SOME BASIC CONCEPTS OF CHEMISTRY

CHEMISTRY

Single Correct Answer Type

1. Weight of oxygen in one mole each of Fe_2O_3 and FeO is in the simple ratio of:
a) 3 : 2 b) 1 : 2 c) 2 : 1 d) 3 : 1

2. Equivalent weight of a bivalent metal is 37.2. The molecular weight of its chloride is
a) 412.2 b) 216 c) 145.4 d) 108.2

3. 0.0833 mole of carbohydrate of empirical formula CH_2O contain 1 g of hydrogen. The molecular formula of the carbohydrate is
a) $C_5H_{10}O_5$ b) $C_3H_4O_3$ c) $C_{12}H_{22}O_{11}$ d) $C_6H_{12}O_6$

4. The equivalent weight of $Zn(OH)_2$ in the following reaction is equal to its,
$Zn(OH)_2 + HNO_3 \longrightarrow Zn(OH)(NO_3) + H_2O$:
a) $\frac{\text{Formula wt.}}{1}$ b) $\frac{\text{Formula wt.}}{2}$ c) $2 \times$ formula wt. d) $3 \times$ formula wt.

5. 5.85 g of NaCl are dissolved in 90 g of water. The mole fraction of NaCl is:
a) 0.1 b) 0.01 c) 0.2 d) 0.0196

6. 2.76 g of silver carbonate on being strongly heated yield a residue weighing
a) 2.16 g b) 2.48 g c) 2.64 g d) 2.32 g

7. A solution contains Na_2CO_3 and $NaHCO_3$.10 mL of the solution required 2.5 mL of 0.1 M H_2SO_4 for neutralization using phenolphthalein as indicator. Methyl orange is then added when a further 2.5 mL of 0.2 M H_2SO_4 was required. The amount of Na_2CO_3 in 1 litre of the solution is:
a) 5.3 g and 4.2 g b) 3.3 g and 6.2 g c) 4.2 g and 5.3 g d) 6.2 g and 3.3 g

8. The volume occupied by one molecule of water (density 1 g cm^{-3}) is:
a) 18 cm^3 b) 22400 cm^3 c) $6.023 \times 10^{-23} cm^3$ d) $3.0 \times 10^{-23} cm^3$

9. 510 mg of a liquid on vaporization in Victor meyer's apparatus displaces 67.2 cm^3 of air at (STP). The molecular weight of the liquid is:
a) 130 b) 17 c) 170 d) 1700

10. What volume of 6 M HCL should be added to 2 M HCL to get 1 L of 3 M HCL?
a) 0.25 L b) 1.00 L c) 0.75 L d) 2.50 L

11. The normality of one molar sodium carbonate solution is:
a) 2 b) 1 c) 0.5 d) 1.5

12. If H_2SO_4 ionises as $H_2SO_4 + 2H_2O \rightarrow 2H_3O^+ + SO_4^2$, then total number of ions produced by 0.1 M H_2SO_4 will be
a) 9.03×10^{21} b) 3.01×10^{22} c) 6.02×10^{22} d) 1.8×10^{23}

13. W_1 of an element combines with oxygen forming W_2 g of its oxide. The equivalent weight of the element is:
a) $[W_1 / W_2] \times 8$ b) $\left[\frac{W_1}{W_2 - W_1}\right] \times 8$ c) $\left[\frac{W_2 - W_1}{W_1}\right] \times 8$ d) $\left[\frac{W_1}{W_1 - W_2}\right] \times 8$

14. A sample of ammonium phosphate $(NH_4)_3PO_4$ contains 6.36 moles of hydrogen atoms. The number of moles of oxygen atom in the sample is
(atomic mass of N = 14.04, H = 1, P = 31, O = 16)
a) 0.265 b) 0.795 c) 2.12 d) 4.14

15. To neutralise 20 mL of $M/$ 10 NaOH, the volume of $M/20$ HCl needed is:
a) 10 mL b) 30 mL c) 40 mL d) 20 mL

16. A, E, M and n are the atomic weight, equivalent weight, molecular weight and valence of an element. The correct relation is:
a) $A = E \times n$ b) $A = M/E$ c) $A = M/n$ d) $M = A \times n$

17. Which one of the following set of units represents the smallest and largest amount of energy respectively?
a) J and erg b) erg and cal c) Cal and eV d) eV and L-atm
18. The number of atoms present in a 0.635 g of Cu piece will be
a) 6.023×10^{-23} b) 6.023×10^{23} c) 6.023×10^{22} d) 6.023×10^{21}
19. What volume of hydrogen gas, at 273 K and 1 atm pressure will be consumed in obtaining 21.6 g of elemental boron (atomic mass = 10.8) from the reduction of boron trichloride by hydrogen?
a) 89.6 L b) 67.2 L c) 44.8 L d) 22.4 L
20. The numerical value of N/n (where N is number of molecules is n moles of gas) is:
a) 8.314 b) 6.02×10^{23} c) 1.602×10^{-24} d) 1.66×10^{-19}
21. In the relationship molecular formula = empirical formula $\times n$. The$'n'$may have:
a) Any value
b) Zero value
c) Only positive integer value
d) None of the above
22. 10 g $CaCO_3$ on heating gives 5.6 g CaO and …. g CO_2.
a) 4.4 b) 5.6 c) 6.5 d) 4.2
23. Which of the following changes with increase in temperature?
a) Molality
b) Weight fraction of solute
c) Fraction of solute present in water
d) Mole fraction
24. On combustion of 4 g of the methane, 10.46 kJ of heat is liberated. Heat of combustion of methane is
a) 83.68 kJ b) 10.46 kJ c) 41.84 kJ d) 20.93 kJ
25. A gas is found to have the formula $(CO)_x$. Its VD is 70. The value of x must be:
a) 7 b) 4 c) 5 d) 6
26. Choose the wrong statement.
a) 1 mole means 6.023×10^{23} particles
b) Molar mass is mass of one molecule
c) Molar mass is mass of one mole of a substance
d) Molar mass is molecular mass expressed in grams
27. The term standard solution is used for the solutions whose:
a) Normality is known b) Molarity is known c) Strength is known d) All of these
28. The ratio of mole fraction of a solute and a solvent in a binary solution is:
a) Ratio of their wt. b) One c) Ratio of their mole d) Zero
29. If in a reaction HNO_3 is reduced to NO, the mass of HNO_3 absorbing one mole of electrons would be
a) 21.0 g b) 36.5 g c) 18.0 g d) 31.5 g
30. At STP 5.6 litre of a gas weighs 60 g. The vapour density of gas is:
a) 60 b) 120 c) 30 d) 240
31. The number of atoms present in 16 g of oxygen gas is:
a) $6.02 \times 10^{11.5}$ b) 3.01×10^{23} c) $3.01 \times 10^{11.5}$ d) 6.02×10^{23}
32. On analysis a certain compound was found to contain iodine and oxygen in the ratio of 254 g of iodine (at. mass 127) and 80 g oxygen (at. mass 16). What is the formula of the compound?
a) IO b) I_2O c) I_2O_3 d) I_2O_5
33. The vapour density of a volatile chloride of a metal is 95 and the specific heat of the metal is 0.13 cal/g. The equivalent weight of the metal will be:
a) 6.0 b) 12.3 c) 18.6 d) 24.5
34. The equivalent weight of a certain trivalent element is 20. Molecular weight of its oxide is
a) 152 b) 56 c) 168 d) 68
35. Gram molecular volume of oxygen at STP is
a) 3200 cm^3 b) 5600 cm^3 c) 22400 cm^3 d) 11200 cm^3

36. Two elements X (at. Wt. 75) and Y (at. wt. 16) combine to give a compound having 75.8% of X. The formula of compound will be
a) XY b) X_2Y c) XY_3 d) X_2Y_3
37. The amount of oxalic acid (hydrated) required to prepare 500 mL of its 0.1 N solution is:
a) 0.315 g b) 6.3 g c) 3.15 g d) 63.0 g
38. The equivalent weight of $KMnO_4$ for acid solution is
a) 79 b) 52.16 c) 158 d) 31.6
39. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is
a) 3 b) 4 c) 5 d) 6
40. A mixture of CH_4, N_2 and O_2 is enclosed in a vessel of one litre capacity at $0°C$. The ratio of particle pressures of gases is 1 : 4 : 2. Total pressure of the gaseous mixture is 2660 mm. the number of molecules of oxygen present in the vessel is
a) $\frac{6.02 \times 10^{23}}{22.4}$ b) 6.02×10^{23} c) 22.4×10^{22} d) 1000
41. x g of Ag was dissolved in HNO_3 and the solution was treated with excess of NaCl when 2.87 g of $AgCl$ was precipitated. The value of x is
a) 1.08 g b) 2.16 g c) 2.70 g d) 1.62 g
42. One mole electron means:
a) N electrons
b) 6.023×10^{23} electrons
c) 0.55 mg electrons
d) All of these
43. A signature, written in carbon pencil weights 1 mg. What is the number of carbon atoms present in the signature?
a) 5.02×10^{23} b) 5.02×10^{20} c) 6.02×10^{20} d) 0.502×10^{20}
44. The minimum quantity of H_2S needed to precipitate 63.5 g of Cu^{2+} will be nearly:
a) 63.5 g b) 31.75 g c) 34 g d) 20 g
45. An unknown element forms an oxide. What will be the equivalent weight of the element if the oxygen content is 20% by weight?
a) 16 b) 32 c) 8 d) 64
46. Cortisone is a molecular substance containing 21 atoms of carbon per molecule. The molecular weight of cortisone is 360.4. what is the percentage of carbon in cortisone?
a) 59.9% b) 75% c) 69.98% d) None of these
47. Which mode of expressing concentration is independent of temperature?
a) Molality b) Per cent by weight c) Mole fraction d) All of these
48. An ion is reduced to the element when it absorbs 6×10^{20} electrons. The number of equivalent of ion is:
a) 0.1 b) 0.01 c) 0.001 d) 0.0001
49. The volume of 0.1 M H_2SO_4 required to neutralise 30 mL of 2.0 M NaOH is:
a) 100 mL b) 300 mL c) 400 mL d) 200 mL
50. The law of definite proportions is not applicable to nitrogen oxide because
a) Nitrogen atomic weight is not constant b) Nitrogen molecular weight is variable
c) Nitrogen equivalent weight is variable d) Oxygen atomic weight is variable
51. 1.520 g of hydroxide of a metal on ignition gave 0.995 g of oxide. The equivalent weight of metal is
a) 1.52 b) 0.995 c) 190 d) 9
52. A hydrocarbon contains 10.5 g carbon and 1 g hydrogen. Its 2.81 g has 1L volume at 1 atm and 127^0C, hydrocarbon is
a) C_6H_7 b) C_7H_8 c) C_5H_6 d) None of the above
53. 1 mole of methyl amine on reaction with nitrous acid gives at NTP
a) 1.0 L of nitrogen b) 22.4 L of nitrogen c) 11.2 L of nitrogen d) 5.6 L of nitrogen
54. The weight of sulphuric acid needed for dissolving 3 g magnesium carbonate is:

a) 3.5 g b) 7.0 g c) 1.7 g d) 17.0 g

55. When a metal is burnt, its weight is increased by 24 per cent. The equivalent weight of the metal will be:
a) 25 b) 24 c) 33.3 d) 76

56. A metal oxide is reduced by heating it in a stream of hydrogen. It is found that after complete reduction, 3.15 g of oxide yielded 1.05 g of metal. From the above data we can say that
a) The atomic weight of metal is 8
b) The atomic weight of metal is 4
c) The equivalent weight of metal is 4
d) The equivalent weight of metal is 8

57. The ratio of amounts of H_2S needed to precipitate all the metal ions from 100 mL of 1 M $AgNO_3$ and 100mL of $CuSO_4$, will be
a) 1 : 1 b) 1 : 2 c) 2 : 1 d) None of these

58. The mole fraction of NaCl in a solution containing 1 mole of NaCl in 1000 g of water is :
a) 0.0177 b) 0.001 c) 0.5 d) 0.244

59. Which is correct for Na_2HPO_3?
a) It is not an acid salt b) Eq. wt. = $\frac{M}{2}$ c) Ox. no. of P is +3 d) All of these

60. How many g of NaOH will be needed to prepare 250 mL of 0.1 M solution?
a) 1 g b) 10 g c) 4 g d) 6 g

61. If the specific heat of a metallic element is 0.214 cal/g, the atomic weight will be closest to:
a) 66 b) 12 c) 30 d) 65

62. An ore contains 1.34% of the mineral argentite, Ag_2S, by mass. How many gram of this ore would have to be processed in order to obtain 1.00 g of pure solid silver, Ag?
a) 74.6 g b) 85.7 g c) 107.9 g d) 134.0 g

63. In which of the following numbers all zeros are significant?
a) 0.500 b) 30.000 c) 0.00030 d) 0.0050

64. Weight of an atom of an element is 6.644×10^{-23} g. What will be the number of g atom of that element in 40 kg?
a) 10^3 b) 10^6 c) 1.5×10^3 d) None of these

65. In a compound A_xB_y :
a) Mole of A = mole of B = mole of A_xB_y
b) Eq. of A = Eq. of B = Eq. of A_xB_y
c) $Y \times X$ mole of $A = Y \times X$ mole of $B = (X + Y)\ X$ mole of A_xB_y
d) $Y \times X$ mole of $A = Y \times X$ mole of B

66. One gram of hydrogen is found to combine with 80 g of bromine. One gram of calcium (Valency =2) combines with 4 g of bromine. The equivalent weight of calcium is
a) 10 b) 20 c) 40 d) 80

67. A bivalent metal has an equivalent mass of 32. The molecular mass of the metal nitrate is
a) 182 b) 168 c) 192 d) 188

68. 12 g of Mg (at. wt. = 24) will react completely with an acid to give:
a) One mole of H_2 b) Half mole of H_2 c) One mole of O_2 d) None of these

69. The atomic weight of a metal (M) is 27 and its equivalent weight is 9, the formula of its chloride will be:
a) MCl b) MCl_9 c) M_3Cl_4 d) MCl_3

70. 1.60 g of a metal were dissolved in HNO_3 to prepare its nitrate. The nitrate on strong heating gives 2 g oxide. The equivalent weight of metal is:
a) 16 b) 32 c) 48 d) 12

71. 5.85 g of NaCl dissolved in H_2O and solution is made upto 500 mL. The molarity is:
a) 0.1 b) 0.2 c) 1.0 d) 0.117

72. Which property of an element is not variable?
a) Valence b) At. wt. c) Eq. wt. d) None of these

73. The oxide of an element possesses the formula M_2O_3. If the equivalent weight of the metal is 9, then the atomic weight of the metal will be:
a) 9 b) 18 c) 27 d) 54

74. 0.7 g of $Na_2CO_3 \cdot xH_2O$ were dissolved in water and the volume was made to 100 mL, 20 mL of this solution required 19.8 mL of $N/10$ HCl for complete neutralisation. The value of x is:
a) 7 b) 3 c) 2 d) 5

75. The specific heat of an element of atomic weight 32 is likely to be:
a) 0.25 cal/g b) 0.24 cal/g c) 0.20 cal/g d) 0.15 cal/g

76. Number of atoms in 560 g of Fe (atomic mass 56 g mol^{-1}) is
a) Twice that of 70 g N b) Half that of 20 g H c) Both are correct d) None of these

77. A 400 mg iron capsule contains 100 mg of ferrous fumarate, $(CHCOO)_2Fe$. the percentage of iron present in it is approximately
a) 33% b) 25% c) 14% d) 8%

78. Equal weights of Zn metal and iodine are mixed together and l_2 is completely converted toZnl_2. What fraction by weight of original Zn remains unreacted? (Zn = 65, I = 127)
a) 0.34 b) 0.74 c) 0.84 d) Unable to predict

79. An aqueous solution containing 6.5 g of NaCl of 90% purity was subjected to electrolysis. After the complete electrolysis, the solution was evaporated to get solid NaOH. The volume of 1 M acetic acid required to neutralise NaOH obtained above is
a) 1000 cm^3 b) 2000 cm^3 c) 100 cm^3 d) 200 cm^3

80. Which of the following is correct?
a) Mole fraction of I + mole fraction of II = 1
(if only two components are present)
b) $\frac{\text{Mole fraction of I}}{\text{Mole fraction of II}} = \frac{\text{mole of I}}{\text{mole of II}}$
(if only two components are present)
c) Mole fraction of solute = $\frac{\text{mole of solute}}{\text{mole of solute+mole of solvent}}$
d) All of the above

81. The number of significant figures in Avogadro's number is
a) Four b) Two c) Three d) Can be any of these

82. A gas has a vapour density 11.2. The volume occupied by 1g of the gas at NTP is
a) 1 L b) 11.2 L c) 22.4 L d) 4 L

83. A metal nitride, M_3N_2 contains 28% of nitrogen. The atomic mass of metal, M is
a) 24 b) 54 c) 9 d) 87.62

84. An oxide of iodine (I = 127) contains 25.4 g of iodine for 8 g of oxygen. Its formula could be:
a) I_2O_3 b) I_2O c) I_2O_5 d) I_2O_7

85. 20 g of an acid furnishes 0.5 moles of H_3O^+ions in its aqueous solution. The value of 1 g eq. of the acid will be:
a) 40 g b) 20 g c) 10 g d) 100 g

86. 10 mL of gaseous hydrocarbon on combustion gives 40 mL of CO_2(g) and 50 mL of H_2O (vap). The hydrocarbon is:
a) C_4H_5 b) C_8H_{10} c) C_4H_8 d) C_4H_{10}

87. 10 mL of concentrated H_2SO_4 (18 M)is diluted to one litre. The approximate molecular of the dilute acid is:
a) 18 M b) 180 M c) 0.18 M d) 1.8 M

88. Which represents per cent by strength?
a) $\frac{\text{wt. of solute}}{\text{volume of solution}} \times 100$
b) $\frac{\text{wt. of solute}}{\text{volume of solution}} \times 100$
c) $\frac{\text{volume of solute}}{\text{volume of solution}} \times 100$
d) All of the above

