing gas masks to generate oxygen :

$KO_2(s) + H_2O(l) \longrightarrow KOH(s) + O_2(g)$

If a reaction vessel contains 0.158 mol KO_2 and 0.10 mol H_2O, how many moles of O_2 can be produced ?

(Round of the answer to two decimal places)

CRX186

27. Nitric acid is manufactured by the Ostwald process, in which nitrogen dioxide reacts with water.

$3\ NO_2\ (g) + H_2O\ (l) \rightarrow 2\ HNO_3\ (aq) + NO\ (g)$

How many grams of nitrogen dioxide are required in this reaction to produce 25.2 gm HNO_3 ?

CRX275

28. What total volume, in litre at 627°C and 82.1 atm, could be formed by the decomposition of 16 gm of NH_4NO_3 ? Reaction : $2\ NH_4NO_3 \rightarrow 2N_2 + O_2 + 4H_2O(g)$. (R : 0.0821 atm L/mole-K)

CRX276

29. Calculate mass of phosphoric acid (in gm) required to obtain 53.4g pyrophosphoric acid.

$2H_3PO_4 \rightarrow H_4P_2O_7 + H_2O$

CRX277

30. Carbon reacts with chlorine to form CCl_4. 36 gm of carbon was mixed with 142 g of Cl_2. If ratio of mass of CCl_4 produced and the remaining mass of excess reactant is y : 1, then value of y is

CRX278

31. A chemist wants to prepare diborane (B_2H_6) by the reaction

$6\ LiH + 8BF_3 \longrightarrow 6Li\ BF_4 + B_2H_6$

If he starts with 2.0 moles each of LiH & BF_3. How many moles of B_2H_6 can be prepared.

CRX279

Degree of Dissociation

32. For the reaction, $CaCO_3(s) \rightarrow CaO(s) + CO_2(s)$, the degree of dissociation (α) is 0.40. Calculate the moles of CO_2 (g) formed from 5g of $CaCO_3$. (Given : Molar mass of $CaCO_3$ = 100 g/mol)

CRX217

33. In the reaction, $HI \rightarrow \frac{1}{2}H_2 + \frac{1}{2}I_2$, 0.1 mole of I_2 is formed form HI. Find the degree of dissociation of HI.

CRX218

Sequential & Parallel Reactions

34. How many grams H_2SO_4 can be obtained from 1320 g PbS as per reaction sequence ?

$2PbS + 3O_2 \longrightarrow 2PbO + 2SO_2$

$3SO_2 + 2HNO_3 + 2H_2O \longrightarrow 3H_2SO_4 + 2NO$

[At. mass : Pb = 208, S = 32]

CRX219

35. $A \longrightarrow 2B + C$

$3B \longrightarrow 2D$

Find moles of D produced if initially 3 moles of A are taken –

CRX220

36. $2A + 3B \longrightarrow 4C + D$
(excess)

$3C \longrightarrow 2E$

If in the above reaction 6 moles of E are produced, find moles of 'A' initially taken.

CRX221

37. Sulphur trioxide may be prepared by the following two reactions :

$S_8 + 8O_2(g) \rightarrow 8SO_2(g)$

$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

If amount of SO_3 will be produced from 1 mol of S_8 is w g, then value of w/100 is.

CRX222

38. When 80 g CH_4 is burnt, CO and CO_2 gases are formed in 1 : 4 mole ratio. If the mass of O_2 gas used in combustion is w g then find value of (w/100).

CRX223

Mixture Problems

39. 1.5 gm mixture of SiO_2 and Fe_2O_3 on very strong heating leave a residue weighing 1.46 gm. The reaction responsible for loss of weight is

$Fe_2O_3(s) \longrightarrow Fe_3O_4(s) + O_2(g)$

What is the percentage by mass of Fe_2O_3 in original sample.

CRX214

40. 19 gm mixture of $Na_2CO_3(s)$ and $NaHCO_3(s)$ on heating gives 2.2 gm CO_2 gas.
Find % $NaHCO_3$ (by mass) in mixture.

CRX215

41. A sample containing only $CaCO_3$ and $MgCO_3$ is ignited to CaO and MgO. The mixture of oxides produced weight exactly half as much as the original sample. Calculate the percentages of $CaCO_3$ (by mass) in the sample.

CRX216

Titration

42. How many millimoles of gaseous ammonia will be required to be passed into 30 cm^3 of 1 N H_2SO_4 solution to bring down the acid strength of the latter to 0.2 N ?

CRX244

43. 5 g of pyrolusite (impure MnO_2) were heated with conc. HCl and Cl_2 evolved was passed through excess of KI solution. The iodine liberated required 40 mL of N/10 hypo solution. Find the % of MnO_2 in the pyrolusite.

CRX245

44. 80 g of a sample of anhydrous $CuSO_4$ was dissolved in water and made to 250 mL. 25 mL of this solution after taking usual precaution was treated with a little excess of KI solution. A white ppt. of CuI and iodine was evolved. The iodine so evolved required 40 mL of 1 M hypo solution. What is the approximate purity of $CuSO_4$ sample ? [Take mol. wt. of $CuSO_4$ = 160 u]

CRX246

45. A 458 g sample containing Mn_3O_4 was dissolved and all manganese was converted to $Mn^{2\oplus}$. In the presence of fluoride ion, $Mn^{2\oplus}$ is titrated with 3 L of $KMnO_4$ solution (which was 1.25 N against oxalate in acidic medium), both reactants being converted to a complex of Mn(III), What was the % of Mn_3O_4 in the sample ?

CRX247

46. 1 g sample of $AgNO_3$ is dissolved in 50 mL of water. It is titrated with 50 mL of KI solution. The AgI precipitated is filtered off. Excess of KI in filtrate is titrated with M/10 KIO_3 in presence of 6M HCl till all $I^{\ominus}$ converted into ICI. It requires 50 mL of M/10 KIO_3 solution. 20 mL of the same stock solution of KI requires 30 mL of M/10 KIO_3 under similar conditions. Calculate % of $AgNO_3$ in sample. The reaction is :

$KIO_3 + 2KI + 6HCl \longrightarrow 3ICI + 3KCl + 3H_2O$

CRX248

47. Calculate volume (in L) of 0.4 M NaOH required to react with following mixture

HCl(1 mol) + H_2SO_4 (2 mol)

CRX280

48. How many litre of 0.1N HCl are required to react completely with 19 gm mixture of Na_2CO_3 and $NaHCO_3$ containing equimolar amount of these two ?

CRX281

49. H_3PO_4 is a tri basic acid and one of its salt is NaH_2PO_4. What volume (in ml) of 1 M NaOH solution should be added to 12 g of NaH_2PO_4 to convert it into Na_3PO_4 ?

CRX282

50. Metallic tin in the presence of HCl is oxidized by $K_2Cr_2O_7$ to stannic chloride, $SnCl_4$. What volume (in litre) of deci-normal dichromate solution would be reduced by 11.9 gm of tin [Sn = 119]

CRX283

51. Calculate the millimoles of Br_2 produced when 10 ml of 0.1 M BrO_3^- reacts with excess of Br^-.

CRX284

52. What volume (in ml) of 0.5 M-$Na_2S_2O_3$ solution will react completely with 12.7 gm iodine ?
(I = 127)

CRX285

53. 20 ml of 2M -H_2SO_4 solution is mixed with 30 ml of 3M - NaOH solution. Calculate the volume (in ml) of 4M-HCl solution needed to neutralise the resulting solution.

CRX286

54. 25 ml of 0.4 M -acidified $KMnO_4$ solution is treated with excess of KI solution. The liberated I_2 exactly requires 20 ml of $Na_2S_2O_3$ solution for titration. What is the molarity of $Na_2S_2O_3$ solution ?

CRX287

55. 4.00 gm NaOH is dissolved in 100 ml HCl solution and the solution is diluted to 500 ml. If 25 ml of the diluted solution exactly requires 10 ml of 0.02 M -Na_2CO_3 solution for titration, calculate the concentration of original HCl solution (in gm/litre).

CRX288

56. 12.7 gm I_2 is dissolved in 200 ml of 1.5 M - NaOH solution. Calculate the volume (in ml) of 0.8 M - HCl solution needed for complete neutralisation of excess NaOH. [I = 127]

CRX289

Eudiometry

57. If V mL of a gaseous hydrocarbon, after explosion with excess of oxygen, showed a contraction of 2.5 V mL and a further contraction of 2 V mL with caustic potash, Find the number of H-atom in 1 molecule of hydrocarbon.

CSM132

58. What volume (in ml) of $O_2(g)$ is needed for complete combustion of 40 ml ethane gas (C_2H_6) ?

CRX290

59. 10 ml of CO is mixed with 25 ml air having 20% O_2 by volume. What would be the final volume (in ml) if none of CO and O_2 is left after the reaction?

CRX291

60. Calculate the volume (in ml) of CO_2 evolved by the combustion of 50 ml of a mixture containing 40% C_2H_4 and 60% CH_4 (by volume)

CRX292

61. 10 moles of a mixture of CO (g) and $CH_4(g)$ was mixed with 22 moles of O_2 gas and subjected to sparking. Find the moles of gas absorbed when the residual gases are passed through alc. KOH.

CRX293

62. 60 ml of a mixture of nitrous oxide and nitric oxide was exploded with excess of hydrogen. If 38 ml of N_2 was formed, calculate % volume of no gas in the mixture.

CRX294

63. When 100 ml of a $O_2 - O_3$ mixture was passed through turpentine, there was reduction of volume by 20 ml. If 100 ml of such a mixture is heated, what will be the increase in volume (in ml)?

CRX295

64. A 20 ml mixture of C_2H_4 and C_2H_2 undergoes sparking in gas eudiometer with just sufficient amount of O_2 and shows contraction of 37.5 ml. The volume (in ml) of C_2H_2 in the mixture is.

CRX296

Hardness of water

65. A sample of hard water contains 324 ppm of $Ca(HCO_3)_2$. How many gm of CaO is needed to remove all bicarbonates from 100 L hard water ?

CRX297

66. 50 L of a water sample contains 7.3 gm $Mg(HCO_3)_2$. Calculate temporary hardness of the water in terms of ppm of $CaCO_3$.

CRX298

Concentration Terms

67. (a) Calculate number of milimoles of 4.9 g H_2SO_4

(b) 50 mL, 0.2 M NaOH is mixed with 20 mL, 0.1 M NaOH. Calculate number of milimoles of Na^+ in final solution.

(c) 3.65 g HCl, 9.80 g H_2SO_4 and 4.9 g H_3PO_4 are mixed together. Calculate the total milimoles of H^+ in the final solution.

(d) 10 mL, 0.1 M NaOH and 10 mL, 0.2 M $Ca(OH)_2$ are added to 80 mL water. Calculate final milimoles & molarity of $[OH^-]$ in final solution.

CRX299

68. Calculate the molarity of the following solutions :

(a) 4g of caustic (NaOH) soda is dissolved in 200 mL of the solution.

(b) 5.3 g of anhydrous sodium (Na_2CO_3) carbonate is dissolved in 100 mL of solution.

(c) 0.365 g of pure HCl gas is dissolved in 50 mL of solution.

CRX300

69. 15 g of methyl alcohol is present in 100 mL of solution. If density of solution is 0.90 g mL^{-1}, calculate the mass percentage of methyl alcohol in solution

CRX301

70. A 7.0 M solution of KOH in water contains 28% by mass of KOH. What is density of solution in gm/ml ? (K = 39)

CRX302

71. The concentration of $Ca(HCO_3)_2$ in a sample of hard water is 405 ppm. The density of water sample is 1.0 gm/ml. If the molarity of solution is $x \times 10^{-3}$ M then find x ?

CRX303

72. Calculate molality (m) of each ion present in the aqueous solution of 2M NH_4Cl assuming 100% dissociation according to reaction.

$NH_4Cl\ (aq) \longrightarrow NH_4^+\ (aq) + Cl^-\ (aq)$

Given : Density of solution = 3.107 gm / ml.

CRX304

73. Find out the volume (L) of 98% w/w H_2SO_4 (density = 1.8 gm/ ml), must be diluted to prepare 12.6 litres of 2.0 M sulphuric acid solution.

CRX305

74. 500 ml of a H_2O_2 solution on complete decomposition produces 2 moles of H_2O. Calculate the volume strength of H_2O_2 solution?

CRX306

75. The volume strength of 100 ml H_2O_2 solution which produce 5.6 litre of oxygen gas at 1 bar & 0°C.

CRX307

EXERCISE - JEE (Main) PYQ

1. 5 moles of AB_2 weigh 125×10^{-3} kg and 10 moles of A_2B_2 weigh 300×10^{-3} kg. The molar mass of A(M_A) and molar mass of B(M_B) in kg mol^{-1} are : **[JEE (Main) 2019]**

(1) $M_A = 50 \times 10^{-3}$ and $M_B = 25 \times 10^{-3}$ (2) $M_A = 25 \times 10^{-3}$ and $M_B = 50 \times 10^{-3}$

(3) $M_A = 5 \times 10^{-3}$ and $M_B = 10 \times 10^{-3}$ (4) $M_A = 10 \times 10^{-3}$ and $M_B = 5 \times 10^{-3}$

CRX034

2. An example of a disproportionation reaction is : **[JEE (Main) 2019]**

(1) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$ (2) $2MnO_4^{\ominus} + 10I^{\ominus} + 16H^{\oplus} \rightarrow 2Mn^{2\oplus} + 5I_2 + 8H_2O$