89. An alkaloid contains 17.28% of nitrogen and it's molecular mass is 162. The number of nitrogen atoms

present in one molecule of alkaloid is

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

90. 6.02×10^{20} molecules of urea are present in 100 mL of its solution. The molarity of urea solution is:

a) 0.1 b) 0.01 c) 0.02 d) 0.001

91. What volume of H_2 at 273 K and 1 atm will be consumed in obtaining 21.6 g of elemental boron (at. mass 10.8) from the reduction of boron trichloride with H_2?

a) 44.8 L b) 22.4 L c) 89.6 L d) 67.2 L

92. In a metal chloride, the weight of metal and chlorine are in the ratio of 1:2. The equivalent weight of the metal will be:

a) 71 b) 35.5 c) 106.5 d) 17.75

93. $KMnO_4$ (mol.wt.= 158) oxidizes oxalic acid in acid medium to CO_2 and water as follows

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

What is the equivalent weight of $KMnO_4$?

a) 158 b) 31.6 c) 39.5 d) 79

94. How many H-atoms are present in 0.046 g of ethanol?

a) 6×10^{20} b) 1.2×10^{21} c) 3×10^{21} d) 3.6×10^{21}

95. The pair of species having same percentage of carbon is:

a) CH_3COOH and $C_6H_{12}O_6$

b) CH_3COOH and C_2H_5OH

c) $HCOOCH_3$ and $C_{12}H_{22}O_{11}$

d) $C_6H_{12}O_6$ and $C_{12}H_{22}O_{11}$

96. The maximum number of molecules is present in:

a) 15 L of H_2 gas at STP b) 5 L of N_2 gas at STP c) 0.5 g of H_2 gas d) 10 g of O_2gas

97. If one mole of ethanol (C_2H_5OH) completely burns to carbon dioxide and water, the weight of carbon dioxide formed is about:

a) 22 g b) 45 g c) 66 g d) 88 g

98. How many moles of $MgIn_2S_4$ can be made from 1 g each of Mg, in and S? (Atomic mass : Mg = 24, , In = 114.8, S = 32)

a) 6.47×10^{-4} b) 3.0×10^{-1} c) 9.17×10^{-2} d) 8.7×10^{-3}

99. One g of a mixture of Na_2CO_3 and $NaHCO_3$ consumes y equivalent of HCl for complete neutralisation. One g of the mixture is strongly heated, then cooled and the residue treated with HCl How many equivalent of HCl would be required for complete neutralization?

a) $2y$ equivalent b) y equivaletnt c) $3y/4$ equivalent d) $3y/2$ equivalent

100. An organic compound containing C and H has 92.3% of carbon, its empirical formula is

a) CH b) CH_3 c) CH_2 d) CH_4

101. 1.5 g of a divalent metal displaced 4 g of copper (at. wt. = 63.8) from a solution of copper sulphate. The atomic weight of the metal is:

a) 12 b) 24 c) 48 d) 6

102. 4 g of copper was dissolved in concentrated nitric acid. The copper nitrate solution on strong heating gave 5 g of its oxide. The equivalent weight of copper is

a) 23 b) 32 c) 12 d) 20

103. If w_1 g of a metal X displaces w_2 g of another metal Y from its salt solution and if the equivalent weights are E_1 and E_2 respectively, the correct expression for the equivalent weight of X is

a) $E_1 = \frac{w_1}{w_2} \times E_2$ b) $E_1 = \frac{w_2 \times E_2}{w_1}$ c) $E_1 = \frac{w_1 \times w_2}{E_2}$ d) $E_1 = \sqrt{\frac{w_1}{w_2} \times E_2}$

104. The weight of an atom of atomic mass 260 amu is:

a) 4.32×10^{-22}g b) 4.32×10^{-23}g c) 4.32×10^{-24}g d) 4.32×10^{-21}g

105. An organic compound has an empirical formula (CH_2O) its vapour density is 45. The molecular formula of the compound is

a) CH_2O b) C_2H_5O c) C_2H_2O d) $C_3H_6O_3$

106. 10 g of hydrogen and 64 of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be:

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

107. If one mole of H_2SO_4 reacts with an excess of NaOH, how many moles of water are formed?

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

108. The mass of $112cm^3$ of CH_4 gas at STP is

a) 0.16 g b) 0.8 g c) 0.08 g d) 1.6 g

109. Which term is to be correctly used for expressing concentration of electrolytes in solution?

a) Molarity b) Normality c) Formality d) None of these

110. The haemoglobin from the red blood corpuscles of most mammals contains approximately 0.33% of iron by weight. The molecular weight of haemoglobin as 67,200. The number of iron atoms in each molecule of haemoglobin is (atomic weight of iron = 56):

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

111. If two compounds have the same empirical formula but different molecular formulae, they must have

a) Different percentage composition b) Different molecular weights
c) Same viscosity d) Same vapour density

112. 0.1 mole of a carbohydrate with empirical formula CH_2O contains 1 g of hydrogen. What is its molecular formula?

a) $C_5H_{10}O_5$ b) $C_6H_{12}O_6$ c) $C_4H_8O_4$ d) $C_3H_6O_3$

113. Mole fraction of the solute in a 1.00 molal aqueous solution is:

a) 1.7700 b) 0.1770 c) 0.0177 d) 0.0344

114. How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atoms?

a) 0.02 b) 3.125×10^{-2} c) 1.25×10^{-2} d) 2.5×10^{-2}

115. 2 g of mixture of CO and CO_2 on reaction with excess I_2O_5 produced 2.54 g of I_2. What would be the mass % of CO_2 in the original mixture?

a) 60 b) 30 c) 70 d) 35

116. On analysis a certain compound was found to contain iodine and oxygen in the ration 254 g of iodine and 80 g of oxygen. The atomic mass of iodine is 127 and that of oxygen is 16. Which is the formula of the compound?

a) IO b) I_2O c) I_5O_2 d) I_2O_5

117. The vapour density of gas A is three times that of gas B. If the molecular weight of A is M, the molecular weight of B is:

a) $3\ M$ b) $\sqrt{3}\ M$ c) $M/3$ d) $M/\sqrt{3}$

118. A sample of pure Cu (3.18 g) heated in a stream of oxygen for some time gains in weight with the formation of black oxide of copper (CuO). The final weight is 3.92 g. What per cent of copper remains unoxidised?

a) ≈ 6.5 b) ≈ 6.9 c) ≈ 7.6 d) ≈ 7.9

119. In the following reaction, which choice has value twice that of the equivalent mass of the oxidizing agent?

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

a) 64 b) 32 c) 16 d) 48

120. The chloride of metal contains 71 % chlorine by weight and the vapour density of it is 50. The atomic weight of the metal will be:

a) 29 b) 58 c) 35.5 d) 71

121. If 0.5 mole of $BaCl_2$ is mixed with 0.2 mole of Na_3PO_4, the maximum number of moles f $Ba_3(PO_4)_2$ that can be formed is

a) 0.7 b) 0.5 c) 0.03 d) 0.10

122. How many significant figures are there in (respectively)

(1)73.000 g (2) 0.0503 g and (3) 2.001 s?

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

123. The formula weight of $Al_2(SO_4)_3$ is 342. A solution containing 342 g of $Al_2(SO_4)_3$ in :

a) One litre of solution is one molar
b) One litre of solution is 2 molar
c) 1000 g of water is 3 normal
d) 2 litre of solution is 3 molar

124. For the reaction, $Na_2CO_3 + 2HCl \rightarrow NaCl + H_2O + CO_2$ Equivalent weight of Na_2CO_3 is
a) $\frac{M}{2}$ b) M c) $2M$ d) $\frac{M}{4}$

125. Two oxides of a metal contain 50% and 40% metal (M) respectively. If the formula of fist oxide is MO_2, the formula of second oxide will be
a) MO_2 b) MO_3 c) M_2O d) M_2O_3

126. An organic compound on analysis was found to contain 10.06% carbon, 0.84% hydrogen and 89.10% chlorine. What will be the empirical formula of the substance?
a) CH_2Cl_2 b) $CHCl_3$ c) CCl_4 d) CH_3Cl

127. 22.4 litre of water vapour at NTP, when condensed to water, occupies an approximate volume of:
a) 18 litre b) 1 litre c) 1 mL d) 18 mL

128. Which statement is correct?
a) Atomic weight of an element varies with valence
b) Molecular weight changes with valence
c) Equivalent weight changes with valence
d) None of the above

129. Excess of carbon dioxide is passed through 50 mL of 0.5 M calcium hydroxide solution. After the completion of the reaction, the solution was evaporate was evaporated to dryness. The solid calcium carbonate was completely neutralised with 0.1 N hydrochloric acid. The volume of hydrochloric acid required is (Atomic mass of calcium=40)
a) 300 cm^3 b) 200 cm^3 c) 500 cm^3 d) 400 cm^3

130. 9.8 g of H_2SO_4 is present in 2 litre of a solution. The molarity of the solution is:
a) 0.1 M b) 0.05 M c) 0.01 M d) 0.2 M

131. The number of mole present in 2 litre of 0.5 M NaOH is:
a) 2 b) 1 c) 0.1 d) 0.5

132. The solution A and B are 0.1 and 0.2 molar in a substance. If 100 mL of A are mixed with 25 mL of B and there is no change in volume on mixing, then the final molarity of the solution is:
a) 0.15 M b) 0.18 M c) 0.12 M d) 0.30 M

133. The gravimetric composition of water as H : O is:
a) 1 : 1 b) 1 : 2 c) 1 : 8 d) 1 : 16

134. A mixture of $CaCl_2$ and NaCl weighing 4.44 g is treated with sodium carbonate solution to precipitate all the Ca^{2+} ions as calcium carbonate. The calcium carbonate so obtained is heated strongly to get 0.56 g of CaO. The percentage of NaCl in the mixture (atomic mass of Ca = 40) is
a) 75 b) 30.6 c) 25 d) 69.4

135. In the reaction,
$2Al(s) + 6HCl(aq) \rightarrow 2Al^{3+}(aq) + 6Cl^-(aq) + 3H_2(g)$
a) 6 L HCl (aq) is consumed for every 3 L H_2(g) produced
b) 33.6 L H_2(g) is produced regardless of temperature and pressure for every mole Al that reacts
c) 67.2 L H_2(g) at STP is produced for every mole Al that reacts
d) 11.2 L H_2(g) at STP is produced for every mole HCl(aq) consumed

136. Number of atoms of oxygen present in 10.6 g of Na_2CO_3 will be
a) 6.02×10^{23} b) 12.04×10^{22} c) 1.806×10^{23} d) 31.80×10^{28}

137. If 0.22 of a substance when vaporized displaced 45 cm^3 of air measured over water at 293 K and 755 mm pressure and if vapour pressure of H_2O = 17.4 mm then the molecular weight of substance will be:
a) 222.2 b) 332.3 c) 121.1 d) 127.5

138. The number of water molecules present in a drop of water (volume 0.0018 mL) at room temperature is

a) 6.023×10^{19} b) 1.084×10^{18} c) 4.84×10^{17} d) 6.023×10^{23}

139. A certain amount of a metal whose equivalent mass is 28 displaces 0.7 L of H_2 at STP from an acid. Hence, mass of the element is

a) 1.75 g b) 0.875 g c) 3.50 g d) 7.00 g

140. Law of multiple proportions is illustrated by one of the following pairs

a) H_2S and SO_2 b) NH_3 and NO_2 c) Na_2S and Na_2O d) N_2O and NO

141. Amount of oxygen required for combustion of 1 kg of a mixture of butane and isobutane is:

a) 1.8 kg b) 2.7 kg c) 4.5 kg d) 3.58 kg

142. About a gaseous reaction,

$xX + yY \longrightarrow lL + mM$

Which statement is wrong?

a) x letre of X combines with y litre of Y to give L and M

b) x moles of X combines with y moles of Y to give L and M

c) x number of molecules of X combine with y number of molecules of Y to form L and M

d) x g of X combines with y g of Y to give M and L

143. The simplest formula of a compound containing 50% of element X (at. wt. 10) and 50% of element Y (at. wt. 20) is:

a) XY b) X_2Y c) XY_2 d) X_2Y_3

144. The number of mole of KCl in 1000 mL of 3 molar solution is:

a) 1.5 b) 3.0 c) 1.0 d) 4.0

145. A person has as many as notes as number of oxygen atoms in 24.8 g $Na_2S_2O_3 \cdot 5H_2O$ (mol. wt. = 248.0). A note counting machine counts 60 million notes per day. How much day would be taken to count these notes?

a) 10^{17} b) 10^{10} c) 10^{15} d) 10^{12}

146. An oxide of sulphur contains 50 % S. what will be its empirical formula?

a) SO b) SO_2 c) SO_3 d) S_2O_3

147. 8 g of O_2 has the same number of molecules as:

a) 7 g of CO b) 11 g of CO_2 c) 7 g of N_2 d) All of these

148. When 10 g of 90% pure lime stone is heated completely, the volume (in litres) of CO_2 is liberated at STP is

a) 22.4 b) 2.24 c) 20.16 d) 2.016

149. Mass of 0.1 mole of methane is

a) 1 g b) 16 g c) 1.6 g d) 0.1 g

150. The per cent of N in 66% pure $(NH_4)_2SO_4$ sample is:

a) 32 b) 28 c) 14 d) None of the above

151. Equal weight of Fe_2O_3 and FeO has weight of oxygen in the ratio:

a) 1.35 b) 0.74 c) 0.37 d) 2.7

152. The number of mole of solute per kg of solvent is called:

a) Mole fraction of solute
b) Normality
c) Molarity
d) Molality

153. The empirical formula of a compound is CH_2O. If its VD is 30, its molecular formula is:

a) CH_2O b) $C_2H_4O_2$ c) $C_3H_6O_3$ d) CH_3OH

154. The decomposition of a certain mass of $CaCO_3$ gave 11.2 dm^3 of CO_2 gas at STP. The mass of KOH required to completely neutralise the gas is

a) 56 g b) 28 g c) 42 g d) 20 g

155. 19.7 kg of gold was recovered from a smuggler. How many atoms of gold were recovered (Au = 197)?

a) 100 b) 6.02×10^{23} c) 6.02×10^{24} d) 6.02×10^{25}

156. 2.79 g of silver carbonate on being strongly heated yields a residue weighing:

a) 2.16 g b) 2.48 g c) 2.32 g d) 2.64 g

157. In acidic medium, the equivalent weight of $K_2Cr_2O_7$ (Mol. wt. $= M$) is

a) M
b) $\frac{M}{2}$
c) $\frac{M}{3}$
d) $\frac{M}{6}$

158. Which has the highest mass?

a) 1 g-atom of C
b) 1/2 mole of CH_4
c) 10 mL of water
d) 3.011×10^{23} atoms of oxygen

159. How many atoms are present in a mole of $CH_3COOC_2H_5$?

a) $14 \times 6.02 \times 10^{23}$ atom/mol
b) $10 \times 6.02 \times 10^{23}$ atom/mol
c) $7 \times 6.02 \times 10^{23}$ atom/mol
d) None of the above

160. Volume of 2 M HCl needed to neutralize the solution containing one litre of 1 M solution of NaOH is :

a) 1 litre
b) 2 litre
c) 3 litre
d) $\frac{1}{2}$ litre

161. 80 g of oxygen contains as many atoms as in

a) 80 g of hydrogen
b) 1 g of hydrogen
c) 10 g of hydrogen
d) 5 g of hydrogen

162. An element A (at. wt. $= 75$) and B (at. wt. $= 25$) combine to form a compound. The compound contains 75% A by weight. The formula of the compound will be:

a) A_2B
b) A_3B
c) AB_3
d) AB

163. If molecular weight of $KMnO_4$ is M, then its equivalent weight in acidic medium would be

a) M
b) $\frac{M}{2}$
c) $\frac{M}{5}$
d) $\frac{M}{3}$

164. Molecular weight of tribasic acid is W. Its equivalent weight will be:

a) $W/2$
b) $W/3$
c) W
d) $3W$

165. 5 mL of N HCl, 20 mL of $N/2$ H_2SO_4 and 30 mL of $N/3$ HNO_3 are mixed together and volume made one litre. The normality of the resulting solution is:

a) $N/5$
b) $N/10$
c) $N/20$
d) $N/40$

166. If 20 g of $CaCO_3$ is treated with 100 mL of 20% HCl solution, the amount of CO_2 produced is

a) 22.4 L
b) 8.80 g
c) 4.40 g
d) 2.24 L

167. The empirical formula of a compound is CH_2. One mole of this compound has a mass of 42 g. Its molecular formula is

a) C_3H_6
b) C_3H_8
c) CH_2
d) C_2H_2

168. The volume of air needed for complete combustion of 1 kg carbon at STP is:

a) 9333.33 litre
b) 933.33 litre
c) 93.33 litre
d) 1866.67 litre

169. Mixture $X = 0.02$ mole of $[Co(NH_3)_5SO_4]Br$ and 0.02 mole of $[Co(NH_3)_5Br]SO_4$ was prepared in 2 L of solution.

1 L of mixture $X +$ excess $AgNO_3 \rightarrow Y$

1 L of mixture $X +$ excess $BaCl_2 \rightarrow Z$

Number of moles of Y and Z are

a) 0.01, 0.01
b) 0.02, 0.01
c) 0.01, 0.02
d) 0.02, 0.02

170. 100 mL each of 0.5 N NaOH, $N/5$ HCl and $N/10$ H_2SO_4 are mixed together. The resulting solution will be:

a) Acidic
b) Neutral
c) Alkaline
d) None of these

171. 1.5 litre of a solution of normality N and 2.5 litres of 2 M HCl are mixed together. The resultant solution had a normality 5. The value of N is:

a) 6
b) 10
c) 8
d) 4

172. The number of water molecules in 1 L of water is

a) 18
b) 18×1000
c) N_A
d) $55.55\ N_A$

173. The maximum number of molecules are present in

a) 15 L of H_2 gas at STP
b) 5 L of N_2 gas at STP
c) 0.5 g of H_2 gas
d) 10 g of O_2 gas

174. Polyethylene can be produced from calcium carbide according to the following sequence of reactions;

$CaC_2 + H_2O \longrightarrow CaO + HC \equiv CH$

$n HC \equiv CH + n H_2 \longrightarrow (-CH_2 - CH_2-)_n$

The mass of polyethylene which can be produced from 20.0 kg of CaC_2 is:

a) 6.75 kg
b) 7.75 kg
c) 8.75 kg
d) 9.75 kg

175. Calculate g-atom of element in 40 kg, if weight of one atom of an element is 6.644×10^{-23}g:

a) 10^2 g-atom
b) 10 g-atom
c) 10^3 g-atom
d) None of these

176. The molality of 15% (wt./vol.) solution of H_2SO_4 of density 1.1 g/cm^3 is approximately:

a) 1.2
b) 1.4
c) 1.8
d) 1.6

177. The density of NH_4OH solution is 0.6 g/mL. It contains 34% by weight of NH_4OH. Calculate the normality of the solution:

a) 4.8 N
b) 10 N
c) 0.5 N
d) 5.8 N

178. 171 g of cane sugar (mol. wt. = 342) are dissolved in 1000 g of water at 30°C. If the density of solution is 1.1 g/mL, then:

a) Molarity < molality
b) Molarity = molality
c) Molality < molarity
d) None of these

179. Amount of oxygen required for complete combustion of 27 g Al is:

a) 24 g
b) 12 g
c) 20 g
d) 6 g

180. The least number of molecules are contained in:

a) 2 g hydrogen
b) 8 g oxygen
c) 4 g nitrogen
d) 16 g CO_2

181. Which of the following is correct for

C(graphite) + O_2 (gas) → CO_2 , heat =−348 kJ?

a) Heat absorbed
b) Mass of product >Mass of reactant
c) Mass of product < Mass of reactant
d) Mass of product = Mass of reactant

182. The molarity of 2 N $H_2SO_4$is:

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

183. 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 given unsatisfactory result when carried out in the presence of HCl because HCl

a) Gets oxidised by oxalic acid to chlorine
b) Furnishes H^+ ions in addition to those from oxalic acid
c) reduces permanganate to Mn^{2+}
d) Oxidises oxalic acid to carbon dioxide and water

184. The mass of 112 cm^3 of CH_4 gas a STP is

a) 0.16 g
b) 0.8 g
c) 0.08 g
d) 1.6 g

185. The volume of oxygen necessary for the complete combustion of 20 L of propane is

a) 40 L
b) 60 L
c) 80 L
d) 100 L

186. The value of gram molar volume of gas is:

a) 1 litre
b) 22.4 litre
c) 11.2 litre
d) 22.4 litre at STP

187. Carbon dioxide contains 27.27% of carbon, carbon disulphide contains 15.79% of carbon and sulphur dioxide contains 50% of sulphur. This data is an agreement with

a) Law of conservation of mass
b) Law of definite proportions
c) Law of multiple proportions
d) Law of reciprocal proportions

188. In a compound C, H, N atoms are present in 9 :1 : 3.5 by weight. Molecular weight of compound is 108, its molecular formula is:

a) $C_2H_6N_2$
b) C_3H_4N
c) $C_6H_8N_2$
d) $C_9H_{12}N_3$

189. The total molarity of all the ions containing 0.1 M of $CuSO_4$ and 0.1 M of $Al_2(SO_4)_3$ is:

a) 0.2 M
b) 0.7 M
c) 0.8 M
d) 1.2 M

190. How much water is to be added to dilute 10 mL of 10 N HCl to make it decinormal?
a) 990 mL b) 1010 mL c) 100 mL d) 1000 mL

191. Density of air at NTP is 0.001293 g/mL. Its vapour density is:
a) 0.001293 b) 1.293 c) 14.48 d) Cannot be calculated

192. The number of moles of water present in 90 g of a water is:
a) 2 b) 3 c) 4 d) 5

193. If 30 mL of H_2 and 20 mL of O_2reacts to form water, what is left at the end of reaction:
a) 10 mL H_2 b) 5 mL H_2 c) 10 mL O_2 d) 5 mL O_2

194. The term atom molecule were introduced by:
a) Ostwald, Avogadro respectively
b) Dalton, Avogadro respectively
c) Avogadro, Dalton respectively
d) None of the above

195. Arrange the following in the order of increasing mass (atomic mass; O = 16, Cu = 63, N = 14)
I. One atom of oxygen
II. One atom of nitrogen
III. 1×10^{-10} mole of oxygen
IV. 1×10^{-10}mole of copper
a) II $< I < III < IV$ b) I $< II < III < IV$ c) III $< II < IV < I$ d) IV $< II < III < I$

196. One part of an element A combines with two parts of another element B. 6 parts of element C combines with 4 parts of$B$. If A and C combine together, the ratio of their weights, will be governed by
a) Law of definite proportions b) Law of multiple proportions
c) Law of reciprocal proportions d) Law of conservation of mass

197. A metal oxide has the formula Z_2O_3. It can be reduced by hydrogen to give free metal and water. 0.1596 g of the metal oxide required 6 mg of hydrogen for complete reduction. The atomic weight of the metal is:
a) 27.90 b) 159.60 c) 79.80 d) 55.80

198. x grams of calcium carbonate was completely burnt in air. The weight of the solid residue formed is 28 g. What is the value of x (in grams)?
a) 44 b) 200 c) 150 d) 50

199. In a gaseous reaction of the type $aA + bB \longrightarrow cC + dD$, which is wrong?
a) a litre of A combines with b litre of B to give C and D
b) a mole of A combines with b mole of B to give C and D
c) a g of A combines with b g of B to give C and D
d) a molecules of A combines with b molecules of B to give C and D

200. Which of the following are correct?
a) G molecular wt. = mol. wt. in g = wt. of N molecules
b) 1 mole = N molecules = 6.023×10^{23}molecule
c) Mole = g molecules
d) All of the above

201. Cyclohexanol is dehydrated to cyclohexene on heating with conc H_2SO_4. The cyclohexene obtained from 100 g cyclohexanol will be
(If yield of reaction is 75%)
a) 61.5 g b) 75.0 g c) 20.0 g d) 41.0 g

202. A compound was found to contain nitrogen and oxygen in the ratio, nitrogen 28 g and 80 g of oxygen. The formula of the compound is:
a) NO b) N_2O_3 c) N_2O_5 d) N_2O_4

203. Versene, a chelating agent having chemical formula $C_2H_4N_2(C_2H_2O_2Na)_4$. If each mole of this compound could bind 1 mole of $Ca^{2}+$, then the rating of pure versene expressed as mg of $CaCO_3$ bound per g of chelating agent is:
a) 100 mg b) 163 mg c) 200 mg d) 263 mg

204. Which of the following is correct?

a) $\text{Meq.} = N \times V_{\text{in mL}} = \frac{\text{wt.}}{\text{Eq.wt.}} \times 1000$

b) $\text{Eq.} = N \times V_{\text{in mL}} = \frac{\text{wt.}}{\text{Eq.wt.}}$

c) Equal equivalent or milli equivalent of reactants react to give same eq. or Meq. of products

d) All of the above

205. 1.0 g of pure calcium carbonate was found to require 50 mL of dilute HCl for complete reactions. The strength of the HCl solution is given by:

a) 4 N b) 2 N c) 0.4 N d) 0.2 N

206. The number of atoms in 4.25 g of NH_3 is approximately

a) 6×10^{23} b) 2×10^{23} c) 1.5×10^{23} d) 1×10^{23}

207. MnO_4^- ions are reduced in acidic condition to Mn^{2+} ions whereas they are reduced in neutral condition to MnO_2. The oxidation of 25 mL of a solution X containing Fe^{2+} ions required in acidic condition 20 mL of a solution Y containing MnO_4^- ions. What volume of solution Y would be required to oxidise 25 mL of a solution X containing Fe^{2+} ions in neutral condition?

a) 11.4 mL b) 12.0mL c) 33.3 mL d) 35.0 mL

208. Number of atoms of He in 100 u of He (atomic weight of He is 4) are

a) 25 b) 100 c) 50 d) $100 \times 6 \times 10^{-23}$

209. Total number of atoms present in 1.0 cm^3 of solid glucose (density 0.8 g/ cm^3) at 25°C are:

a) 2.68×10^{21} b) 6.42×10^{22} c) 2.68×10^{22} d) 2.68×10^{23}

210. For preparing $M/$ 10 solution of H_2SO_4 in one litre we need H_2SO_4:

a) 9.8 g b) 49.0 g c) 4.8 g d) 0.09 g

211. Given, that the abundances of isotopes $_{54}Fe$, $_{56}Fe$ and $_{57}Fe$ are 5%, 90% and 5%, respectively, the atomic mass of Fe is

a) 55.85 b) 55.95 c) 55.75 d) 56.05

212. The concentration of solution containing 0.5 mole H_3PO_4 dissolved in 500 g water:

a) 1 m b) 1 M c) 1 N d) 0.5 M

213. Which of the following is correct?

a) $\text{Mole} = \text{molarity} \times V_{\text{in L}} = \frac{\text{wt.}}{\text{mol. wt.}}$

b) $\text{Milli mole} = \text{molarity} \times V_{\text{in mL}} = \frac{\text{wt.}}{\text{mol. wt.}} \times 1000$

c) Mole and milli mole of reactants react according to stoichiometric ratio of balanced chemical equation

d) All of the above

214. 100 g of $CaCO_3$ is treated with 1 L of 1 N HCI. What would be the weight of CO_2 liberated after the completion of the reaction?

a) 55 g b) 11 g c) 22 g d) 33 g

215. If an iodized salt contains 1% KI and a person takes 2 g of the salt every day, the iodide ions going into his body every day would be approximately

a) 7.2×10^{21} b) 7.2×10^{19} c) 3.6×10^{21} d) 9.5×10^{19}

216. The mass of 11.2 L of ammonia gas at STP is

a) 8.5 g b) 85 g c) 17 g d) 1.7 g

217. 0.52 g of dibasic acid required 100 mL of 0.1 N NaOH for complete neutralization. The equivalent weight of acid is:

a) 26 b) 52 c) 104 d) 156

218. 100 tons of Fe_2O_3 containing 20% impurities will give iron by reduction with H_2 equal to

a) 112 tons b) 80 tons c) 160 tons d) 56 tons

219. 25 mL of a solution of barium hydroxide on titration with 0.1 M solution of HCl gave a titre value of 35 mL. The molarity of $Ba(OH)_2$ is:

a) 0.28 b) 0.35 c) 0.07 d) 0.14

220. Volume occupied by one molecule of water (density = 1 g cm^{-3}) is:

a) $6.023 \times 10^{-23} cm^3$ b) $3.0 \times 10^{-23} cm^3$ c) $5.5 \times 10^{-23} cm^3$ d) $9.0 \times 10^{-23} cm^3$

221. The mass of nitrogen per gram hydrogen in the compound hydrazine is exactly one and half times the mass of nitrogen in the compound ammonia. The fact illustrates the
a) Law of conservation of mass
b) Multiple valency of nitrogen
c) Law of multiple proportions
d) Law of definite proportions

222. Strength of the solution is given by:
a) $S = N \times E$
b) $S = \frac{\text{wt. of solute}}{\text{volume of solution in litre}}$
c) $S = M \times \text{mol. wt.}$
d) All of the above

223. 0.5 mole of H_2SO_4 is mixed with 0.2 mole of $Ca(OH)_2$. The maximum number of mole of $CaSO_4$ formed is:
a) 0.2 b) 0.5 c) 0.4 d) 1.5

224. On dissolving 1 mole each of the following acids in 1 litre water, the acid which do not give a solution of 1 N strength is:
a) HCl b) $HClO_4$ c) HNO_3 d) H_3PO_4

225. The empirical formula of a compound is CH. Its molecular weight is 78. The molecular formula of the compound will be:
a) C_2H_2 b) C_3H_3 c) C_2H_4 d) C_2H_6

226. Of two oxides of iron, the first contained 22% and the second contained 30% of oxygen by weight. The ratio of weights of iron in the two oxides that combine with the same weight of oxygen, is
a) 3 : 2 b) 2 : 1 c) 1 : 2 d) 1 : 1

227. The total number of protons in 10 g of calcium carbonate is ($N_0 = 6.023 \times 10^{23}$)
a) 3.01×10^{24} b) 4.06×10^{24} c) 2.01×10^{24} d) 3.02×10^{24}

228. In the following reaction,
$MnO_2 + 4HCL \longrightarrow MnCl_2 + 2H_2O + Cl_2$
2 mol MnO_2 reacts with 4 mol of HCl to form 11.2 L Cl_2 at STP. Thus, per cent yield of Cl_2 is
a) 25% b) 50% c) 100% d) 75%

229. The normality of 1% (wt./vol.)H_2SO_4 is nearly:
a) 0.02 b) 0.2 c) 0.1 d) 1

230. The mass of 1 mole of electrons is
a) 9.1×10^{-28} g b) 1.008 mg c) 0.55 mg d) 9.1×10^{-27} g

231. 74.4 g of a metallic chloride contains 35.5 g of chlorine. The equivalent weight of the metal is:
a) 19.5 b) 35.5 c) 39.0 d) 78.0

232. Equivalent weight of an acid
a) Depends on the reaction involved
b) Depends upon the number of oxygen atoms present
c) Is always constant
d) None of the above

233. Which of the following is not a mixture?
a) Gasoline b) Distilled alcohol c) LPG d) lodized table salt

234. The equivalent weight of a divalent metal is 31.82. The weight of single atom is:
a) $32.77 \times 6.02 \times 10^{23}$ b) $63.64 \times 6.02 \times 10^{23}$ c) 63.64 d) $63.64/6.02 \times 10^{23}$

235. Number of mole of 1 m^3 gas at NTP are:
a) 44.6 b) 40.6 c) 42.6 d) 48.6

236. The per cent loss in weight after heating a pure sample of potassium chlorate (mol. wt. = 122.5) will be:
a) 12.25 b) 24.50 c) 39.18 d) 49.0

237. The number of milli equivalent contained in 0.5 litre of 0.2 N solution is:
a) 0.1 b) 100 c) 0.01 d) 1.0

238. Out of 1.0 g dioxygen, 1.0 g (atomic) oxygen and 1.0 g ozone, the maximum number of molecules are contained in

a) 1.0 g of atomic oxygen
b) 1.0 g of ozone
c) 1.0 g of oxygen gas
d) All contain same number of atoms

239. A sample of AIF_3 contains 3.0×10^{24} F ions. The number of formula units of this sample are
a) 9.0×10^{24}
b) 3.0×10^{24}
c) 0.75×10^{24}
d) 1.0×10^{24}

240. One mole of CO_2 contains
a) 3 g atoms of CO_2
b) 18.1×10^{23} molecules of CO_2
c) 6.02×10^{23} atoms of O
d) 6.02×10^{23} atoms of C

241. For the reaction, $A + 2B \longrightarrow C$, 5 moles of A and 8 moles of B will produce:
a) 5 moles of C
b) 4 moles of C
c) 8 moles of C
d) 13 moles of C

242. Which sample contains the largest number of atoms?
a) 1 mg of C_4H_{10}
b) 1 mg of N_2
c) 1 mg of Na
d) 1 mL of water

243. An aromatic hydrocarbon with empirical formula C_5H_4 on treatment with concentrated H_2SO_4 gave a monosulphonic acid. 0.104 g of the acid required 10 mL of $\frac{N}{20}$ NaOH for complete neutralisation. The molecular formula of hydrocarbon is
a) C_5H_4
b) $C_{10}H_8$
c) $C_{15}H_{12}$
d) $C_{20}H_{16}$

244. If isotopic distribution of C-12 and C-14 is 98% and 2% respectively then the number of C-14 atoms in 12 g of carbon is
a) 1.032×10^{22}
b) 3.01×10^{22}
c) 5.88×10^{23}
d) 6.023×10^{23}

245. Zinc sulphate contains 22.65% of zinc and 43.9% of water of crystallization. If the law of constant proportions is true then the weight of zinc required to produce 20 g of the crystals will be
a) 45.3 g
b) 4.53 g
c) 0.453 g
d) 453 g

246. The number of gram molecules of chlorine in 6.02×10^{25} hydrogen chloride molecules is
a) 10
b) 100
c) 50
d) 5

247. The net charge on ferrous ion is:
a) +2
b) +3
c) +4
d) +5

248. H_2O_2 solution used for hair bleaching is sold as a solution of approximately 5.0 g H_2O_2 Per 100 mL of the solution. The molecular weight of H_2O_2 is 34. The molarity of this solution is approximately:
a) 3.0
b) 1.5
c) 0.15
d) 4.0

249. 4.6×10^{22} atoms of an element weigh 13.8 g. The atomic weight of element is
a) 290
b) 180
c) 34.4
d) 10.4

250. The weight of 50% (wt./wt.) solution of HCl required to react with 100 g of $CaCO_3$ would be:
a) 73 g
b) 100 g
c) 146 g
d) 200 g

251. An element, X has the following isotopic composition
^{200}X: 90%
^{199}X: 8.0%
^{202}X: 2.0%
The weighted average atomic mass of the naturally occurring element X is closed to
a) 200 u
b) 210 u
c) 202 u
d) 199 u

252. Law of constant composition is same as the law of
a) Conservation of mass
b) Conservation of energy
c) Multiple proportion
d) Definite proportion

253. One atom of an element X weight 6.643×10^{-23}g. number of moles of atom in 20 kg is
a) 140
b) 150
c) 250
d) 500

254. The reaction, $2C + 2O_2 \longrightarrow 2CO_2$ is carried out by taking 24 g carbon and 96 g O_2. Which one is limiting reagent?
a) C
b) O_2
c) CO_2
d) None of these

255. 1000 g aqueous solution of $CaCO_3$ contains 10 g of calcium carbonate. Concentration of solution is:
a) 10 ppm
b) 100 ppm
c) 1000 ppm
d) 10000 ppm

256. The maximum amount of $BaSO_4$ precipitated on mixing 20 mL of 0.5 M $BaCl_2$ with 20 mL of 1 M H_2SO_4 is:

a) 0.25 mole b) 0.5 mole c) 1 mole d) 0.01 mole

257. The percentage of an element M is 53 in its oxide of molecular formula M_2O_3. Its atomic mass is about
a) 45 b) 9 c) 18 d) 27