(3) $2CuBr \rightarrow CuBr_2 + Cu$ (4) $2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$

CRX035

3. 50 mL of 0.5 M oxalic acid is needed to neutralize 25 mL of sodium hydroxide solution. The amount of NaOH in 50 mL of the given sodium hydroxide solution is : **[JEE (Main) 2019]**

(1) 4 g (2) 2 g (3) 8 g (4) 1 g

CRX036

4. In order to oxidise a mixture one mole of each of FeC_2O_4, $Fe_2(C_2O_4)_3$, $FeSO_4$ and $Fe_2(SO_4)_3$ in acidic medium, the number of moles of $KMnO_4$ required is - **[JEE (Main) 2019]**

(1) 3 (2) 2 (3) 1 (4) 1.5

CRX037

5. The strength of an aqueous NaOH solution is most accurately determined by titrating :
(Note : consider that an appropriate indicator is used) **[JEE (Main) 2020]**

(1) Aq. NaOH in a volumetric flask and concentrated H_2SO_4 in a conical flask

(2) Aq. NaOH in a pipette and aqueous oxalic acid in a burette

(3) Aq. NaOH in a burette and concentrated H_2SO_4 in a conical flask

(4) Aq. NaOH in a burette and aqueous oxalic acid in a conical flask

CRX038

6. A 100 mL solution was made by adding 1.43 g of $Na_2CO_3 \cdot xH_2O$. The normality of the solution is 0.1 N. The value of x is _____.
(The atomic mass of Na is 23g/mol) :- **[JEE (Main) 2020]**

CRX039

7. The strengths of 5.6 volume hydrogen peroxide (of density 1 g/mL) in terms of mass percentage and molarity (M), respectively, are: **[JEE (Main) 2020]**
(Take molar mass of hydrogen peroxide as 34 g/mol)

(1) 1.7 and 0.25 (2) 1.7 and 0.5 (3) 0.85 and 0.5 (4) 0.85 and 0.25

CRX040

8. The formula of a gaseous hydrocarbon which requires 6 times of its own volume of O_2 for complete oxidation and produces 4 times its own volume of CO_2 is C_xH_y. The value of y is _____.

[JEE (Main) 2021]

CRX041

9. Complete combustion of 1.80 g of an oxygen containing compound ($C_xH_yO_z$) gave 2.64 g of CO_2 and 1.08 g of H_2O. The percentage of oxygen in the organic compound is: **[JEE (Main) 2021]**

(1) 51.63 (2) 63.53 (3) 53.33 (4) 50.33

CRX042

10. The density of NaOH solution is 1.2 g cm^{-3}. The molality of this solution is _____ m.
(Round off to the Nearest Integer)
[Use : Atomic masses : Na : 23.0 u O : 16.0 u, H : 1.0 u
Density of H_2O : 1.0 g cm^{-3}] **[JEE (Main) 2021]**

CRX043

11. An aqueous KCl solution of density 1.20 g mL^{-1} has a molality of 3.30 mol kg^{-1}. The molarity of the solution in mol L^{-1} is _____ (Nearest integer) **[JEE (Main) 2021]**
[Molar mass of KCl = 74.5]

CRX044

12. The molarity of the solution prepared by dissolving 6.3 g of oxalic acid ($H_2C_2O_4.2H_2O$) in 250 mL of water in mol L^{-1} is $x \times 10^{-2}$. The value of x is _____. (Nearest integer)
[Atomic mass : H : 1.0, C : 12.0, O : 16.0] **[JEE (Main) 2021]**

CRX045

13. Sodium oxide reacts with water to produce sodium hydroxide. 20.0 g of sodium oxide is dissolved in 500 mL of water. Neglecting the change in volume, the concentration of the resulting NaOH solution is _____ $\times 10^{-1}$ M. (Nearest integer)
[Atomic mass : Na = 23.0, O = 16.0, H = 1.0] **[JEE (Main) 2021]**

CRX046

14. If 80 g of copper sulphate $CuSO_4 \cdot 5H_2O$ is dissolved in deionised water to make 5 L of solution. The concentration of the copper sulphate solution is $x \times 10^{-3}$ mol L^{-1}. The value of x is _____.
[Atomic masses Cu : 63.54 u, S : 32 u, O : 16 u, H : 1 u] **[JEE (Main) 2021]**

CRX047

15. SO_2Cl_2 on reaction with excess of water results into acidic mixture
$SO_2Cl_2 + 2H_2O \rightarrow H_2SO_4 + 2HCl$
16 moles of NaOH is required for the complete neutralisation of the resultant acidic mixture. The number of moles of SO_2Cl_2 used is : **[JEE (Main) 2022]**

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

CRX048

16. Which of the given reactions is not an example of disproportionation reaction ? **[JEE (Main) 2022]**

(1) $2H_2O_2 \rightarrow 2H_2O + O_2$
(2) $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$
(3) $MnO_4^{\ominus} + 4H^{\oplus} + 3e^{\ominus} \rightarrow MnO_2 + 2H_2O$
(4) $3MnO_4^{2\ominus} + 4H^{\oplus} \rightarrow 2MnO_4^{\ominus} + MnO_2 + 2H_2O$

CRX049

17. 250 g solution of D-glucose in water contains 10.8% of carbon by weight. The molality of the solution is nearest to

(Given: Atomic Weights are H, 1u ; C, 12u ; O, 16u) **[JEE (Main) 2022]**

(1) 1.03 (2) 2.06 (3) 3.09 (4) 5.40

CRX050

18. An organic compound gives 0.220 g of CO_2 and 0.126 g of H_2O on complete combustion. If the % of carbon is 24 then the % hydrogen is _____ $\times 10^{-1}$. (Nearest integer) **[JEE (Main) 2023]**

CRX308

19. The density of a monobasic strong acid (Molar mass 24.2 g mol) is 1.21 kg L. The volume of its solution required for the complete neutralization of 25 mL of 0.24 M NaOH is_____$\times 10^{-2}$ mL (Nearest integer) **[JEE (Main) 2023]**

CRX309

20. 20 mL of calcium hydroxide was consumed when it was reacted with 10 mL of unknown solution of H_2SO_4. Also 20 mL standard solution of 0.5 M HCl containing 2 drops of phenolphthalein was titrated with calcium hydroxide the mixture showed pink colour when burette displayed the value of 35.5 mL whereas the burette showed 25.5 mL initially. The concentration of H_2SO_4 is _____ M (Nearest integer) **[JEE (Main) 2023]**

CRX310

EXERCISE - JEE (Advanced) PYQ

1. Dissolving 120 g of urea (mol. wt. 60) in 1000 g of water gave a solution of density 1.15 g/mL. The molarity of the solution is **[JEE (Advanced) 2011]**