258. H_3BO_3 is:
a) Monobasic and weak Lewis acid
b) Monobasic and weak Bronsted acid
c) Monobasic and strong Lewis acid
d) Tribasic and weak Bronsted acid

259. A sample of peanut oil weighing 1.5763 g is added to 25 mL of 0.4210 M KOH after saponification is complete 8.46 mL of 0.2732 M H_2SO_4 is needed to neutralise excess KOH. The saponification number of peanut oil is:
a) 209.6 b) 108.9 c) 98.9 d) 218.9

260. What quantity of ammonium sulphate is necessary for the production of NH_3 gas sufficient to neutralize a solution containing 292 g of HCl? $[HCl = 36.5, (NH_4)_2SO_4 = 132, NH_3 = 17]$
a) 272 g b) 403 g c) 528 g d) 1056 g

261. A partially dried clay mineral contains 8% water. The original sample contained 12% water and 45% silica. The % of silica in the partially dried sample is nearly:
a) 50% b) 49% c) 55% d) 47%

262. Number of g-atoms of an element in one atom are:
a) 6.023×10^{23} b) 1.66×10^{-24} c) 2×10^{23} d) None of these

263. Concentration of HCl is 10 N. 100 mL of 1 N HCl can be obtained by diluting:
a) 10 mL of conc. HCl to 100 mL
b) 20 mL of conc. HCl to 100 mL
c) 100 mL of conc. HCl to 200 mL
d) 100 mL of conc. HCl to 100 mL

264. The number of formula units of calcium fluoride, CaF_2 present in 146.4 g of CaF_2 (the molar mass of CaF_2 is 78.08 g/mol) is
a) 1.129×10^{24} CaF_2 b) 1.146×10^{24} CaF_2 c) 7.808×10^{24} CaF_2 d) 1.877×10^{24} CaF_2

265. What is the weight of oxygen that is required for the complete combustion of 2.8 kg of ethylene?
a) 9.6 kg b) 96.0 kg c) 6.4 kg d) 2.8 kg

266. The number of sodium atoms in 2 moles of sodium ferrocyanide is
a) 12×10^{23} b) 26×10^{23} c) 34×10^{23} d) 48×10^{23}

267. Stoichiometric ratio of sodium dihydrogen orthophosphate and sodium hydrogen orthophosphate required for synthesis of $Na_5P_3O_{11}$ is
a) 1.5 : 3 b) 3 : 1.5 c) 1 : 1 d) 2 : 3

268. 4.4 g of CO_2 and 2.24 litre of H_2 at STP are mixed in a container. The total number of molecules present in the container will be:
a) 6.022×10^{23} b) 1.2044×10^{23} c) 2 mole d) 6.023×10^{24}

269. Calculate the number of moles left after removing 10^{21} molecules from 200 mg ofCO_2.
a) 0.00454 b) 0.00166 c) 2.88×10^{-3} d) None of these

270. Which has maximum number of atoms?
a) 24 g of C (12) b) 56 g of Fe (56) c) 27 g of Al (27) d) 108 g of Ag (108)

271. A sample of copper sulphate pentahydrate contains 8.64 g of oxygen. How many gram of Cu is present in this sample?
(Atomic mass of Cu = 63.6, S = 32.06, O = 16)
a) 0.952 g b) 3.816 g c) 3.782 g d) 8.64 g

272. To neutralise completely 20 ML of 0.1 M aqueous solution of phosphorous acid (H_3PO_3), the volume of 0.1 M aqueous KOH solution required is :
a) 60 mL b) 20 mL c) 40 mL d) 10 mL

273. 2 g of O_2 at 0^0C and 760 mm of Hg pressure has volume

a) 1.4 L b) 2.8 L c) 11.2 L d) 22.4 L

274. An organic compound contains 20.0% C, 6.66% H, 47.33% N and the rest was oxygen. Its molar mass is 60 g mol^{-1} the molecular formula of the compound is

a) CH_4N_2O b) $C_2H_4NO_2$ c) CH_3N_2O d) $CH_4N_2O_2$

275. One mole of solute (NaCl) is dissolved in 1 litre water. The molarity of solution is:

a) $> 1\ M$ b) $< 1\ M$ c) $= 1\ M$ d) $= 2\ M$

276. 100 mL of 0.1 N hypo decolourised iodine by the addition of x gram of crystalline copper sulphate to excess of KI. The value of $'x'$ is

(molecular wt. of $CuSO_4, 5H_2O$ is 250)

a) 5.0 g b) 1.25 g c) 2.5 g d) 4 g

277. Which of the following contains greatest number of oxygen atoms?

a) 1 g of O b) 1 g of O_2

c) 1 g of O_3 d) All have the same number of atoms

278. The normality of 4% (wt./vol.) NaOH is:

a) 0.1 b) 1.0 c) 0.05 d) 0.01

279. The mass of potassium dichromate crystals required to oxidise 750 cm^3 of 0.6 M Mohr's salt solution is (Given, molar mass : Potassium dichromate = 294, Mohr's salt = 392)

a) 0.49 g b) 0.45 g c) 22.05 g d) 2.2 g

280. If 0.5 mole of $BaCl_2$ is mixed with 0.2 mole of Na_3PO_4 the maximum number of mole of $Ba_3(PO_4)_2$ that can be formed is:

a) 0.7 b) 0.5 c) 0.30 d) 0.1

281. Which has the maximum number of atoms?

a) 6 g C b) 1 g H_2 c) 12 g Mg d) 30 g Ca

282. Mixing up of equal volumes of 0.1 M NaOH and 0.1 M CH_3COOH yields a solution which is:

a) Basic b) Acidic c) Neutral d) None of these

283. If 6.3 g of $NaHCO_3$ are added to 15.0 g CH_3COOH solution, the residue is found to weight 18.0 g. what is the mass of CO_2 released in the reaction?

a) 4.5 g b) 3.3 g c) 2.6 g d) 2.8 g

284. 50 mL of an aqueous solution of glucose contains 6.02×10^{22} molecules. The concentration of solution is:

a) 0.1 M b) 1.0 M c) 0.2 M d) 2.0 M

285. Molar concentration of a solution in water is:

a) Always equal to normality of solution

b) More than molality of the solution

c) Equal to molality of the solution

d) Less than the molality of the solution

286. 1 kg of NaOH solution contains 4 g of NaOH. The approximate concentration of the solution is:

a) 1 molar b) 0.1 molar c) Decinormal d) About 0.1 N

287. How many moles of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl?

a) 0.333 b) 0.011 c) 0.029 d) 0.044

288. The nature of mixture obtained mixing 50 mL of 0.1 M H_2SO_4 and 50 mL of 0.1 M NaOH is:

a) Acidic b) Basic c) Neutral d) amphoteric

289. Number of electrons in 1.8 mL of H_2O is :

a) 6.02×10^{23} b) 3.011×10^{23} c) 0.6022×10^{23} d) 60.22×10^{23}

290. If a compound contains two oxygen atoms, four carbon atoms and number of hydrogen atom is double of carbon atoms, the vapour density of it is:

a) 88 b) 44 c) 132 d) 72

291. Molecular weight of oxalic acid is 126. The weight of oxalic acid required to neutralise 1000 mL of normal solution of NaOH is:

a) 126 g b) 63 g c) 6.3 g d) 12.6 g

292. The number of hydrogen atoms present in 25.6 g of sucrose($C_{12}H_{22}O_{11}$) which has a molar mass of 342.3 g is

a) 22×10^{23} b) 9.91×10^{23} c) 11×10^{23} d) 44×10^{23} H atoms

293. Molarity of liquid HCl with density equal to 1.17 g/mL is:

a) 36.5 b) 18.25 c) 32.05 d) 4.65

294. If 20 mL of 0.4 N NaOH solution completely neutralizes 40 mL of a dibasic acid, the molarity of the acid solution is:

a) 0.1 M b) 0.2 M c) 0.3 M d) 0.4 M

295. 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:

a) 1.78 M b) 2.00 M c) 2.05 M d) 2.22 M

296. Equivalent weight of NH_3 as a base is:

a) 17 b) 17/3 c) 1.7 d) 17/2

297. $KMnO_4$ reacts with oxalic acid according to the equation

$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$ Here, 20 mL of 0.1 M $KMnO_4$ is equivalent to

a) 20 mL of 0.5 M $H_2C_2O_4$
b) 50 mL of 0.1 M $H_2C_2O_4$
c) 50 mL of 0.1 M $H_2C_2O_4$
d) 20 mL of 0.1 M $H_2C_2O_4$

298. To prepare a standard solution of a substance, we use:

a) A pipette b) A burette c) Measuring flask d) Measuring cylinder

299. There are two isotopes of an element with atomic mass$z$. Heavier one has atomic mass $z+2$ and lighter one has z−1, the abundance of lighter one is

a) 66.6% b) 69.7% c) 6.67% d) 33.3%

300. 3 g of an oxide of a metal is converted to chloride completely and it yielded 5 g of chloride. The equivalent weight of the metal is

a) 33.25 b) 3.325 c) 12 d) 20

301. The molarity of 20.0 mass % H_2SO_4 solution of density 11.14 g cm^{-3} is

a) 2.56 mol dm^{-3} b) 1.56 mol dm^{-3} c) 1.26 mol dm^{-3} d) 2.32 mol dm^{-3}

302. How many moles of Fe^{2+} ions are formed, when excess of iron is treated with 50 mL of 4.0 M HCl under inert atmosphere? Assume no change in volume:

a) 0.4 b) 0.1 c) 0.2 d) 0.8

303. 100 mL of 0.3 N HCl solution were mixed with 200 mL of 0.6 N H_2SO_4 solution. The final acidic normality is:

a) 0.9 N b) 0.6 N c) 0.5 N d) 0.4 N

304. 45 g of acid of mol. wt. 90 neutralized by 200 mL of 5 N caustic potash. The basicity of the acid is:

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

305. The equivalent weight of KIO_3 in the reaction,

$2Cr(OH)_3 + OH^- + KIO_3 \rightarrow 2CrO_4^{2-} + 5H_2O + KI$ is

a) Mol. wt. b) Mol. wt./3 c) Mol. wt./6 d) Mol. wt./2

306. The sample with largest number of atoms is

a) 1 g of O_2(g) b) 1 g of Ni(s) c) 1 g of B(s) d) 1 g of N_2(g)

307. The equation,

$2Al(s)(3/2)O_2(g) \longrightarrow Al_2O_3(s)$shows that:

a) 2 mole of Al reacts with (3/2) mole of O_2 to produce (7/2) mole of Al_2O_3
b) 2 g of Al reacts with (3/2) g of $O_2$to produce one mole of Al_2O_3
c) 2 g of Al reacts with (3/2)litre of $O_2$to produce 1 mole of Al_2O_3
d) 2 mole of Al reacts with (3/2) mole of O_2 to produce 1 mole of Al_2O_3

308. The number of atoms in 3.2 g of oxygen gas are:

a) 6.02×10^{22} b) 6.02×10^{23} c) 12.04×10^{22} d) 12.04×10^{23}

309. The number of atoms in n moles of gas can be given by:

a) $n \times$ Av. no.$\times$ atomicity b) $\frac{n \times \text{Av. no.}}{\text{atomicity}}$ c) $\frac{\text{Av. no.} \times \text{atomicity}}{n}$ d) None of these

310. How many moles of $Al_2(SO_4)_3$ would be in 50 g of the substance?
a) 0.083 mol b) 0.952 mol c) 0.481 mol d) 0.140 mol

311. The molecular weight of air will be
(the components of air given as $N_2 - 78\%, O_2 - 21\%, Ar - 09\%$ and $CO_2 - 0.1\%$)
a) 18.64 b) 24.968 c) 28.964 d) 29.864

312. 1.520 g of the hydroxide of a metal on ignition gave 0.995 g of oxide. The equivalent weight of metal is:
a) 1.520 b) 0.995 c) 19.00 d) 9.00

313. The hydrated salt $Na_2SO_4 \cdot nH_2O$, undergoes 55% loss in weight on heating and becomes anhydrous. The value of n will be:
a) 5 b) 3 c) 7 d) 10

314. When 100 g of ethylene polymerizes to polyethylene according to the equation,
$n\text{CH}_2 = \text{CH}_2 \longrightarrow -(\text{CH}_3 - \text{CH}_2)_n-$.
The weight of polyethylene produced will be:
a) $\frac{n}{2}$ g b) 100 g c) $\frac{100}{n}$ g d) $100n$ g

315. Vapour density of a volatile substance is 4 ($CH_4 = 1$). Its molecular weight would be:
a) 8 b) 2 c) 64 d) 128

316. Dulong and Petit's law is valid only for
a) Metals b) Non-metals c) Gaseous elements d) Solid elements

317. The molarity of pure water is:
a) 55.6 b) 50 c) 100 d) 18

318. A molal solution is one that contains one mole of a solute in:
a) 1000 g of the solvent
b) 1000 mL of the solution
c) One litre of the solvent
d) 22.4 litre of the solution

319. The weight of a substance that displaces 22.4 litre air at NTP is:
a) Mol. wt. b) At. wt. c) Eq. wt. d) All of these

320. The density (in g mL^{-1}) of a 3.60 M H_2SO_4 solution having 29% by mass of H_2SO_4 (molar mass 98)will be:
a) 1.45 b) 1.64 c) 1.88 d) 1.22

321. One atom of an element weights 1.8×10^{-22}g. its atomic mass is
a) 29.9 b) 18 c) 108.36 d) 154

322. How many moles of electrons weigh one kilogram?
a) 6.023×10^{23} b) $\frac{1}{9.108} \times 10^{31}$ c) $\frac{6.023}{9.108} \times 10^{54}$ d) $\frac{1}{9.108 \times 6.023} \times 10^{8}$

323. The number of moles of water in 488 g $BaCl_2 \cdot 2H_2O$ are:
a) 2 b) 3 c) 4 d) 5

324. The number of molecules in 16 g of methane is:
a) 3.0×10^{23} b) 6.02×10^{23} c) $\frac{16}{6.02} \times 10^{23}$ d) $\frac{16}{3.0} \times 10^{23}$

325. The percentage of P_2O_5 in diammonium hydrogen phosphate, $(NH_4)_2HPO_4$ is
a) 23.48 b) 46.96 c) 53.78 d) 71.00

326. Acidified $KMnO_4$ oxidises oxalic acid to CO_2. What is the volume (in litres) of 10^{-4}M $KMnO_4$ required to completely oxidise 0.5 L of 10^{-2} M oxalic acid in acid medium?
a) 125 b) 1250 c) 200 d) 20

327. 0.003924 have .... significant figures.
a) 6 b) 4 c) 3 d) 7

328. The formula mass of Mohr's salt is 392. The iron present in it is oxidised by $KMnO_4$ in acid medium. The equivalent mass of Mohr's salt is

a) 392 b) 31.6 c) 278 d) 156

329. Matter is anything which occupies . . . A. . . and has . . . B . . . .
Here A and B are
a) Density and mass b) Volume and mass c) Space and mass d) None of these

330. Which is not a molecular formula?
a) $C_6H_{12}O_6$ b) $Ca(NO_3)_2$ c) $C_2H_4O_2$ d) N_2O

331. Insulin contains 3.4% sulphur. What will be the minimum molecular weight of insulin?
a) 94.117 b) 1884 c) 941.176 d) 976

332. Which of the following contains maximum number of molecules?
a) 100 cc of CO_2 at STP b) 150 cc of N_2at STP c) 50 cc of SO_2 at STP d) 200 cc of NH_3at STP

333. Weight of a single molecule of water is:
a) 3.0×10^{-23} g b) 6.02×10^{23} g c) 6.02×10^{-23} g d) None of these

334. Air contains 20%O_2 by volume. How much volume of air will be required for 100 cc of acetylene?
a) 500 cc b) 1064 cc c) 212.8 cc d) 1250 cc

335. 1.35 g of pure Ca metal was quantitatively converted into 1.88 g of pure CaO, what is atomic weight of Ca?
a) 40.75 b) 50 c) 60 d) 70

336. If 250 mL of a solution contains 2.7 g of H_3PO_4, the normality of the solution is:
a) 4.0 b) 0.33 c) 0.4 d) 0.1

337. The weights of two elements which combine with one another are in the ratio of their:
a) At. wt. b) Mol. wt c) Eq. wt. d) None of these

338. One litre N_2,$\frac{7}{8}$ litre O_2 and 1 litre CO are taken in a mixture under indentical conditions of P and T. The amount of gases present in mixture is given by:
a) $w_{N_2} = w_{O_2} > w_{CO}$ b) $w_{N_2} = w_{CO} > w_{O_2}$ c) $w_{N_2} = w_{O_2} = w_{CO}$ d) $w_{CO} > w_{N_2} > w_{O_2}$

339. Volume of 0.1 M NaOH needed for the neutralisation of 20 mL of 0.05 M oxalic acid is:
a) 10 mL b) 15mL c) 20 mL d) 30 mL

340. The mole fraction of solute in one molal aqueous solution is:
a) 0.009 b) 0.018 c) 0.027 d) 0.036

341. If we consider that $\frac{1}{6}$, in place of $\frac{1}{12}$, mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of a substance will

a) Be a function of the molecular mass or the substance
b) Remain unchanged
c) Increase two fold
d) Decrease twice

342. A compound contains 54.55% carbon, 9.09 % hydrogen, 36.36% oxygen. The empirical formula of this compound is
a) C_3H_5O b) $C_4H_8O_2$ c) $C_2H_4O_2$ d) C_2H_4O

343. The total number of protons, electrons and neutrons in 12 g of $^{12}_{6}C$ is:
a) 1.084×10^{25} b) 6.022×10^{23} c) 6.022×10^{22} d) 18

344. The volume of 0.25 M H_3PO_4 required to neutralise 25 mL of 0.03 M $Ca(OH)_2$is:
a) 1.32 mL b) 13.2 mL c) 26.4 mL d) 2.0 mL

345. 100 mL of PH_3 when decomposed produces phosphorus and hydrogen. The change in volume is:
a) 50 mL increase b) 500 mL decrease c) 900 mL decrease d) None of these

346. Density of a 2.05 M solution of acetic acid in water is 1.02g/mL. The molality of the solution is:
a) 1.14 mol kg^{-1} b) 3.28 mol kg^{-1} c) 2.28 mol kg^{-1} d) 0.44 mol kg^{-1}

347. What weight of sodium hydroxide is required to neutralize 100 mL of 0.1 N HCl?
a) 4.0 g b) 0.04 g c) 0.4 g d) 2.0 g

348. The amount of anhydrous Na_2CO_3 present in 250 mL of 0.25 M solution is :
a) 6.625 g b) 6.0 g c) 66.25 g d) 6.225 g

349. Mole fraction of A in water is 0.2. The molality of A in water is:

a) 13.8 b) 13.6 c) 14.0 d) 16.0

350. How many g of KCl would have to be dissolved in 60 g H_2O to give 20% by weight of solution?
a) 15 g b) 1.5 g c) 11.5 g d) 31.5 g

351. What volume of oxygen gas (O_2) measured at 0°C and 1 atm, is needed to burn completely 1L of propane gas (C_3H_8) measured under the same conditions?
a) 6 L b) 5 L c) 10 L d) 7 L

352. The weight of 11.2 litre of any gas at STP represents its:
a) Gram molecular weight
b) Gram equivalent weight
c) Gram atomic weight
d) Vapour density

353. The normality of 10% (weight/volume) acetic acid is:
a) 1 N b) 10 N c) 1.7 N d) 0.83 N

354. The stoichiometry of the following reaction is
$K_2S_2O_8(aq) + 2KI(aq) \rightarrow 2K_2SO_4(aq) + I_2(aq)$
a) 2 : 2 b) 1 : 1 c) 1 : 2 d) 2 : 1

355. 2 mole of ethyl alcohol are present with 6 mole of water. The mole fraction of alcohol is:
a) 0.5 b) 0.75 c) 0.15 d) 0.25

356. What is the $[OH^-]$ in the final solution prepared by mixing 20.0 mL of 0.050 M HCl with 30.0 mL of 0.10 M $Ba(OH)_2$?
a) 0.12 M b) 0.10 M c) 0.40 M d) 0.0050 M

357. The pair of compounds which cannot exist in solution is:
a) $NaHCO_3$ and NaOH b) Na_2CO_3 and $NaHCO_3$ c) Na_2CO_3 and NaOH d) $NaHCO_3$ and NaCl

358. An oxide of metal has 20% oxygen, the eq. wt. of oxide is:
a) 32 b) 40 c) 48 d) 52

359. What weight of silver chloride will be precipitated when a solution containing 4.77 g of $NaCl$ is added to a solution of 5.77 g of $AgNO_3$? (Na = 23, Cl = 35.5, Ag = 108, N = 14 and O = 16)
a) 4.37 g b) 4.87 g c) 5.97 g d) 3.87 g

360. Number of molecules in 100 mL of each of O_2, NH_3 and CO_2 at STP are in the order
a) $CO_2 < O_2 < NH_3$ b) $NH_3 < O_2 < CO_2$
c) $NH_3 = CO_2 < O_2$ d) All have same number of molecules

361. The equivalent weight of a substances is the weight which either combines of displaces:
a) 8 part oxygen b) 1 part hydrogen c) 35.5 part chlorine d) All of these

362. Which of the following is correct?
a) $\text{Eq. wt. of element} = \frac{\text{at. wt.}}{\text{valence}}$
b) $\text{Eq. wt. of compound} = \frac{\text{mol.wt.}}{\text{total charge on cation or anion}}$
c) $\text{Eq. wt. of acid} = \frac{\text{mol. wt.}}{\text{basicity}}$
d) $\text{Eq. wt. of base} = \frac{\text{mol. wt.}}{\text{acidity}}$

363. Which represents per cent by volume?
a) $\frac{\text{wt. of solute}}{\text{wt. of solution}} \times 100$
b) $\frac{\text{wt. of solute}}{\text{volume of solution}} \times 100$
c) $\frac{\text{volume of solute}}{\text{volume of solution}} \times 100$
d) All of the above

364. In the aqueous solution of sulphuric acid the mole fraction of water is 0.85. the molality of the solution is :

a) 8.9 m b) 0.19 m c) 9.8 m d) 15 m

365. The number of atoms in 0.1 mol of a triatomic gas is:
($N_A = 6.02 \times 10^{23}$ mol^{-1})
a) 6.026×10^{23} b) 1.806×10^{23} c) 3.600×10^{23} d) 1.80×10^{23}

366. Which contains greatest number of oxygen atoms?
a) 1 g of O
b) 1 g of O_2
c) 1 g of O_3
d) All have the same number of atoms

367. The electrochemical equivalent of a metal is 'x' g coulomb^{-1}. The equivalent weight of metal is
a) x b) $x \times 96500$ c) $\frac{x}{96500}$ d) $1.6 \times 10^{-19} \times x$

368. By Victor meyer's method, one determine the vapour density if:
a) Non-volatile solid b) All substances c) Volatile liquid d) Electrolyte

369. The percentage of oxygen in NaOH is:
a) 40 b) 16 c) 8 d) 1

370. Sulphur forms the chlorides S_2Cl_2 and SCl_2. The equivalent mass of sulphur in SCl_2 is 16. The equivalent mass of sulphur S_2Cl_2 is:
a) 8 b) 16 c) 64 d) 32

371. 1.520 g of the hydroxide of a metal on ignition gave 0.995 g of oxide. The equivalent weight of metal is
a) 1.520 b) 0.995 c) 19.00 d) 9.00

372. The product of atomic weight and specific heat of a metal is approximately 6.4. This was given by:
a) Dalton's law b) Avogadro's law c) Newton's law d) Dulong Petit's law

373. If a mixture containing 3 moles of hydrogen and 1 mole of nitrogen is converted completely into ammonia, the ratio of initial and final volumes under the same temperature and pressure would be:
a) 3 : 1 b) 1 : 3 c) 2 : 1 d) 1 : 2

374. The least count of an instrument is 0.01 cm. Taking all precautions, the most possible error in the measurement can be
a) 0.005 cm b) 0.01 cm c) 0.0001 cm d) 0.1 cm

375. A metal M forms a compound M_2HPO_4. The formula of the metal sulphate is:
a) M_2SO_4 b) MSO_4 c) $M(SO_4)_2$ d) $M_2(SO_4)_3$

376. If the molecular weight of $Na_2S_2O_3$ and I_2 are M_1 and M_2 respectively, then what will be the equivalent weight of $Na_2S_2O_3$ and I_2 in the following reaction?
$2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$
a) M_1, M_2 b) $M_1, M_2/2$ c) $2M_1, M_2$ d) $M_1, 2M_2$

377. In the final answer of the expression $\frac{(29.2-20.2)(1.79\times10^5)}{1.37}$, the number of significant figures is
a) 1 b) 2 c) 3 d) 4

378. Haemoglobin contains 0.33% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (at. Wt. of $Fe = 56$) present in one molecule of haemoglobin is
a) 6 b) 1 c) 4 d) 2

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

380. In a compound C, H and N are present is 9 : 1 : 3.5 by weight. If molecular weight of the compound is 108, then the molecular formula of the compound is
a) $C_2H_6N_2$ b) C_3H_4N c) $C_6H_8N_2$ d) $C_9H_{12}N_3$

381. When 10 g of methane is completely burnt in oxygen, the heat evolved is 560 kJ. What is the heat of combustion (in kJ mol^{-1}) of methane?
a) −1120 b) −968 c) −896 d) −560

382. How much of 0.1 M H_2SO_4 solution is required to neutralize 50 mL of 0.2 M NaOH solution?
a) 0.50 mL b) 50 mL c) 100 mL d) 5.0 mL
383. One litre of CO_2 is passed over hot coke. The volume becomes 1.4 litre. The per cent composition of products is:
a) 0.6 litre CO
b) 0.8 litre CO_2
c) 0.6 litre CO_2 and 0.8 litre CO
d) None of the above
384. Equivalent weight of oxygen is:
a) 32 b) 8 c) 16 d) 24
385. Arsenic forms two oxides, one of which contains 65.2% and the other 75.5% of the element. Hence, equivalent masses of arsenic are in the ratio
a) 1 : 2 b) 3 : 5 c) 13 : 15 d) 2 : 1
386. The oxide of a metal contains 60 % of the metal. What will be the percentage of bromine in the bromide of the metal, if the valency of the metal is the same in both the oxide and the bromide?
a) ≈ 87 b) ≈ 70 c) ≈ 77 d) ≈ 93
387. An aqueous solution of 6.3 g oxalic acid dihydrate is made up to 250 mL. The volume of 0.1 N NaOH required to completely neutralised 10 mL of this solution is:
a) 40 mL b) 20 mL c) 10 mL d) 4 mL
388. The enthalpy of combustion of methane at 25^0C is 890kJ. The heat liberated when 3.2 g of methane is burnt in air is
a) 445 kJ b) 278 kJ c) -890 kJ d) 178 kJ
389. A signature written with carbon pencil weighs 1 mg. what is the number of carbon atoms present in the signature?
a) 6.02×10^{20} b) 0.502×10^{20} c) 5.02×10^{23} d) 5.02×10^{20}
390. If 1.2 g of a metal displace 1.12 litre hydrogen at normal temperature and pressure, equivalent weight of metal would be:
a) 12 b) 24 c) 1.2×11.2 d) $1.2 \div 11.2$
391. 34 g of hydrogen peroxide is present in 1120 mL of solution. This solution is called:
a) 10 vol solution b) 20 vol solution c) 30 vol solution d) 32 vol solution
392. A sample of a mixture of $CaCl_2$ and $NaCl$ weighing 4.22 g was treated to precipitate all the Ca as $CaCO_3$. This $CaCO_3$ is then heated and quantitatively converted into 0.959 g of CaO. Calculate the percentage of $CaCl_2$ in the mixture.
(Atomic mass of $Ca = 40, O = 16, C = 12$ and $Cl = 35.5$)
a) 31.5% b) 21.5% c) 45.04% d) 68.48%
393. 11.2 litre of NH_3 at STP has electrons:
a) 3.01×10^{21} b) 3.01×10^{22} c) 3.01×10^{25} d) 3.01×10^{24}
394. Which of the following pairs contains equal number of atoms?
a) 11.2 cc (STP) of nitrogen and 0.015 g of nitric oxide
b) 22.4 L (STP) of nitrous oxide and 22.4 L of nitric oxide
c) 1 millimole of HCL and 0.5 millimole of H_2S
d) 1 mole of H_2O_2 and 1 mole of N_2O_4
395. The number of atoms present in a molecule is called:
a) Atomicity b) Molecularity c) Poison's ratio d) None of these
396. Which has the highest weight?
a) 1 m^3 of water b) A normal adult man c) 10 L of Hg d) All have same weight
397. 74.5 g of a metallic chloride contains 35.5 g of chlorine, the equivalent weight of the metal is
a) 19.5 b) 35.5 c) 39 d) 78.0
398. A compound contains 69.5% oxygen and 30.5% nitrogen and its molecular weight is 92. The formula of the compound is

a) N_2O b) NO_2 c) N_2O_4 d) N_2O_5

399. The solid like conducting state of gases with free electrons is called

a) Sol state b) Gel state c) Plasma state d) All of these

400. A g of a metal displaces V mL of H_2 at NTP. Equivalent weight E, of metal is:

a) $E = \frac{A}{\text{wt.of } H_2 \text{ displaced}} \times E_H$

b) $E = \frac{A \times 1.008 \times 22400}{\text{volume of } H_2 \text{ displaced} \times 2}$

c) $E = \frac{A \times 1.008}{\text{volume of } H_2 \text{ displaced} \times 0.0000897}$

d) All of the above

401. The formula which represents the simple ratio of atoms in a compound is called:

a) Molecular formula b) Structure formula c) Empirical formula d) Rational formula

402. How many mole of atoms are in a mole of CH_3COOH molecule?

a) 2 moles of C atoms, 4 moles of H atoms, 2 moles of O atoms

b) 1 mole of C atom, 2 moles of H atoms, 1 mole of O atom

c) 2 moles of C atom, 3 moles of H atoms, 2 moles of O atoms

d) None of the above

403. If the density of water is 1 g cm^{-3} then the volume occupied by one molecule of water is approximately

a) 18 cm^3 b) 22400 cm^3 c) $6.02 \times 10^{-23} cm^3$ d) $3.0 \times 10^{-23} cm^3$

404. What will be the normality of a solution obtained by mixing 0.45 N and 0.60 N NaOH in the ratio 2 :1 by volume?

a) 0.4 N b) 0.5 N c) 1.05 N d) 0.15 N

405. For the reaction,

$X + 2Y \longrightarrow Z$

5 Moles of X and 9 moles of Y will produce

a) 5 moles of Z b) 8 moles of Z c) 14 moles of Z d) 4 moles of Z

406. A student performs a titration with different burettes and finds titre values of 25.2 mL, 25.25 mL, and 25.0mL. The number of significant figures in the average titre value is

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

407. 100 mL of 20.8% $BaCl_2$ solution and 50 mL of 9.8% H_2SO_4

Solution will form $BaSO_4$

$(\text{Ba} = 137, \text{Cl} = 35.5, \text{S} = 32, \text{H} = 1, \text{O} = 16)$

$BaCl_2 + H_2SO_4 \longrightarrow Ba_2SO_4 + 2HCl$

a) 23.3 g b) 11.65 g c) 30.6 g d) None of these

408. n gram of a substance X reacts with m gram of substance Y to form p gram of substance R and q gram of substance$S$. This reaction can be represented as follows

$X + Y = R + S$

The relation which can be established in the amounts of the reactants and the products will be

a) $n - m = p - q$ b) $n + m = p + q$ c) $n = m$ d) $p = q$

409. On adding 20 mL of 0.1 N NaOH solution to 10 mL of 0.1 N HCl, the resulting solution will:

a) Turn blue litmus red

b) Turn phenolphthalein solution pink

c) Turn methyl orange red

d) Will have no effect on red or blue litmus paper

410. The number of atoms in 558.5 g of Fe (at.wt. 55.85) is:

a) Twice that in 60 g carbon

b) 6.022×10^{22}

c) Half in 8 g He

d) $558.5 \times 6.023 \times 10^{23}$

411. If 20% nitrogen is present in a compound, it's minimum molecular weight will be:

a) 144 b) 28 c) 100 d) 70

412. The dehydration yield of cyclohexanol to cyclohexene is 75%. What would be the yield, if 100 g of cyclohexanol is dehydrated?

a) 61.7 g b) 16.5 g c) 6.15 g d) 615 g

413. A mixture containing 100 g H_2 and 100 g O_2 is ignited so that water is formed according to the reaction, $2H_2 + O_2 \longrightarrow 2H_2O$; How much water will be formed?

a) 113 g b) 50 g c) 25 g d) 200 g

414. The numerical value of $\frac{N}{n}$ (where, N is the number of molecules in a given sample of gas and n is the number of moles of the gas) is

a) 8.314 b) 6.02×10^{23} c) 0.0821 d) 1.66×10^{-19}

415. The ionic strength of Na^+ on mixing 100 mL 0.1 M NaCl and 100mL 0.1 M Na_2SO_4 is:

a) 0.2 b) 0.1 c) 0.3 d) 0.075

416. Number of g-atom of S present in 49 g H_2SO_4 are:

a) 0.5 b) 1 c) 0.2 d) 0.3

417. 276 g of silver carbonate on being strongly heated yields a residue weighing

a) 3.54 g b) 3.0 g c) 1.36 g d) 2.16 g

418. The mole fraction of oxygen in a mixture of 7 g of nitrogen and 8 g of oxygen is:

a) 8/5 b) 0.5 c) 0.25 d) 1.0

419. 0.5 g of fuming H_2SO_4 (oleum) is diluted with water. This solution is completely neutralized by 26.7 mL of 0.4 N NaOH. The percentage of free SO_3 in the sample is:

a) 30.6% b) 40.6% c) 20.6% d) 50%

420. The mass of $BaCO_3$ produced when excess CO_2 is bubbled through a solution of 0.205 mole $Ba(OH)_2$ is,

a) 81 g b) 40.5 g c) 20.25 g d) 162 g

421. An example of homogeneous mixture is

a) Mixture of soil and water b) Mixture of salt and sand grains

c) Sugar solution d) None of the above

422. The molarity of a solution containing 5.3 g of anhydrous Na_2CO_3 per litre is :

a) 0.01 M b) 0.05 M c) 0.02 M d) 1 M

423. To what extent must a given solution containing 40 mg $AgNO_3$ per mL be diluted to yield a solution containing 16 mg $AgNO_3$ per mL?

a) Each mL must be diluted to 2.5 mL

b) To each mL of solution 2.5 mL of water should be added

c) To 1.5 mL of solution 2.5 mL of water should be added

d) To 1.5 mL of solution 1.5 mL of water should be added

424. In the reaction,

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

Equivalent weight of iodine will be equal to

a) Molecular weight b) 1/2 of molecular weight

c) 1/4 of molecular weight d) Twice of molecular weight

425. Mol. wt. = vapour density × 2, is valid for:

a) metals b) non-metals c) Solids d) Gases

426. The volume of oxygen required for complete oxidation of 2.0 litre methane at NTP is:

a) 12.25 litre b) 4 litre c) 1 litre d) 3 litre

427. One mole of a mixture of CO and CO_2 requires exactly 20 g of NaOH in solution for complete conversion of all the CO_2 into Na_2CO_3. How much NaOH would it require for conversion into Na_2CO_3, if the mixture (one mole) is completely oxidised to CO_2?