(A) 1.78 M (B) 2.00 M (C) 2.05 M (D) 2.22 M

CRX069

2. 29.2 % (w/w) HCl stock solution has a density of 1.25 g mL^{-1}. The molecular weight of HCl is 36.5g mol^{-1}. The volume (mL) of stock solution required to prepare a 200 mL solution of 0.4 M HCl is. **[JEE (Advanced) 2012]**

CRX070

3. Which ordering of compounds is according to the decreasing order of the oxidation state of nitrogen- **[JEE (Advanced) 2012]**

(A) HNO_3, NO, NH_4Cl, N_2 (B) HNO_3, NO, N_2, NH_4Cl

(C) HNO_3, NH_4Cl, NO, N_2 (D) NO, HNO_3, NH_4Cl, N_2

CRX071

4. A compound **H_2X** with molar weight of 80 g is dissolved in a solvent having density of 0.4 g /ml, assuming no change in volume upon dissolution, the **molality** of a 3.2 molar solution is. **[JEE (Advanced) 2014]**

CRX072

5. For the reaction

$$I^{\ominus} + ClO_3^{\ominus} + H_2SO_4 \rightarrow Cl^{\ominus} + HSO_4^{\ominus} + I_2$$

The correct statement(s) in the balanced equation is / are : **[JEE (Advanced) 2014]**

(A) Stoichiometric coefficient of $HSO_4^{\ominus}$ is 6 (B) Iodide is oxidized

(C) Sulphur is reduced (D) H_2O is one of the products

CRX073

6. The mole fraction of a solute in a solution is 0.1. At 298 K, molarity of this solution is the same as its molality. Density of this solution at 298 K is 2.0 g cm^{-3}. The ratio of the molecular weights of the solute and solvent, $\left(\frac{MW_{solute}}{MW_{solvent}}\right)$, is **[JEE (Advanced) 2016]**

CRX074

7. In neutral or faintly alkaline solution, 8 moles permanganate anion quantitatively oxidize thiosulphate anions to produce X moles of a sulphur containing product. the magnitude of X is **[JEE (Advanced) 2016]**

CRX075

8. The order of the oxidation state of the phosphorus atom in H_3PO_2, H_3PO_4, H_3PO_3 and $H_4P_2O_6$ is **[JEE (Advanced) 2017]**

(A) $H_3PO_4 > H_4P_2O_6 > H_3PO_3 > H_3PO_2$ (B) $H_3PO_3 > H_3PO_2 > H_3PO_4 > H_4P_2O_6$

(C) $H_3PO_2 > H_3PO_3 > H_4P_2O_6 > H_3PO_4$ (D) $H_3PO_4 > H_3PO_2 > H_3PO_3 > H_4P_2O_6$

CRX076

9. The ammonia prepared by treating ammonium sulphate with calcium hydroxide is completely used by $NiCl_2.6H_2O$ to form a stable coordination compound. Assume that both the reactions are 100% complete. If 1584 g of ammonium sulphate and 952g of $NiCl_2.6H_2O$ are used in the preparation, the combined weight (in grams) of gypsum and the nickel-ammonia coordination compound thus produced is___.

(Atomic weights in g mol^{-1}: H = 1, N = 14, O = 16, S = 32, Cl = 35.5, Ca = 40, Ni = 59)

$(NH_4)_2SO_4 + Ca(OH)_2 \longrightarrow CaSO_4.2H_2O + 2NH_3$

$NiCl_2 \cdot 6H_2O + 6NH_3 \longrightarrow [Ni(NH_3)_6]Cl_2 + 6H_2O$ **[JEE (Advanced) 2018]**

CRX077

10. Galena (an ore) is partially oxidized by passing air through it at high temperature. After some time, the passage of air is stopped, but the heating is continued in a closed furnace such that the contents undergo self-reduction. The weight (in kg) of Pb produced per kg of O_2 consumed is _____ . (Atomic weights in g mol^{-1} : O = 16, S = 32, Pb = 207) **[JEE (Advanced) 2018]**

CRX078

11. To measure the quantity of $MnCl_2$ dissolved in an aqueous solution, it was completely converted to $KMnO_4$ using the reaction,

$MnCl_2 + K_2S_2O_8 + H_2O \rightarrow KMnO_4 + H_2SO_4 + HCl$ (equation not balanced).

Few drops of concentrated HCl were added to this solution and gently warmed. Further, oxalic acid (225 mg) was added in portions till the colour of the permanganate ion disappeared. The quantity of $MnCl_2$ (in mg) present in the initial solution is _____. **[JEE (Advanced) 2018]**

(Atomic weights in g mol^{-1} : Mn = 55, Cl = 35.5)

CRX079

12. The amount of water produced (in g) in the oxidation of 1 mole of rhombic sulphur by conc.HNO_3 to a compound with the highest oxidation state of sulphur is ___

(Given data : Molar mass of water = 18 g mol^{-1}) **[JEE (Advanced) 2019]**

CRX080

13. The mole fraction of urea in an aqueous urea solution containing 900 g of water is 0.05. If the density of the solution is 1.2 g cm^{-3}, the molarity of urea solution is _____

(Given data : Molar masses of urea and water are 60 g mol^{-1} and 18 g mol^{-1}, respectively)

[JEE (Advanced) 2019]

CRX081

14. 5.00 mL of 0.10 M oxalic acid solution taken in a conical flask is titrated against NaOH from a burette using phenolphthalein indicator. The volume of NaOH required for the appearance of permanent faint pink color is tabulated below for five experiments. What is the concentration, in molarity, of the NaOH solution ? **[JEE (Advanced) 2020]**

Exp. No.	Vol. of NaOH (ml)
1	12.5
2	10.5
3	9
4	9
5	9

CRX082

15. In the chemical reaction between stoichiometric quantities of $KMnO_4$ and KI in weakly basic solution, what is the number of moles of I_2 released for 4 moles of $KMnO_4$ consumed?

[JEE (Advanced) 2020]

CRX083

Question Stem for Question Nos. 16 and 17

Question Stem

A sample (5.6 g) containing iron is completely dissolved in cold dilute HCl to prepare a 250 mL of solution. Titration of 25.0 mL of this solution requires 12.5 mL of 0.03 M $KMnO_4$ solution to reach the end point. Number of moles of $Fe^{2\oplus}$ present in 250 mL solution is $x \times 10^{-2}$ (consider complete dissolution of $FeCl_2$). The amount of iron present in the sample is y% by weight.

(Assume : $KMnO_4$ reacts only with $Fe^{2\oplus}$ in the solution

Use : Molar mass of iron as 56 g mol^{-1})

16. The value of **x** is _____.

[JEE (Advanced) 2021]

CRX084

17. The value of **y** is _____.

[JEE (Advanced) 2021]

CRX085

18. Dissolving 1.24 g of white phosphorous in boiling NaOH solution in an inert atmosphere gives a gas **Q**. The amount of $CuSO_4$ (in g) required to completely consume the gas **Q** is _____.