a) 60 g b) 80 g c) 40 g d) 20 g

428. The equivalent weight of H_3PO_4 in the following reaction is,

$H_3PO_4 + Ca(OH)_2 \longrightarrow CaHPO_4 + 2H_2O$:

a) 98 b) 49 c) 32.66 d) 40

429. 1.0 g of hydrogen contains 6×10^{23} atoms. The atomic weight of helium is 4. If follows that the number of atoms in 1 g of He is:
a) $1/4 \times 6 \times 10^{23}$ b) $4 \times 6 \times 10^{23}$ c) 6×10^{23} d) 12×10^{23}
430. The hardness of water is usually expressed in:
a) ppm b) g/litre c) Mol/litre d) None of these
431. An element forms an oxide, in which the oxygen is 20% of the oxide by weight , the equivalent weight of the given element will be:
a) 32 b) 40 c) 60 d) 128
432. The ratio of amounts of H_2S needed to precipitate all the metals ions from 100 mL of 1 M $AgNO_3$ and 100 mL of 1 M $CuSO_4$ is:
a) 1 : 2 b) 2 : 1 c) Zero d) Infinite
433. 5.6 litre of oxygen at NTP is equivalent to:
a) 1 mole b) 1/2 mole c) 1/4 mole d) 1/8 mole
434. A solution of HCl containing 0.03659 g/mL and another solution of acetic acid containing 0.04509 g/mL, then:
a) N_{HCl} is more b) N_{CH_3COOH} is more c) Both have same N d) None of these
435. The equivalent weight of an acid is obtained by dividing its mol. wt. by its:
a) Acidity b) Basicity c) pH d) None of these
436. For the reaction, $Fe_2O_3 + 3CO \rightarrow 2\,Fe + 3CO_2$ the volume of carbon monoxide required to reduce one mole of ferric oxide is
a) 22.4 dm^3 b) 44.8 dm^3 c) 67.2 dm^3 d) 11.2 dm^3
437. 224 mL of a triatomic gas weights 1 g at 273 K and 1 atm. The mass of one atom of this gas is:
a) 8.30×10^{-23}g b) 2.08×10^{-23}g c) 5.53×10^{-23}g d) 6.24×10^{-23}g
438. The empirical formula of a compound isCH_2. One mole of this compound has a mass of 56 g. its molecular formula is
a) C_3H_6 b) C_4H_8 c) CH_2 d) C_2H_2
439. Which has maximum number of atoms?
a) 2.0 mol of S_8 b) 6.0 mol of S c) 5.5 mol of SO_2 d) 4.48 L of CO_2 at 5TP
440. Which represents per cent by weight?
a) $\frac{\text{wt. of solute}}{\text{wt. of solution}} \times 100$
b) $\frac{\text{wt. of solute}}{\text{volume of solution}} \times 100$
c) $\frac{\text{volume of solute}}{\text{volume of solution}} \times 100$
d) None of the above
441. How many g are present in one mole of $MgSO_4$?
a) 120.4 b) 130.2 c) 12.04 d) 360
442. A solution contains one mole of alcohol and four moles of water. What are the mole fractions of water and alcohol?
a) 1/4, 4/1 b) 4/1, 1/4 c) 4/5, 1/5 d) 1/5, 4/5
443. Approximate atomic weight of an element is 26.89. If its equivalent weight is 8.9 the exact atomic weight of element would be:
a) 26.89 b) 8.9 c) 17.8 d) 26.7
444. 0.75 moles of a solid A_4 and 2 moles of $O_2(g)$ are heated in a sealed vessel, completely using up the reactants and produces only one compound. It is found that when the temperature is used to initial temperature, the contents of the vessel exhibit a pressure equal to $\frac{1}{2}$ of the original pressure. The formula of the product will be
a) A_2O_3 b) A_3O_8 c) A_3O_4 d) AO_2
445. 25.3 g solution carbonate, Na_2CO_3 was dissolved in enough water to make 250 mL of solution. If sodium

carbonate dissociates completely, molar concentration of Na^+ and carbonate ions are respectively.
(mol. mass of $Na_2CO_3 = 106 \text{ g mol}^{-1}$)
a) 0.9555 M and 1.910 M
b) 1.910 M and 0.955 M
c) 1.90 M and 1.1910 M
d) 0.477 M and 0.477 M

446. NO reacts withO_2 to form No_2. When 10 g of NO_2 is formed during the reaction, the mass of O_2 consumed is
a) 1.90 g b) 5.0 g c) 3.48 g d) 13.9 g

447. Two solutions of a substance (non-electrolyte) are mixed in the following manner. 480 mL of 1.5 M of I solution with 520 mL of 1.2 M of II solution. The molarity of final solution is:
a) 1.20 M b) 1.50 M c) 1.344 M d) 2.70 M

448. A vogadro's number is the number of molecules present in:
a) 22.4 litre of a gas of NTP
b) 1 mole of a substance
c) G mol. wt. of a substance
d) All of the above

449. Camphor is often used in molecular mass determination because
a) It is readily available
b) It has a very high cryoscopic constant
c) It is volatile
d) It is solvent for organic substances

450. The molality of 1 M solution of NaCl (specific gravity 1.0585) g/mL) is:
a) 1.0585 b) 1.0 c) 0.10 d) 0.0585

451. An organic compound contains 49.3% carbon, 6.84% hydrogen and its vapour density is 73. Molecular formula of the compound is
a) $C_3H_5O_2$ b) $C_4H_{10}O_2$ c) $C_6H_{10}O_4$ d) $C_3H_{10}O_2$

452. How many g of glucose be dissolved to make one litre solution of 10% (wt./vol.) glucose?
a) 10 g b) 180 g c) 100 g d) 1.8 g

453. How many atoms are contained in a mole of $Ca(OH)_2$?
a) $30 \times 6.02 \times 10^{23}$ atom/mol
b) $5 \times 6.02 \times 10^{23}$ atom/mol
c) $3 \times 6.02 \times 10^{23}$ atom/mol
d) None of the above

454. The normality of 0.3 M phosphorous acid (H_3PO_3) is :
a) 0.1 b) 0.9 c) 0.3 d) 0.6

455. 0.84 g of a metal carbonate reacts with 40 mL of /2 H_2SO_4. The equivalent weight of metal carbonate is:
a) 84 g b) 64 g c) 42 g d) 38 g

456. If 1/6 in place of 1/12 mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of a substance will:
a) Decrease twice
b) Increases two folds
c) Remains unchanged
d) Be a function of the molecular mass of element

457. A gas is found to have formula$[CO]_x$. Its vapour density is 70, the x is
a) 3.0 b) 3.5 c) 5.0 d) 6.5

458. 2 g of metal carbonate is neutralised completely by 100mL of 0.1 (N) HCl. The equivalent weight of metal carbonate is
a) 50 b) 100 c) 150 d) 200

459. The smallest matter particle that can take part in chemical reaction is
a) Atom b) Molecule c) Both (a) and (b) d) None of these

460. The equivalent weight of a solid element is found to be 9. If the specific heat of this element is

1.05 $Jg^{-1}K^{-1}$, then its atomic weight is

a) 17 b) 21 c) 25 d) 27

461. The largest number of molecules are in:

a) 36 g H_2O b) 28 g CO c) 46 g C_2H_5OH d) 54 g N_2O_5

462. Vapour density of a metal chloride is 66. Its oxide contains 53% metal. The atomic weight of the metal is:

a) 21 b) 54 c) 27.06 d) 2.706

463. The number of Cl^- and Ca^{2+} ions in 222 g $CaCl_2$ are :

a) $4\ N, 2\ N$ b) $2\ N, 4\ N$ c) $1\ N, 2\ N$ d) $2\ N, 1\ N$

464. How many gram of KCL would have to be dissolved in 60 g H_2O to give 40% by weight of solution?

a) 40 g b) 20 g c) 15 g d) 10 g

465. The units J Pa^{-1} is equivalent to

a) m^3 b) cm^3 c) dm^3 d) None of these

466. If 250 mL of a solution contains 24.5 g H_2SO_4, the molarity and normality respectively are:

a) $1\ M, 2\ N$ b) $1\ M, 0.5\ N$ c) $0.5\ M, 1N$ d) $2\ M, 1N$

467. Equivalent weight of bivalent metal is 32.7. Molecular weight of its chloride is :

a) 68.2 b) 103.7 c) 136.4 d) 166.3

468. Insulin contains 3.4% Sulphur. The minimum mol. weight of insulin is:

a) 941.176 b) 944 c) 945.27 d) None of these

469. How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atoms?

a) 0.02 b) 3.125×10^{-2} c) 1.25×10^{-2} d) 2.5×10^{-2}

470. The gram molecular weight of hydrogen peroxide is 34. What is the unit of gram molecular weight?

a) g b) mole c) g mol^{-1} d) mol g

471. Which one of the following has maximum number of atoms of oxygen?

a) 2 g of carbon monoxide b) 2 g of carbon dioxide

c) 2 g of sulphur dioxide d) 2 g of water

472. Equal volumes of 0.1 M $AgNO_3$ and 0.2 M NaCl are mixed. The concentration of NO_3^- ions in the mixture will be:

a) 0.1 M b) 0.05 M c) 0.2 M d) 0,15 M

473. The equivalent mass of chlorine is 35.5 and the atomic mass of copper is 63.5. the equivalent mass of copper chloride is 99.0. hence, formula of copper chloride is

a) CuCl b) Cu_2Cl c) $CuCl_2$ d) None of these

474. The reaction between yttrium metal, Y and dilute hydrochloric acid produces $H_2(g)$ and Y^{3+} icons. The molar ratio of yttrium used to hydrogen produces is

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

475. Two elements X (atomic weight = 75) and Y (atomic weight =16) combine to give a compound having 75.8% of X. The formula of the compound is:

a) XY b) X_2Y c) X_2Y_2 d) X_2Y_3

476. Which of the following has the smallest number of molecules?

a) 0.1 mole of CO_2 gas b) 11.2 L of CO_2 gas at STP

c) 22 g of CO_2 gas d) 22.4×10^3 mL of CO_2 gas at STP

477. Sodium nitrate on reduction with Zn in presence of NaOH solution produces NH_3. Mass of sodium nitrate absorbing 1 mole of electron will be

a) 7.750 b) 10.625 c) 8.000 d) 9.875

478. The percentage of nitrogen in urea is about:

a) 38.4 b) 46.6 c) 59.1 d) 61.3

479. What volume of 0.8 M solution contains 0.1 milli mole of solute?

a) 100 mL b) 125 mL c) 500 mL d) 0.125 mL

480. The equivalent weight of an element can be calculated from:

a) 6.4 divided by specific heat and valence

b) Atomic weight divided by atomicity

c) Molecular weight divided by atomicity, all divided by the valence
d) None of the above

481. 4 g-atom of Ag contains:
a) 108 g b) 4 g c) 432 g d) None of these

482. The correctly reported answer of the addition of 4.523, 2.3 and 6.24 will have significant figures
a) Two b) Three c) Four d) Five

483. Weight of H_2O in 1000 kg $CuSO_4 \cdot 5H_2O$ is:
a) 360.5 kg b) 36.05 kg c) 3605 kg d) 3.605 g

484. 3.0 molal NaOH solution has a density of 1.110 g/mL. The molarity of the solution is:
a) 2.9732 b) 3.05 c) 3.64 d) 3.0504

485. An oxide of a metal (M) contains 40% by mass of oxygen. Metal (M) has atomic mass of 24. The empirical formula of the oxide is:
a) M_2O b) MO c) M_2O_3 d) M_3O_4

486. The vapour density of a gas is given by:
a) VD = mol. wt./2
b) $VD = \frac{\text{wt. of } N \text{ molecules of gas}}{\text{wt. of } N \text{ molecules of } H_2}$
c) $VD = \frac{\text{wt. of 1 mole of gas}}{\text{wt. of 1 mole of } H_2}$
d) All of the above

487. In the disproportionation reaction $3HClO_3 \rightarrow HClO_4 + Cl_2 + 2O_2 + H_2O$, the equivalent mass of the oxidising agent is (molar mass of $HClO_3 = 84.45$)
a) 16.89 b) 32.22 c) 84.45 d) 28.15

488. How many atoms are contained in a mole of acetic acid?
a) $8 \times 6.02 \times 10^{23}$ atom/mol
b) $4 \times 6.02 \times 10^{23}$ atom/mol
c) $6 \times 6.02 \times 10^{23}$ atom/mol
d) None of the above

489. Specific gravity of solution is given by:
a) Weight of 1 mL solution
b) Mole present in 1 mL solution
c) Volume of 1 g solution
d) None of the above

490. Which property of an element is always a whole number?
a) Atomic volume b) Atomic weight c) Atomic number d) Equivalent weight

491. An aqueous solution of urea containing 18 g urea in 1500 cm^3 of solution has a density of 1.052 g/cm^3. If the molecular weight of urea is 60, then the molality of solution is:
a) 0.2 b) 0.192 c) 0.064 d) 1.2

492. The relative abundance of two isotopes of atomic weight 85 and 87 is 75% and 25% respectively. The average atomic weight of element is
a) 75.5 b) 85.5 c) 40.0 d) 86.0

493. A molar solution represents a solution of molarity equal to:
a) 1 b) 2 c) 3 d) None of these

494. The answer of the calculation $\frac{2.568 \times 5.8}{4.168}$ in significant figures will be
a) 3.579 b) 3.570 c) 3.57 d) 3.6

495. 14 g of element X combine with 16 g of oxygen. On the basis of this information, which of the followings is a correct statement?
a) The element X could have an atomic weight of 7 and its oxide is XO
b) The element X could have an atomic weight of 14 and its oxide formula is X_2O
c) The element X could have an atomic weight of 7 and its oxide is X_2O
d) The element X could have an atomic weight of 14 and its oxide is XO_2

496. Consider the following data:

Element	Atomic weight
A	12
B	35.5

A and B combine to form a new substance X. If four moles of B combine with one mole of A to give one mole of X, then the weight of ne mole of X is:

a) 47.5 g b) 83 g c) 154 g d) 166 g

497. One mole of P_4 molecules contain:

a) 1 molecule

b) 4 molecules

c) $\frac{1}{4} \times 6.022 \times 10^{23}$ atoms

d) 24.088×10^{23} atoms

498. Molecular weight of NaCl is 58.5. A solution of NaCl containing 5.85 g NaCl per litre is :

a) 1 molar b) 0.1 molar c) 2 molar d) 0.585 molar

499. The solution having lowest molar concentration is:

a) 1.0 N HCl b) 0.4 N H_2SO_4 c) 0.1 N Na_2CO_3 d) None of these

500. The value of amu is which of the following?

a) 1.57×10^{-24}kg b) 1.66×10^{-24}kg c) 1.99×10^{-23}kg d) 1.66×10^{-27}kg

501. How many g are present in one mole of Ag?

a) 107.9 b) 108.6 c) 10.29 d) None of these

502. One mole of chlorine combines with certain weight of metal giving 111 g of its chloride. The same amount of metal can displace 2 g of hydrogen from an acid. The atomic weight of the metal is:

a) 40 b) 20 c) 80 d) None of these

503. Equivalent weight of anhydrous oxalic acid is:

a) 45 b) 63 c) 126 d) 90

504. Molarity is expressed as:

a) Litre mol^{-1} b) Mol $litre^{-1}$ c) Mol kg^{-1} d) G $litre^{-1}$

505. H_3PO_4 is a tribasic acid and one of its salts is NaH_2PO_4. What volume of 1 M NaOH should be added to 12 g NaH_2PO_4 (mol. wt. 120) to exactly convert it into Na_3PO_4 ?

a) 100 mL b) 300 mL c) 200 mL d) 80 mL

506. How many atoms are contained in one mole of sucrose ($C_{12}H_{22}O_{11}$)?

a) $45 \times 6.02 \times 10^{23}$ atom/mol

b) $20 \times 6.02 \times 10^{23}$ atom/mol

c) $5 \times 6.02 \times 10^{23}$ atom/mol

d) None of the above

507. What is the volume (in litres) of oxygen required at STP to completely convert 1.5 moles of sulphur into sulphur dioxide?

a) 11.2 b) 22.4 c) 33.6 d) 44.8

508. What is the number of moles of $Fe(OH)_3$(s) that can be produced by allowing 1 mole of Fe_2S_3, 2 moles of H_2O and 3 moles of O_2 to react as

$2Fe_2S_3 + 6H_2O + 3O_2 \longrightarrow 4Fe(OH)_3 + 6S$?

a) 1 mol b) 1.84 mol c) 1.34 mol d) 1.29 mol

509. The number of molecules of CO_2 present in 44 g of CO_2 is

a) 6.0×10^{23} b) 3×10^{23} c) 12×10^{23} d) 3×10^{10}

510. 1 L oxygen gas at STP will weigh

a) 1.43 g b) 2.24 g c) 11.2 g d) 22.4 g

511. Which has maximum number of atoms?

a) 24 g of C b) 56 g of Fe c) 26 g of Al d) 108 g of Ag

512. In multiplication and division, the significant figures of answer must be same as that in the quantity with . ... Number of significant figures.

a) Maximum b) 3 c) 2 d) Minimum

513. A solution of known normality is diluted to two times. Which of the following changes during dilution?

a) Equivalent of solute
b) Moles of solute
c) Volume of 1 g solution
d) None of the above

514. The number of moles of oxygen in one litre of air containing 21% oxygen by volume, in standard conditions, is

a) 0.186 mol b) 0.21 mol c) 2.10 mol d) 0.0093 mol

515. One gram mole of a gas at NTP occupies 22.4 L. This fact was derived from

a) Law of gaseous volumes b) Avogadro's hypothesis
c) Berzelius hypothesis d) Dalton's atomic theory

516. What is the equivalent weight of $SnCl_2$ in the following reaction,
$SnCl_2 + Cl_2 \rightarrow SnCl_4$?

a) 95 b) 45 c) 60 d) 30

517. The standard adopted for the determination of atomic weight of elements is based on

a) H^1 b) C^{12} c) O^{16} d) S^{32}

518. What amount of bromine will be required to convert 2 g of phenol into 2, 4, 6-tribromo phenol?

a) 20.44 g b) 6.00 g c) 4.00 g d) 10.22 g

519. Equivalent weight of an acid:

a) Depends on the reaction involved with a base
b) Depends on the number of oxygen atoms present
c) Is always constant
d) None of the above

520. The highest mass corresponds to which of the following?

a) 1 molecule of O_2
b) 1×10^{-23} g mole of O_2
c) An O^{2-} ion
d) 1 mole of O_2

521. The number of molecules in 4.25 g of ammonia is approximately:

a) 3.5×10^{23} b) 1.5×10^{23} c) 0.5×10^{23} d) 2.5×10^{23}

522. If V mL of the vapours of substance at NTP weight Wg. Mol. wt. of substance is:

a) $(W/V) \times 22400$ b) $V/W = 22400$ c) $(W - V) \times 22400$ d) $\frac{W \times 1}{V \times 22400}$

523. Sodium bicarbonate on heating decomposes to form sodium carbonate, CO_2 and water. If 0.2 moles of sodium bicarbonate is completely decomposed, how many moles of sodium carbonate is formed?

a) 0.1 b) 0.2 c) 0.05 d) 0.025

524. The reaction of calcium with water is represented by the equation,
$Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2$
What volume of H_2, at STP would be liberated when 8 g of calcium completely reacts with water?

a) 4480 cm^3 b) 2240 cm^3 c) 1120 cm^3 d) 0.4 cm^3

525. The isotopic abundance of C-12 and C-14 is 98% and 2% respectively. What would be the number of C-14 isotope in 12 g carbon sample?

a) 1.032×10^{22} b) 3.01×10^{23} c) 5.88×10^{23} d) 6.02×10^{23}

SOME BASIC CONCEPTS OF CHEMISTRY

CHEMISTRY

: ANSWER KEY :

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

353)	c	354)	c	355)	d	356)	b
357)	a	358)	b	359)	b	360)	d
361)	d	362)	f	363)	b	364)	c
365)	b	366)	d	367)	b	368)	c
369)	a	370)	d	371)	d	372)	d
373)	c	374)	b	375)	a	376)	b
377)	b	378)	c	379)	d	380)	c
381)	c	382)	b	383)	c	384)	b
385)	b	386)	a	387)	a	388)	d
389)	b	390)	a	391)	a	392)	c
393)	d	394)	a	395)	a	396)	a
397)	c	398)	c	399)	c	400)	d
401)	c	402)	a	403)	d	404)	b
405)	d	406)	c	407)	b	408)	b
409)	b	410)	a	411)	d	412)	a
413)	a	414)	b	415)	d	416)	a
417)	d	418)	b	419)	c	420)	b
421)	c	422)	b	423)	a	424)	b
425)	d	426)	b	427)	b	428)	b
429)	a	430)	a	431)	a	432)	a
433)	c	434)	a	435)	b	436)	c
437)	c	438)	b	439)	c	440)	a
441)	a	442)	c	443)	d	444)	c
445)	b	446)	c	447)	c	448)	d
449)	c	450)	b	451)	c	452)	c
453)	b	454)	d	455)	c	456)	c
457)	c	458)	d	459)	a	460)	d
461)	a	462)	c	463)	a	464)	a
465)	a	466)	a	467)	c	468)	a
469)	b	470)	c	471)	d	472)	b
473)	a	474)	d	475)	d	476)	a
477)	b	478)	b	479)	d	480)	a
481)	c	482)	b	483)	a	484)	a
485)	b	486)	d	487)	a	488)	a
489)	a	490)	c	491)	b	492)	b
493)	a	494)	d	495)	c	496)	c
497)	d	498)	b	499)	c	500)	d
501)	a	502)	a	503)	a	504)	b
505)	c	506)	a	507)	c	508)	c
509)	a	510)	a	511)	a	512)	d
513)	d	514)	d	515)	b	516)	a
517)	b	518)	d	519)	a	520)	d
521)	b	522)	a	523)	a	524)	a
525)	a						

SOME BASIC CONCEPTS OF CHEMISTRY

CHEMISTRY

: HINTS AND SOLUTIONS :

1 **(d)**
Wt. of O in Fe_2O_3 and FeO is 48 : 16

2 **(c)**
Equivalent weight of bivalent metal=37.2
$\therefore$ Atomic weight of metal=$37.2 \times 2 = 74.4$
$\therefore$ Formula of chloride=MCl_2
Hence, molecular weight of chloride
$MCl_2 = 74.4 + 2 \times 35.5$
$= 145.4$

3 **(d)**
$\because$ 0.0833 mole of carbohydrate has hydrogen=1 g
$\therefore$ 1 mole of carbohydrate has hydrogen
$= \frac{1}{0.0833} = 12$ g
Given, empirical formula of carbohydrate (CH_2O) has 2 g of hydrogen.
$\therefore \quad n = \frac{12}{2} = 6$
$\therefore$ Molecular formula of carbohydrate is
$(CH_2O)_n = (CH_2O)_6 = C_6H_{12}O_6$

4 **(a)**
Eq. wt. $Zn(OH)_2 = \frac{\text{mol.wt.}}{\text{acidity}} = \frac{M}{1}$;
Acidity of $Zn(OH)_2 = 1$; only one OH is replaced.

5 **(d)**
$$\text{M. f.} = \frac{5.85/58.5}{\frac{5.85}{58.5} + \frac{90}{18}} = 0.0196$$

6 **(a)**
$$2Ag_2CO_3 \xrightarrow{\Delta} 4\,Ag + 2CO_2 + O_2$$
2×276 g $\quad 4 \times 108$ g (s)
$\because$ 2×276 g of Ag_2CO_3 gives=4×108 g Ag
$\therefore$ 1 g of Ag_2CO_3 gives=$\frac{4\times108}{2\times276}$
$\therefore$ 276 g of Ag_2CO_3 gives=$\frac{4\times108\times2.76}{2\times276}$
=2.16 g

7 **(a)**
For phenolphthalein:
$\frac{1}{2}$Meq. of $Na_2CO_3 = 2.5 \times 0.1 \times 2 = 0.5$
For methyl orange:
$\frac{1}{2}$ Meq. of Na_2CO_3 + Meq. of $NaHCO_3$
$= 2.5 \times 0.2 \times 2 = 1.0$
$\therefore$ Meq. of $NaHCO_3 = 0.5$ and Meq. of Na_2CO_3
$= 1.0$
$\therefore \quad \frac{w}{84} \times 1000 = 0.5 \qquad \frac{w}{106/2} \times 1000 =$
1
$\therefore w = 0.042$ g in 10 mL $\qquad \therefore w = 0.053$ g in 10 mL
$\therefore w = 4.2$ g in 1 litre $\qquad = 5.3$ g in 1 litre

8 **(d)**
$\because$ 18 g water has N molecules
$\therefore$1 g water has $\frac{N}{18}$ molecules
or $\frac{N}{18}$ molecules occupy volume $= 1\text{cm}^3 \left(d = \frac{m}{V}\right)$
$\therefore$ 1molecule occupies volume
$$= \frac{18}{N} = \frac{18}{6.023 \times 10^{23}} \approx 3 \times 10^{-23}\ \text{cm}^3$$

9 **(c)**
$$m = \frac{wRT}{PV} = \frac{510 \times 10^{-3} \times 0.0821 \times 273}{1 \times 67.2/1000} = 170$$

10 **(a)**
Suppose the volume of 6 M HCL required to obtain 1 L of 3 M
HCl = x L
$\therefore$ volume of 2 N HCl required $= (1 - x)$ L
Applying the molarity equation
$M_1V_1 + M_2V_2 = M_3V_3$
6M HCl + 2 MHCl 3M HCl
$6x + 2(1 - x) = 3 \times 1$
$4x = 1$
$x = 0.25$ L
Hence, volume of 6M HCl required $= 0.25$ L
and volume of 2M HCl required $= 0.75$ L

11 **(a)**
$N = M \times$ acidity $= 1 \times 2 = 2$ (Na_2CO_3 is diacidic base)

12 **(d)**
1 mole of H_2SO_4 gives = 3 moles of ions or $3 \times 6.023 \times 10^{23}$ ions
$\therefore$ 0.1 mole of H_2SO_4 will give $= 0.1 \times 3 \times 6.023 \times 10^{23}$ ions
$= 1.8 \times 10^{23}$ ions

13 **(b)**
Eq. of element = Eq. of oxygen or $\frac{W_1}{E_1} = \frac{W_2 - W_1}{8}$

14 **(c)**
1 mole of $(NH_4)_3PO_4$ contains 12 moles of hydrogen atoms.
$\therefore$ 12 moles of hydrogen atoms $\equiv$ 1 mole of

$(NH_4)_3PO_4$

$\therefore$ 1 moles of hydrogen atom $= \frac{1}{12}$ mole of $(NH_4)_3PO_4$

$\therefore$ 6.36 moles of hydrogen atom $= \frac{1}{12} \times 6.36$

$= \frac{6.36}{12}$ mole of $(NH_4)_3PO_4$

1 mole of $(NH_4)_3PO_4 = 4$ moles of oxygen

So, $\frac{6.36}{12}$ mole of $(NH_4)_3PO_4 = \frac{4\times6.36}{12} = 2.12$ mol

15 **(c)**

Meq. of HCl = Meq. of NaOH;

Thus, $\frac{1}{20} \times V = 20 \times \frac{1}{10}$

$V = 40$ mL

16 **(a)**

Molecular weight = Eq. wt. × valence factor

17 **(d)**

Smallest and largest amount of energy respectively eV and L-atm.

$1 \text{ eV} = 1.6 \times 10^{-19}$J

$1 \text{ L} - \text{atm} = 101.325$ J

18 **(d)**

$\because$ 63.8 g of Cu has atoms $= 6.023 \times 10^{23}$

$\therefore 1g$ of Cu has $= \frac{6.023\times10^{23}}{63.5g}$

$\therefore 0.635\ g$ of Cu has $= \frac{6.023\times10^{23}}{63.5} \times 0.635$

$= 6.023 \times 10^{21}$ atoms

19 **(b)**

$2BCl_3 + 3H_2 \rightarrow 2B + 6HCl$

2 mol 3 mol 2 mol

21.6 g=2 mol

21.6 g B= 2 mol B≡ 3 mol H_2

$pV = nRT$

$\therefore V = \frac{nRT}{P} = \frac{3 \times 0.0821 \times 273}{1} = 67.2$ L

20 **(b)**

$\frac{N}{n} = \frac{N_{AV}.\times n}{n} = N_{AV}.$

21 **(c)**

n *is* an integer.

22 **(a)**

Conservation of mass should be noticed.

23 **(c)**

The volume of water changes with temperature.

24 **(c)**

$\because$ Amount of heat evolved on combustion of 4 g of methane=10.46 kJ

$\therefore$ The amount of heat evolved on combustion of one mole of methane (*ie*, 16 g of CH_4)

$= \frac{10.46}{4} \times 16 = 41.84$kJ

25 **(c)**

Mol. wt. $= 70 \times 2 = 140$;

$(CO)x$, $\therefore(12 + 16).x = 140$ $\therefore x = 5$

28 **(c)**

Mole fraction of solute $= \frac{n}{n+N}$;

Mole fraction of solvent $= \frac{N}{n+N}$;

29 **(a)**

We have $HNO_3^{+5} \rightarrow \overset{+2}{NO}$

Change in oxidation number = 3

Equivalent mass of $HNO_3 = \frac{63g\ mol^{-1}}{3\ eq\ mol^{-1}} = 21$ g eq^{-1}

30 **(b)**

5.6 litre = 60 g

$\therefore$ 22.4 litre = 240 g = mol. wt.

$\therefore$ Vapour density $= M/2 = 120$

31 **(d)**

32 g O_2 contains $2N$ atoms.

33 **(b)**

Mol. wt. of metal chloride $= 95 \times 2 = 190$

At. wt. of metal $= \frac{6.4}{0.13} = 49.23$

Let the metal chloride be MCl_n

Then $49.23 + n \times 35.5 = 190$

$\therefore$ n = 3.9 ≈ 4;

$\therefore$Eq. wt. of metal $= \frac{49.23}{4} = 12.3$

34 **(c)**

Atomic weight of element,

M =equivalent weight×valency

$= 20 \times 3$

$= 60$

Molecular formula of its oxide=M_2O_3

Hence, molecular weight of oxide

$= 2 \times 60 + 3 \times 16$

$= 120 + 48 = 168$

35 **(b)**

Gram molecular volume of oxygen at STP is 5.6L or 5600 cm^3.

36 **(d)**

Element	Percentage	At. Wt.	Moles	Simplest Ratio
X	75.8	75	$\frac{75.8}{15} = 1$	2
Y	24.2	16	$\frac{24.2}{16} = 1.5$	3

$\therefore$ The formula of the compound isX_2Y_3.

37 **(c)**

Meq. of oxalic acid $= 500 \times 0.1 = 50$

$\therefore$ $\frac{w}{E} \times 1000 = 50$

$\because \quad w = \frac{126}{2} \times \frac{50}{1000} \quad \left(\because E = \frac{126}{2}\right)$

$= 3.15$ g

38 **(d)**

In acidic medium following reaction takes place.

$8H^+ + 5e^- + MnO_4^- \rightarrow Mn^{2+} + 4H_2O$

$\therefore$ Equivalent weight of $KMnO_4$ in acidic medium

$= \frac{\text{molecular weight of } KMnO_4}{5}$

$= \frac{158}{5} = 31.6$

39 **(d)**

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

$\overset{+6}{Cr_2O_7^{2-}} \rightarrow Cr^{3+}$

x-factor=6

Mohr's salt, $FeSO_4.(NH_4)_2SO_4.6H_2O$

oxidation; $Fe^{2+} \rightarrow Fe^{3+}$

x-factor=1

Mole ratio is reverse of x-factor ratio. Therefore, one mole of dichromate required=6 moles of Mohr's salt.

40 **(a)**

Particle pressure of oxygen $= \frac{2}{1+4+2} \times 2660$

$= 760$ mm

Thus, 1 L oxygen gas is present at 0°C and 760 mm pressure.

$\therefore$ Number of oxygen molecules $= \frac{6.023 \times 10^{23}}{22.4}$

41 **(b)**

$2Ag + 2HNO_3 \longrightarrow 2AgNO_3 + H_2$

$2AgNO_3 + 2NaCl \longrightarrow 2AgCl + NaNO_3$

$AgCl \equiv AgNO_3 \equiv Ag$

143.5g 170 g 108g

$\because$ 143.5 g AgCl is obtained from Ag = 108g

$\therefore$ 2.87 g AgCl is obtained from Ag $= \frac{108 \times 2.87}{143.5}$

= 2.16g

42 **(d)**

1 mole is defined as the amount of matter that contains as many as objects (atoms, molecule, electron, proton or whatever, objects we are considering) as the number of atoms in exactly 12g of C^{12}, *i. e*., Avogadro's number.

43 **(d)**

$\because$ Number of atoms present in 12 g carbon

$= 6.023 \times 10^{23}$

$\therefore$ No. of atoms present in 1 mg carbon

$= \frac{6.023 \times 10^{23} \times 1}{12 \times 1000}$

$= 0.502 \times 10^{20}$

44 **(c)**

Meq. of H_2S = Meq. of Cu^{2+}

$\frac{w}{34/2} \times 1000 = \frac{63.5}{63.5/2} \times 1000$

45 **(b)**

Given that, oxygen contents in element oxide is 20% by weight.

Hence, element contents in element oxide is 80% by weight.

Then, equivalent weight of unknown element= $\frac{80}{20} \times 8$

$\therefore$ Equivalent weight of unknown element=32

46 **(c)**

Molecular weight of cortisone = 360.4

Molecular weight of 21 carbon atom $= 21 \times 12 = 252$

% of carbon in cortisone $= \frac{252 \times 100}{360.4}$

= 69.9%

47 **(d)**

The terms which involves only weights in their formula

$\left[e.g. \text{ molality} = \frac{\text{wt. of solute} \times 1000}{\text{mol. wt. of solute} \times \text{wt. of solvent}}\right]$

are independent of temperature. On the other hand, since, volume change with temperature, the terms having volume in their formula

$\left[e.g. \text{ molality} = \frac{\text{wt. of solute} \times 1000}{\text{mol. wt. of solute} \times \text{volume of solvent}}\right]$

are dependent on temperature.

48 **(c)**

6×10^{23} electron ≡1 equivalent.

49 **(b)**

Meq. of H_2SO_4 = Meq. of NaOH

$V \times 0.1 \times 2 = 30 \times 2.0 \times 1$

$\therefore \quad V = 300$ mL

50 **(c)**

Nitrogen shows variable valency and thus, have variable equivalent weight.

51 **(d)**

$\frac{E_{\text{hydroxide}}}{E_{\text{metal}} + E_{OH^-}} > \frac{E_{\text{oxide}}}{E_{\text{metal}} + E_O}$

$\frac{1.520}{E + 17} = \frac{0.995}{E + 8}$

or $E = 9$

52 **(b)**

Given, mass of C=10.5 g

H=1.0 g

p=1atm

$V = 1$ L
$T = 127°C = 127 + 273 = 400$ K
Mass of gas=2.81 g
Weight of C + weight of hydrogen=10.5+1.0=11.5 g
∴ % of carbon=$\frac{10.5}{11.5} \times 100 = 91.3\%$
∴ % of hydrogen=$\frac{1.0}{11.5} \times 100 = 8.7\%$

Element	%	At. weight	Ratio of atoms	Simplest ratio
C	91.3	12	91.3/12=7.61	7.61/7.61=1
H	8.7	1	8.7/1=8.7	8.7/7.61 =1.14×7=8

From gas equation, $pV = nRT$
or $n = \frac{pV}{RT}$
$\frac{\text{mass}}{\text{mole mass}} = \frac{pV}{RT}$
or 2.81/mole mass=$\frac{1 \times 1}{0.082 \times 400}$
=92
Empirical formula wt.=C_7H_8
∴ Empirical formula=$7 \times 12 + 8 \times 1$
$= 92$
$n = \frac{\text{molecular wt.}}{\text{empirical formula wt.}} = \frac{92}{92} = 1$
Molecular formula=n (empirical formula)
$= 1\ (C_7H_8)$
$= C_7H_8$

53 **(b)**
$CH_3 - NH_2 + HNO_2 \rightarrow CH_3OH + N_2 + H_2O$
1 mole of methyl amine gives 1 mole N_2
i.e., 22.4 L of nitrogen at NTP.