[Given : Atomic mass of H = 1, O = 16, Na = 23, P = 31, S = 32, Cu = 63]

[JEE (Advanced) 2022]

CRX311

19. The stoichiometric reaction of 516 g of dimethyldichlorosilane with water results in a tetrameric cyclic product **X** in 75% yield. The weight (in g) of **X** obtained is___.

[Use, molar mass (g mol^{-1}): H = 1, C = 12, O = 16, Si = 28, Cl = 35.5]

[JEE (Advanced) 2023]

CRX312

20. H_2S (5 moles) reacts completely with acidified aqueous potassium permanganate solution. In this reaction, the number of moles of water produced is **x**, and the number of moles of electrons involved is **y**. The value of (**x** + **y**) is ___.

[JEE (Advanced) 2023]

CRX313

JEE (Main) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION–A

- This section contains **TWENTY** questions.
- Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +4, if only the bubble corresponding to the correct option is darkened.
Zero Marks : 0, if none of the bubbles is darkened.
Negative Marks : –1 in all other cases

1. Amongst the following, the pair having both the metals in their highest oxidation state is :

(1) $[Fe(CN)_6]^{3\ominus}$ and $[Co(CN)_6]^{3\ominus}$ (2) CrO_2Cl_2 and $MnO_4^{\ominus}$

(3) TiO_2 and MnO_2 (4) $[MnCl_4]^{2\ominus}$ and $[NiF_6]^{2\ominus}$

CRX001

2. In which of the following reactions H_2O_2 acts as a reducing agent ?

(A) $H_2O_2 + 2H^{\oplus} + 2e^{\ominus} \longrightarrow 2H_2O$

(B) $H_2O_2 - 2e^{\ominus} \longrightarrow O_2 + 2H^{\oplus}$

(C) $H_2O_2 + 2e^{\ominus} \longrightarrow 2OH^{\ominus}$

(D) $H_2O_2 + 2OH^{\ominus} - 2e^{\ominus} \longrightarrow O_2 + 2H_2O$

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

CRX002

3. Which of the following statements is incorrect :

(1) 0.2 moles of $KMnO_4$ will oxidise one mole of ferrous ions to ferric ions in acidic medium.

(2) 1.5 moles of $KMnO_4$ will oxidise 1 mole of ferrous oxalate to one mole of ferric ion and carbon dioxide in acidic medium in acidic medium.

(3) 0.6 moles of $KMnO_4$ will oxidise 1 mole of ferrous oxalate to one mole of ferric ion and carbon dioxide in acidic medium.

(4) 1 mole of $K_2Cr_2O_7$ will oxidise 2 moles of ferrous oxalate to ferric ions and carbon dioxide in acidic medium.

CRX003

4. The normality of mixture obtained by mixing 100 mL of 0.2 M H_2SO_4 and 200 mL of 0.2 M HCl is:

(1) 0.0267 (2) 0.2670 (3) 1.0267 (4) 1.1670

CRX004

5. Mixture of $MgCO_3$ & $NaHCO_3$ on strong heating gives CO_2 & H_2O in 3 : 1 mole ratio. The weight % of $NaHCO_3$ present in the mixture is:

(1) 30% (2) 80% (3) 40% (4) 50%

CRX005

6. What is the equivalent weight of H_2SO_4 in the reaction ?

$H_2SO_4 + NaI \rightarrow Na_2SO_4 + I_2 + H_2S + H_2O$

(1) 12.25 (2) 49 (3) 61.25 (4) 98.00

CRX006

7. What will happen if the solution of potassium chromate reacts with excess amount of nitric acid:

(1) Cr reduces in the oxidation state +3 from $CrO_4^{2\ominus}$.

(2) Cr oxidises in the oxidation state +7 from $CrO_4^{2\ominus}$.

(3) $Cr^{3\oplus}$ and $Cr_2O_7^{2\ominus}$ will be formed.

(4) $Cr_2O_7^{2\ominus}$ and H_2O will be formed.

CRX007

8. 100 millimoles of dichloroacetic acid ($CHCl_2COOH$) can neutralize how many moles of ammonia to form ammonium dichloroacetate :

(1) 0.0167 (2) 0.1 (3) 0.3 (4) 0.6

CRX008

9. The minimum mass of mixture of A_2 and B_4 required to produce at least 1 kg of each product is :
(Given At. mass of 'A' = 10 ; At. mass of 'B' = 120)

$5A_2 + 2B_4 \longrightarrow 2AB_2 + 4A_2B$

(1) 2120 gm (2) 1060 gm (3) 560 gm (4) 1660 gm

CRX009

10. An ideal gaseous mixture of ethane (C_2H_6) and ethene (C_2H_4) occupies 28 litre at 1atm, 0°C. The mixture reacts completely with 128 gm O_2 to produce CO_2 and H_2O. Mole fraction of C_2H_6 in the mixture is–

(1) 0.6 (2) 0.4 (3) 0.5 (4) 0.8

CRX010

11. Equal masses of $KClO_3$ undergoes different reaction in two different container :

(i) $2KClO_3 \longrightarrow 2KCl + 3O_2$

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

Mass ratio of the KCl produced in respective reaction is x : 1. Value of '**x**' will be.

(1) 4 (2) 2 (3) 0.25 (4) 3

CRX011

12. The vapour density of sample of partially decomposed cyclobutane (C_4H_8) gas is 20. The degree of dissociation of C_4H_8 into C_2H_4 gas is -

(1) 0.25 (2) 0.50 (3) 0.60 (4) 0.40

CRX012

13. The density of a sample of SO_3 gas is 2.5 g/L at 0°C and 1 atm. It's degree of dissociation into SO_2 and O_2 gases is -

(1) $\frac{6}{7}$ (2) $\frac{1}{7}$ (3) $\frac{3}{7}$ (4) $\frac{5}{7}$

CRX013

14. Polyethene can be prepared by CaC_2 by the following sequence of reactions.

$CaC_2 + H_2O \rightarrow CaO + C_2H_2$

$C_2H_2 + H_2 \rightarrow C_2H_4$

$nC_2H_4 \rightarrow (C_2H_4)_n$

(Polyethene)

The mass in kg of polyethene that can be prepared by 20 kg CaC_2.

(1) 4.1 kg (2) 8.75 kg (3) 3.78 kg (4) 10 kg

CRX014

15. Assuming complete precipitation of AgCl, calculate the sum of the molar concentration of all the ions if 2 lit of 2M Ag_2SO_4 is mixed with 4 lit of 1 M NaCl solution is :
(1) 4M (2) 2M (3) 3 M (4) 2.5 M

CRX015

16. Equal weight of NaCl and KCl are dissolved separately in equal volumes of solutions. Molarity of the solutions will be –
(1) Equal (2) Greater for NaCl (3) Greater for KCl (4) Uncomparable.

CRX016

17. The relationship between mole fraction (X_A) of the solute & molality 'm' of its solution in ammonia would be
(1) $\frac{55.56(X_A)}{1-X_A}$=m (2) $\frac{58.82(X_A)}{1-X_A}$ = m (3) $\frac{58.82(1-X_A)}{X_A}$=m (4) $\frac{55.56(1-X_A)}{X_A}$=m

CRX017

18. The concentrated sulphuric acid that is peddled commercially is 95% H_2SO_4 by weight. If the density of this commercial acid is 1.834 g cm^{-3}, the molarity of this solution is :-
(1) 17.8 M (2) 15.7 M (3) 10.5 M (4) 12.0 M

CRX018

19. x mmol of XeF_4 quantitatively oxidized KI to I_2 and liberated Xe, alongwith formation of KF. This iodine required 20 ml of decinormal hypo solution for exact titration. The value of x is
(1) 0.5 (2) 1.0 (3) 2.0 (4) 5.0

CRX019

20. Equal volumes of 10% (w/v) of HCl is mixed with 10% (w/v) NaOH solution. The resultant solution be.
(1) Basic (2) Neutral (3) Acidic (4) Can't be predicted.

CRX020

SECTION-B

- This section will have **TEN questions**. Candidate can choose to attempt any 5 questions out of these 10 questions. In case if candidate attempts more than 5 questions, first 5 attempted questions will be considered for marking.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value (Answer should be rounded off to the nearest integer).
- Answer to each question will be evaluated according to the following marking scheme:

  Full Marks : +4, if only correct answer is given.
  Zero Marks : 0, if no answer is given.
  Negative Marks :-1 for incorrect answer

---

1. A 3 mole mixture of $FeSO_4$ and $Fe_2(SO_4)_3$ required 100 mL of 2M $KMnO_4$ solution in acidic medium. Find the mole of $FeSO_4$ in the mixture.

CRX021

2. A solution of $Na_2S_2O_3$ is standardised iodometrically against 3.34 g of pure $KBrO_3$ (converted to $Br^{\ominus}$), requiring 40 mL $Na_2S_2O_3$ solution. What is the molarity of $Na_2S_2O_3$ solution ? (molar mass of $KBrO_3$ = 167 g mol^{-1})

CRX022

3. One liter of a sample of hard water contains 11.1 mg of $CaCl_2$ & 9.5 mg of $MgCl_2$. What is degree of hardness in terms of ppm of $CaCO_3$?

CRX023

4. Units of parts per million (ppm) or per billion (ppb) are often used to describe the concentrations of solutes in very dilute solutions. The units are defined as the number of grams of solute per million or per billion grams of solvent. Bay of Bengal has 2.1 ppm of lithium ions. If the molality of $Li^{\oplus}$ is $x \times 10^{-4}$ m, then find x. (Li = 7)

CRX024

5. The concentration of a solution is 8% (w/w) and 10% (w/v). If density (in gm/mℓ) of solution is x find the value of 100 x ?

CRX025

6. How much $BaCl_2$ (in gm) would be needed to make 250 ml of a solution having the same concentration of $Cl^{\ominus}$ as one containing 1.825 gm HCl per 100 ml ? (Ba = 137)

CRX026

7. 500 gm of urea solution of mole fraction 0.2 is diluted to 1500 gm. The mole fraction of solute in the diluted solution is $p \times 10^{-2}$. Find p ?

CRX027

8. A sample of mixture of $CaCl_2$ and NaCl weighing 2.22 gm was treated to precipitate all the Ca as $CaCO_3$ which was then heated and quantitatively converted to 0.84 gm of CaO. Mass fraction of $CaCl_2$ in the mixture is $X \times 10^{-2}$. Find X ?

CRX028

9. If the yield of chloroform obtainable from acetone and bleaching powder is 58%. The weight of acetone (in gm) required for producing 239 mg of chloroform is $X \times 10^{-1}$. Find X ?

$2CH_3COCH_3 + 6CaOCl_2 \rightarrow Ca(CH_3COO)_2 + 2CHCl_3 + 3CaCl_2 + 2Ca(OH)_2$

CRX029

10. In a determination of P, an aqueous solution of NaH_2PO_4 is treated with a mixture of ammonium and magnesium ions to precipitate magnesium ammonium phosphate $Mg(NH_4)PO_4.\ 6H_2O$. This is heated and decomposed to magnesium pyrophosphate, $Mg_2P_2O_7$ which is weighed. A solution of NaH_2PO_4 yielded 1.11 g of $Mg_2P_2O_7$. What weight of NaH_2PO_4 (in gm) was present originally ? (P = 31)
(Give your answer in nearest integer)

CRX030

JEE (Advanced) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION–I

- This section contains **EIGHT** questions.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the second decimal place; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct).
- Answer to each question will be evaluated according to the following marking scheme:

  Full Marks : +3, if ONLY the correct numerical value is entered as answer.

  Zero Marks : 0, in all other cases.

---

1. A sample of iron ore, weighing 0.700g, is dissolved in nitric acid. The solution is then diluted with water, following with sufficient concentrated aqueous ammonia, to quantitative precipitation the iron as $Fe(OH)_3$. The precipitate is filtered, ignited and weighed as Fe_2O_3. If the mass of the ignited and dried precipitate is 0.541g, what is the mass percent of iron in the original iron ore sample (Fe = 56)

CRX051

2. 500 ml of 0.90M CH_3COOH solution is mixed with 600 ml 12% w/v CH_3COOH solution then calculate the final molarity of solution.

CRX052

3. How much minimum volume (in L) of $\left(\frac{5}{51}\right)$ M aluminium sulphate solution should be added to excess calcium nitrate to obtain atleast 1 gm of each salt in the reaction.

$Al_2(SO_4)_3 + 3Ca(NO_3)_2 \longrightarrow 2Al(NO_3)_3 + 3CaSO_4$

CRX053

4. 60 ml of a **"x"** % w/w alcohol by weight (d = 0.6 g/cm^3) must be used to prepare 200 cm^3 of 12% alcohol by weight (d = 0.90 g/cm^3). Calculate the mass of alcohol (in gm) in original sample.

CRX054

5. Determine the volume (in L) of diluted nitric acid (d = 1.11 g mL^{-1}, 20% w/v HNO_3) that can be prepared by diluting 50 mL of conc. HNO_3 with water (d =1.42 g mL^{-1}, 70% w /v).

CRX055

6. A sample containing 4.2g of KOH and $Ca(OH)_2$ is neutralized by an acid. It consumes 0.1 equivalent of acid. Calculate the mass percentage of KOH in the sample. (K = 39)

CRX056

7. 520 gm mixture of Fe_2O_3 and FeO reacts completely with 158 gm $KMnO_4$ in acidic medium Calculate the mole % of Fe_2O_3 in mixture. [Fe = 56, K = 39, Mn = 55]

CRX057

8. 50 ml of 0.02 M -acidified $KMnO_4$ solution is mixed with 40 ml of KI solution. If the resulting solution requires 20 ml of 0.1 M-$K_2Cr_2O_7$ solution for titration of excess KI, calculate the molarity of KI solution.

CRX058

SECTION–II

- This section contains **SIX** questions.
- In this section question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+4, if only (all) the correct option(s) is (are) chosen.
Partial Marks	:	+3, if all the four options are correct but ONLY three options are chosen.
Partial Marks	:	+2, if three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks	:	+1, if two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks	:	0, if none of the options is chosen (i.e. the question is unanswered).
Negative Marks	:	–2 in all other cases.

---

9. 50 gm of $CaCO_3$ is allowed to react with 68.6 gm of H_3PO_4 then select the correct option(s)-

$3CaCO_3 + 2H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 3H_2O + 3CO_2$

(A) 51.67 gm salt is formed
(B) Amount of unreacted reagent = 35.93 gm
(C) formed = 0.5 moles
(D) formed = 0.7 mole

CRX059

10. Given

$2ZnS + 3O_2 \xrightarrow{80\%} 2ZnO + 2SO_2$

$ZnO + H_2SO_4 \xrightarrow{75\%} ZnSO_4 + H_2O$

$2ZnSO_4 + 2H_2O \xrightarrow{50\%} 2Zn + 2H_2SO_4 + O_2$

If 15 mol of ZnS reacts with excess of reactants then which of the following statement(s) is/are correct?

(A) 15 mol of Zn formed
(B) 2.25 mol of O_2 gas released
(C) 18 mol of H_2SO_4 formed
(D) 9 mol of $ZnSO_4$ formed

CRX060

11. The molar concentration of HCl (aq.) is 10^{-5} M. Which of the following statements are correct.
($d_{solution}$ = 1 gm /cc)

(A) The mole fraction of HCl $\cong 1.8 \times 10^{-7}$
(B) The concentration of HCl in ppm is 3.65 ppm
(C) The molality of HCl solution is approximately 10^{-5} m
(D) The (w/v)% of solution is 3.65×10^{-5} %

CRX061

12. 100 mL of 0.06 M $Ca(NO_3)_2$ is added to 50 mL of 0.06 M $Na_2C_2O_4$. After the reaction is complete (CaC_2O_4 is precipitated)

(A) 0.003 moles of calcium oxalate will get precipitated

(B) 0.003 M $Ca^{2\oplus}$ will remain in excess

(C) $Na_2C_2O_4$ is the limiting reagent

(D) Oxalate ion ($C_2O_4^{2\ominus}$) concentration in final solution is 0.003 M

CRX062

13. 0.2 mole of Cl_2 is reacted with 500 ml of 1.2 M - NaOH solution

$Cl_2 + OH^{\ominus} \rightarrow ClO_3^{\ominus} + Cl^{\ominus} + H_2O$

The incorrect information(s) related is/are -

(A) Cl_2 is limiting reagent

(B) 0.4 mole NaOH will left unreacted

(C) $[ClO_3^{\ominus}]_{\text{final solution}} = 0.133$ M

(D) $[Cl^{\ominus}]_{\text{final solution}} = 0.267$ M

CRX063

14. 100 ml of 0.4 M -acidified $KMnO_4$ solution may be decolourised completely by

(A) 200 ml 1N - $K_2Cr_2O_7$ solution

(B) 300 ml 0.5M - H_2O_2 solution

(C) 100 ml 0.8N - KI solution

(D) 75 ml 1.4 N - $H_2C_2O_4$ solution

CRX064

SECTION–III

- This section contains **FOUR** questions.
- Each question contains two columns, **Column-I** and **Column-II.**
- **Column-I** has **four** entries (A), (B), (C) and (D).
- **Column-II** has **five** entries (P), (Q), (R), (S) and (T).
- Match the entries in **Column-I** with the entries in **column-II.**
- One or more entries in **Column-I** may match with one or more entries in **Column-II.**
- The ORS contains a 4 × 5 matrix whose layout will be similar to the one shown below:

(A) (P) (Q) (R) (S) (T)

(B) (P) (Q) (R) (S) (T)

(C) (P) (Q) (R) (S) (T)

(D) (P) (Q) (R) (S) (T)

- For each entry in **column-I,** darken the bubbles of all the matching entries. For example, if entry (A) in **Column-I** matches with entries (Q), (R) and (T), then darken these three bubbles in the ORS. Similarly, for entries (B), (C) and (D).
- For each question, marks will be awarded in <u>one of the following categories</u> :

For each entry in **Column-I**

Full Marks : +2 if only the bubble(s) corresponding to all the correct match(es) is (are) darkened.

Zero Marks : 0 if none of the bubbles is darkened.

Negative Marks : –1 in all other cases.

15. Match the column-

Column-I	**Column-II (Mass of product)**
(P) $2H_2 + O_2 \rightarrow 2H_2O$ 1g 1g	(1) 1.028 g
(Q) $3H_2 + N_2 \rightarrow 2NH_3$ 1g 1g	(2) 1.333 g
(R) $H_2 + Cl_2 \rightarrow 2HCl$ 1g 1g	(3) 1.125 g
(S) $2H_2 + C \rightarrow CH_4$ 1g 1g	(4) 1.214 g

(A) P-3; Q-4; R-1; S-2
(B) P-2; Q-4; R-1; S-3
(C) P-4; Q-3; R-1; S-2
(D) P-2; Q-3; R-1; S-4

CRX065

16. Match the column-

Column-I (Concentration of aqueous solution)	**Column-II (Density of given solutions is 1.2 g/ml)**
(A) 2M NaOH solution	(P) 16gm solute in 240gm solution
(B) $8\%\left(\frac{w}{V}\right)$ KOH solution	(Q) 60gm solute in 240 gm solution
(C) $25\%\left(\frac{w}{W}\right)$ $CaCO_3$ solution	(R) 8gm solute in 100 ml solution
(D) $X_{C_3H_7OH} = \frac{1}{11}$	(S) 30 gm solute in 100 ml solution
	(T) 1 mole solute in 400 gm solution

(A) A-P,R; B-P,R; C-Q,S,T; D-S,Q
(B) A-P,S; B-R,S; C-Q,S,T; D-P,S
(C) A-P,T; B-S,T; C- S,T; D-S,Q
(D) A-R,S; B-P,S; C-Q,T; D-Q,R

CRX066

17. Match the column-

Column-I	**Column-II**
(A) 120 g CH_3COOH in 1 L solution (d_{sol} = 1.2 g/mL)	(P) M = 2
(B) 120 g glucose dissolved in 1 L solution (d_{sol} = 1.2 g/mL)	(Q) 10% w/w solution
(C) $X_{NH_2CONH_2}$ = 1/31 (aqueous solution)	(R) 12% w/v solution
(D) 19.6% (w/v) H_2SO_4 solution → ($d_{solution}$ = 1.2 g/mL)	(S) m = 1.85
	(T) m = 0.617

(A) A→P,S; B→P,R,S; C→Q,S,T; D→P,S
(B) A→R,S,T; B→R,S,T; C→S,T; D→S,Q
(C) A→P,Q,R,S; B→Q,R,T; C→Q,S; D→P
(D) A→P,R,S; B→P,S; C→Q,T; D→Q,R

CRX067

18. Match the column-

Column-I	**Column-II**
(A) $\underline{P_2H_4} \longrightarrow PH_3 + P_4H_2$	(p) E = $\frac{3M}{4}$
(B) $\underline{I_2} \longrightarrow I^{\ominus} + IO_3^{\ominus}$	(q) E = $\frac{3M}{5}$
(C) $MnO_4^{\ominus} + \underline{Mn^{2\oplus}} + H_2O \longrightarrow Mn_3O_4 + H^{\oplus}$	(r) E = $\frac{15M}{26}$
(D) $\underline{H_3PO_2} \longrightarrow PH_3 + H_3PO_3$	(s) E = $\frac{5M}{6}$

(A) A-r; B-q; C-r; d-s
(B) A-s; B-q; C-r; d-p
(C) A-p; B-q; C-r; d-s
(D) A-s; B-p; C-q; d-r

CRX068

ANSWER KEY

EXERCISE - O

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	B	C	C	A	C	D	B	D	D
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	D	D	C	D	B	C	B	B	D
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	C	D	D	D	C	A	A	A	D	B
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	C	D	C	A	C	A	B	B	A	A
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	D	B	B	D	D	C	B	A	D	C
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	C	C	C	B	B	B	A	D	C	D
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	D	C	D	A	D	B	B	D	B	B
Que.	71	72	73	74	75	76	77	78	79	80
Ans.	D	A	C	A	B	C	C	B	B	B
Que.	81	82	83	84	85	86	87	88	89	90
Ans.	A	A	A	C	D	C	A	B	C	D
Que.	91	92	93	94	95	96	97	98	99	100
Ans.	D	C	D	D	C	C	B	B	C	D
Que.	101	102	103	104	105	106	107	108	109	110
Ans.	B	A	B	B	D	C	C	D	A	C
Que.	111	112	113	114	115	116	117	118	119	120
Ans.	B	D	C	B	C	D	A	C	D	D
Que.	121	122	123	124	125	126	127	128	129	130
Ans.	C	A	C	B	D	D	B	B	D	D
Que.	131	132	133	134	135	136	137	138	139	140
Ans.	A	B	B	A	C	A	B	C	D	B
Que.	141	142	143	144	145	146	147	148	149	150
Ans.	D	B	D	A	ACD	ABD	ACD	AB	ABCD	A

EXERCISE - S

1. (a) +5 (b) +2 (c) –1 (d) +2
(e) +6 (f) +3 (g) +4/3 (h) –1/3
(i) +8/3 (j) +16/3 (k) 0 (l) +1/2
(m) –1/2 (n) +2

2. (a) +3 (b) +3, +6 (c) +2 (d) $+\frac{200}{93}$
(e) +6 (f) +6 (g) +6

3. (a) Reduction (b) Oxidation (c) Reduction (d) Oxidation
(e) Reduction (f) Oxidation (g) Reduction

4. (a) Oxidant : O_2 ; Reductant : Zn (b) Oxidant : H^+ ; Reductant : Zn
(c) Oxidant : NO_3^- ; Reductant : Zn (d) Oxidant : SO_2 ; Reductant : H_2S
(e) Oxidant : MnO_4^- ; Reductant : Cl^- (f) Oxidant : MnO_4^- ; Reductant : H_2O_2

5. Theoretical **6.** Theoretical **7.** Theoretical **8.** 20.1 **9.** 72.61
10. (1) 1 (2) 1 (3) 1 (4) 1 (5) 2
11. (21)
12. (i) 13.91 or 13.92 (ii) 5.66 or 5.67
13. (5) **14.** (1.4) **15.** (5.55 or 5.56) **16.** (1.5)
17. (0.15) **18.** (0.80) **19.** (0.20) **20.** (33.33)
21. (2352) **22.** (5.28) **23.** (66.67) **24.** (1600)
25. (50) **26.** (0.12) **27.** (27.60) **28.** (0.63)
29. (58.80) **30.** (6.41 or 6.42) **31.** (0.25) **32.** (0.02)
33. (0.2) **34.** (539) **35.** (4) **36.** (4.5)
37. (6.40) **38.** (3.04) **39.** (80) **40.** (44.21)
41. (28.4) **42.** (24) **43.** (3.48) **44.** (80)
45. (50) **46.** (85) **47.** (12.50) **48.** (3)
49. (200) **50.** (4) **51.** (3) **52.** (200)
53. (2.50) **54.** (2.50) **55.** (39.42) **56.** (250)
57. (6) **58.** (140) **59.** (30) **60.** (70)
61. (10) **62.** (73.33) **63.** (10) **64.** (5)
65. (11.20) **66.** (100)
67. (a) 50 milimoles (b) 12 milimoles (c) 450 milimoles (d) 5 milimoles, 0.05 M
68. (a) 0.50 M, (b) 0.50 M (c) 0.20 M
69. (16.66 or 16.67) **70.** (1.40) **71.** (2.50) **72.** (0.66 or 0.67)
73. (1.40) **74.** (45.40 V) **75.** (56.00 V)

EXERCISE - JEE (Main) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	3	1	2	4	10	2	8	3	5
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	3	20	13	64	3	3	2	56	12	1

EXERCISE - JEE (Advanced) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	8	B	8	ABD	9	6	A	2992	6.47
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	126	288	2.98	0.11	6	1.875	18.75	2.38/2.39	222	18

JEE (Main) Practice Paper

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	2	4	2	2	4	3	4	2	1	2
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	1	4	1	2	2	2	2	1	1	3
Section-B	Q.	1	2	3	4	5	6	7	8	9	10
	A.	1	3	20	3	125	13	5	75	2	1

JEE (Advanced) Practice Paper

Section-I	Q.	1	2	3	4	5	6	7	8
	A.	54	1.50	0.02	21.60	0.17 or 0.18	35	16.67	0.42
Section-II	Q.	9	10	11	12	13	14		
	A.	ABC	BD	ACD	AC	BD	B		
Section-III	Q.	15	16	17	18				
	A.	A	A	C	B				

Important Notes