54 **(a)**
Meq. of $MgCO_3$ = Meq. of H_2SO_4
∴ $\frac{3}{84/2} \times 1000 = \frac{w}{49} \times 1000$;
∴ $w = 3.5$ g

55 **(c)**
Eq. of metal = Eq. of oxide
$\frac{100}{E} = \frac{24}{8}$
∴ $E = 33.3$

57 **(b)**
100 mL of 1 M $AgNO_3 \equiv 0.1$ mol $AgNO_3$
100 mL of 1 M $CuSO_4 = 0.1$ mol $CuSO_4$
$2AgNO_3 + H_2S \rightarrow Ag_2S + 2HNO_3$
2 mol 1 mol
0.1 mol 0.05 mol
$CuSO_4 + H_2S \rightarrow CuS + H_2SO_4$
1 mol 1 mol
0.1 mol 0.1 mol
∴ Ratio of the amounts of H_2S needed=0.05:0.1=1:2

58 **(a)**
Mole fraction $= \frac{1}{1+\frac{1000}{18}} = 0.0177$

59 **(d)**
H_3PO_3 is dibasic acid; thus, Na_2HPO_3 is normal salt
$= M/2$

60 **(a)**
Meq. of NaOH $= 250 \times 0.1 = 25$
∴ $\frac{w}{40} \times 1000 = 25$
∴ w = 1 g

61 **(c)**
At. wt. × specific heat ≈ 6.4

62 **(b)**
$Ag_2S \equiv 2Ag$
248g 2×108g
2×108 g Ag is obtained from $Ag_2S = 248$ g
1 g Ag will be obtained from $Ag_2S = \frac{248 \times 1}{2 \times 108}$
$= \frac{248}{216}$ g
But, the ore contains only 1.34% Ag_2S.
Thus, 1 g Ag is obtained from ore $= \frac{248}{216} \times \frac{100}{1.34}$ g
$= 85.68$ g

64 **(a)**
Number of atoms in 40 kg=$\frac{40 \times 10^3 \text{g}}{6.644 \times 10^{-23} \text{ g}}$
(∵ Weight of an atom=6.644×10^{-23}g)
$= 6.02 \times 10^{26}$
∴ Number of gram atoms of element in 40 kg
$= \frac{6.02 \times 10^{26}}{6.02 \times 10^{23}} = 10^3$

66 **(b)**
Since, 1 g hydrogen combines with 80 g bromine, the eq. wt. of bromine = 80
∵ 4 g bromine combines with Ca = 1g
∴ 80 g bromine will combine with Ca $= \frac{1 \times 80}{4} =$ 20g
∴ Eq. wt. of Ca is 20 g.

67 **(d)**
Atomic mass of the metal=$32 \times 2 = 64$
Formula of metal nitrate=$M(NO_3)_2$
∴ Molecular mass=64+28+96=188

68 **(b)**
$Mg + 2HCl \longrightarrow MgCl_2 + H_2$
24 g Mg gives one mole H_2

69 **(d)**
Valence of $M = \frac{27}{9} = 3$,
Thus, formula of chloride is MCl_3.

70 **(b)**

Eq. of metal = Eq. of oxide

$$\frac{1.6}{E} = \frac{2}{E+8}; E = 32$$

71 **(b)**

$$M = \frac{5.85 \times 1000}{58.5 \times 500} = 0.2$$

72 **(b)**

Valence of an element is variable say it is 2 and 3 in $FeCl_2$ and $FeCl_3$ respectively. Also equivalent weight $= \frac{\text{at. weight}}{\text{valence}}$ and thus, it is also variable.

73 **(c)**

At. wt. = Eq. wt. × 3 (valence = 3)

74 **(c)**

Meq. of $Na_2CO_3 \cdot xH_2O$ in 20 mL $= 19.8 \times \frac{1}{10}$

∴ Meq. of $Na_2CO_3 \cdot xH_2O$ in 100 mL $= 19.8 \times \frac{1}{10} \times 5$

∴ $\frac{w}{E} \times 1000 = 19.8 \times \frac{1}{10} \times 5$

or $\frac{0.7}{M/2} \times 1000 = \frac{19.8}{2}$

∴ $M = 141.41$

∴ $23 \times 2 + 12 + 3 \times 16 + 18x = 141.41$

∴ $x = 2$

75 **(c)**

At. wt. × specific heat = 6.4

76 **(c)**

Moles of Fe$=\frac{560}{56} = 10$

Moles of N$=\frac{70}{14} = 5$

Moles of H$=\frac{20}{1} = 20$

Equal number of moles have equal number of atoms.

Hence, number of atoms in 560 g of Fe is twice that of 70 g N and is half that of 20 g of H.

77 **(d)**

Molecular mass of $(CHCOO)_2Fe$=170

∴ In 100 g $(CHCOO)_2Fe$, iron present $= \frac{56}{170} \times 100$ mg

= 32.9 mg

Since, this quantity of Fe is present in 400 mg of capsule,

∴ % of Fe in capsule $= \frac{32.9}{400} \times 100 = 8.2\%$

78 **(b)**

By the equation

	Zn	$+ I_2$	$\longrightarrow ZnI_2$
Initial moles (if x be the wt. Of Zn and I_2 each initially)	$\frac{x}{65}$	$\frac{x}{254}$	0
No. of moles at the end	$\left(\frac{x}{65} - \frac{x}{254}\right)$	0	$\frac{x}{254}$

Of reaction

So, fraction of Zn unreacted $= \frac{\frac{x}{65} - \frac{x}{254}}{\frac{x}{65}} = 0.74$

79 **(c)**

Weight of pure NaCl$=6.5 \times 0.9 = 5.85$ g

No. of equivalent of NaCl$= \frac{5.85}{58.5} = 0.1$

No. of equivalent of NaOH obtained=0.1

Volume of 1 M acetic acid required for the neutralisation of

$$NaOH = \frac{0.1 \times 1000}{1}$$

$= 100 \text{ cm}^3$

82 **(a)**

Given vapour density=11.2

Molecular weight$=2 \times 11.2 = 22.4$

∴22.4 g of gas occupies=22.4 L at STP

∴ 1 g of gas occupies$=\frac{22.4}{22.4} \times 1 = 1$ L at STP

83 **(a)**

In the given metal nitride, nitrogen present is 28% that means, the nitride contains 28 g nitrogen and 72 g metal.

Moles of metal $= \frac{72}{x}$

Moles of nitrogen $= \frac{28}{14} = 2$

$\Longrightarrow$ Molar ratio, $M : N = \frac{72}{x} : 2 = 3 : 2$

$$\frac{72}{x} = 3$$

∴ $x = 24$

84 **(c)**

g atom of I$= \frac{25.4}{127} = 0.2$

g atom of oxygen $= \frac{8}{16} = 0.5$

∴Ratio of g atoms I : O : : 2 : 5

85 **(a)**

0.5 mole of $H_3O^+ = 20$ g; Also H_3O^+ is monovalent, thus

Mol. wt. = Eq. wt.

∴1 mole of $H_3O^+ = 40$ g

86 **(d)**

$$C_aH_b + \left(a + \frac{b}{4}\right)O_2 \longrightarrow aCO_2 + (b/2)H_2O$$

C_aH_b	O_2	CO_2	H_2O
10	Excess	-	-
0		$10a$	$5b$

∴ $10a = 40$ ∴ $a = 4$

$5b = 50$ ∴ $b = 10$

87 **(c)**

Milli mole of $\underset{\text{(Conc.)}}{H_2SO_4}$ = Milli mole of $\underset{\text{(Dil.)}}{H_2SO_4}$

$$10 \times 18 = M \times 1000$$

∴ $M = 0.18$

89 **(d)**

100 g alkaloid contains nitrogen=17.28 g

∴ 162 g alkaloid will contain nitrogen

$= \frac{17.28 \times 162}{100}$ g

$= 27.9$ g ≈ 28 g

Atomic weight of nitrogen=14

So, number of atoms of nitrogen present in one molecular of alkaloid= $\frac{28}{14} = 2$

90 **(b)**

$$M = \frac{\text{moles of urea}}{\text{volume in litre}} = \frac{6.02 \times 10^{20}}{6.02 \times 10^{23} \times \frac{100}{1000}}$$

$= 0.01\,M$

91 **(d)**

$2BCl_3 + 3H_2 \longrightarrow 2B + 3HCl$

$2 \times 10.8\text{g}\,B \equiv 3 \times 22.4\text{ L } H_2$

$\therefore\quad 21.6\text{g B} \equiv \frac{3 \times 22.4 \times 21.6}{2 \times 10.8}$

$= 67.2\text{L } H_2$

92 **(d)**

Eq. of metal = Eq. of chlorine

$\frac{w}{E} = \frac{2w}{35.5}$ $\quad \therefore E = \frac{35.5}{2} =$ 17.75

93 **(b)**

$$5C_2O_4^{2-} + \overset{+7}{2MnO_4^-} + 16H^+ \rightarrow 10CO_2 + 2Mn^{2+} + 8H_2O$$

Equivalent weight= $\frac{\text{molecular weight}}{\text{change in oxidation number}}$

$= \frac{158}{5} = 31.6$

94 **(d)**

Mol. wt. of C_2H_5OH

$= 12 \times 2 + 1 \times 5 + 16 + 1 = 46$ g

∵ 46 g of C_2H_5OH has hydrogen atoms

$= 6 \times$ Avogadro number

∴ 0.046 g of C_2H_5OH has hydrogen atoms

$= \frac{6 \times 6.023 \times 10^{23} \times 0.046}{46}$

$= 3.6 \times 10^{21}$ atoms of hydrogen.

95 **(a)**

Both have same empirical formula CH_2O.

96 **(a)**

Moles of $H_2 = \frac{15}{22.4} = 0.67$

Moles of $N_2 = \frac{5}{22.4} = 0.22$

Moles of $H_2 = \frac{0.5}{2} = 0.25$

Moles of $O_2 = \frac{10}{32} = 0.31$

Larger is number of mole, more is number of molecule.

97 **(d)**

$C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$

2 mole CO_2 is formed.

99 **(b)**

$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$

$Na_2CO_3 \xrightarrow{\Delta} Na_2CO_3$

The no. of equivalent of $NaHCO_3$ = No. of equivalent of Na_2CO_3 formed. Thus , same equivalent of HCl will be used.

100 **(a)**

Element	%ntage atomic wt.	Simplest ratio
C	$\frac{92.3}{12} = 7.69$	$\frac{7.69}{7.69} = 1$
H	$\frac{7.7}{1} = 7.70$	$\frac{7.70}{7.69} = 1$

∴ Empirical formula=CH

101 **(b)**

Eq. of metal = Eq. of Cu

$\therefore \quad \frac{1.5}{E} = \frac{4}{64/2}$

$\therefore \quad E = 12$

$\therefore \quad$ At. wt. = 24

102 **(b)**

Weight of copper oxide=5 g

Weight of copper taken=4 g

∴ Weight of oxygen in copper oxide=5-4=1 g

∴ Weight of copper, reacted with 1 g $O_2 = 4$ g

∴ Weight of copper, which would react with 8 g $O_2 = \frac{4 \times 8}{1} = 32$ g

Hence, equivalent weight of copper=32

103 **(a)**

$$\frac{\text{wt. of metal X}}{\text{wt. of metal Y}} = \frac{\text{Eq. wt. of metal X}}{\text{Eq. wt. of metal Y}}$$

104 **(a)**

1 atom = 260 amu = $260 \times 1.66 \times 10^{-24}$g

105 **(d)**

Mol. wt.=2 × vapour density

$= 2 \times 45 = 90$

Empirical formula weight=12+2+16=30

$\therefore n = \frac{\text{mol. wt}}{\text{empirical formula wt.}}$

$= \frac{90}{30} = 3$

∴ Molecular formula of the compound

$= (CH_2O)_3$

$= C_3H_6O_3$

106 **(d)**

Mole ratio of $H_2 : O_2 : H_2O :: 2 : 1 : 2$

107 **(a)**

$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$

108 **(c)**

$\because$ Mass of 22400 cm^3 of CH_4 at STP = 16 g

$\therefore$ Mass of 1 cm^3 of CH_4 at STP = $\frac{16}{22400}$ g

$\therefore$ Mass of 112 cm^3 of CH_4 at STP = $\frac{16}{22400} \times 112$

= 0.08 g

109 **(c)**

For electrolytic concentration term formality is used in place of molarity. Formality is g formula weight of electrolyte in one litre solution. Remember it is not possible to determine exact mol. weight of electrolytes. We simply assume the formula say for sodium chloride it is NaCl and formula weight is 58.5. This value can never be obtained experimentally.

110 **(c)**

100 g sample ≡ 0.33 g iron

$\therefore$ 67200 g ≡ 221.8 g iron

$\therefore$ Number of iron atoms per molecule of haemoglobin

$= \frac{221.8}{56} \approx 4.$

111 **(b)**

Since, the molecular formula is n times the empirical formula, therefore, different compounds having the same empirical formula must have different molecular weights.

112 **(a)**

$\because$ 0.1mole of carbohydrate contains = 1 g of hydrogen.

$\therefore$ 1 mole of carbohydrate contains = $\frac{1}{0.1}$

= 10 g

hydrogen

Hence, its molecular formula = $C_5H_{10}O_5$.

113 **(c)**

Mole fraction of solute = $\frac{n}{n+\lambda}$

$= \frac{1}{1+\frac{1000}{18}} = 0.0177$

114 **(b)**

8 mole O ≡ 1 mole $Mg_3(PO_4)_2$

$\therefore$ 0.25 mole O = $\frac{1\times0.25}{8}$

$= 3.125 \times 10^2$ mole $Mg_3(PO_4)_2$

115 **(b)**

$5CO + I_2O_5 \rightarrow 5CO_2 + I_2$

1 mole of I_2 ≡1 moles of I_2O_5 ≡5 moles of CO

Hence, mole of CO=$5 \times \frac{2.54}{254} = 0.05$

Mass of CO=$0.05 \times 28 = 1.4$g

Mass of $CO_2 = 2 - 1.4 = 0.6$ g

Mass % of $CO_2 = \frac{0.6\times100}{2} = 30$

116 **(d)**

g-atom of $I_2 = \frac{254}{127} = 2$;

g-atom of oxygen = $\frac{80}{16} = 5$

$\therefore$ compound is I_2O_5.

117 **(c)**

Vapour density of $A = 3 \times$ Vapour density of B

$\therefore$ mol. wt. of $A = 3 \times$ mol. wt. of B

118 **(c)**

Let a g of Cu be oxidised to give CuO,

$i.e., \frac{(63.6+16)a}{63.6}$ g

Thus, final weight

$= (3.18 - a) + \frac{(63.6+16)a}{63.6} = 3.92$

$\therefore \quad a = 2.94$ g

Thus, % of Cu left unoxidised

$\frac{(3.18-2.94)}{3.18} \times 100 = 7.55\%$

119 **(b)**

Eq. wt. of $SO_2 = \frac{\text{molar mass}}{\text{O.N.of S}} = \frac{64}{4} = 16$

$\therefore$ Twice of this value = 32

120 **(a)**

Mol. wt. of metal chloride = 50 × 2=100;

Let metal chloride be MCl_n then

Eq. of metal = Eq. of chloride, or $\frac{29}{E} = \frac{71}{35.5}$

$\therefore \quad E = \frac{29}{2}$;

Now $\quad a + 35.5n = 100$

or $\quad n.E + 35.5n = 100$;

$\therefore \quad n = 2$

Therefor, $\quad a = 2 \times E = 2 \times (29/2) = 29.$

121 **(d)**

$\underset{3\text{ mol}}{3BaCl_2} + \underset{2\text{ mol}}{2Na_3PO_4} \longrightarrow \underset{1\text{ mol}}{Ba_3(PO_4)_2} + 6NaCl$

Here, Na_3PO_4 is the limiting reactant.

2 moles of Na_3PO_4 gives 1 mole of $Ba_3(PO_4)_2$

So, 0.2 mole of Na_3PO_4 will give 0.1 mole of$Ba_3(PO_4)_2$.

123 **(a)**

$$M_{Al_2(SO_4)_3} = \frac{342}{342 \times 1} = 1$$

124 **(a)**

$Na_2CO_3 + 2HCl \rightarrow NaCl + H_2O + CO_2$

In the above reaction equivalent weight of Na_2CO_3 is $\frac{M}{2}$ because 2 moles of Na^+ being transferred per mole of Na_2CO_3.

125 **(b)**

	Oxide I	Oxide II
Metal, M	50%	40%
Oxygen, O	50%	60%

As first oxide is MO_2

Let atomic mass of $M = x$

$\therefore\ \%O = \frac{32}{x+32} \times 100$

Or $\frac{50}{100} = \frac{32}{x+32}$

Or $0.5 = \frac{32}{x+32}$

Or $0.5 \times x + 16 = 32$

Or $0.5x = 16$

$x = 32$

$\therefore$At. Mass of metal $M = 32$

Let formula of second oxide is M_2O_n

$\%M = \frac{2x}{2x+16n} \times 100 = \frac{64}{64+16n} \times 100$

$$\frac{40}{100} = \frac{64}{64+16n}$$

Or $\frac{100}{40} = \frac{64+16n}{64}$

$2.5 = 1 + 0.25\,n$

$n = \frac{1.5}{0.25} = 6$

Therefore, formula of second oxide $= M_2O_6$

Or $= MO_3$

126 **(b)**

Element	**% age**	**Atomic mass**	**Molar ratio**	**Simpler molar ratio**
C	10.06 %	12	$\frac{10.06}{12} = 0.84$	$\frac{0.84}{0.84} = 1$
H	0.84 %	1	$\frac{0.84}{1} = 0.84$	$\frac{0.84}{0.84} = 1$
Cl	89.10 %	35.5	$\frac{89.10}{35.5} = 2.5$	$\frac{2.5}{0.84} = 3$

Thus, the empirical formula of the substance of $CHCl_3$.

127 **(d)**

22.4 litre water vapour $= 1$ mole $H_2O = 18$ g H_2O liquid $=18$ mL H_2O .

128 **(c)**

Eq. wt. of $FeCl_2$ = Mol. wt. 2/; Eq. wt. of $FeCl_3$ = mol. wt./3

129 **(c)**

No. of Millimoles of $Ca(OH)_2 = 50 \times 0.5 = 25$

No. of Millimoles of $CaCO_3 = 25$

No. of milliequivalents of $CaCO_3 = 50$

$\therefore$ Volume of 0.1 N HCl$=\frac{50}{0.1} = 500\ cm^3$

130 **(b)**

$$M = \frac{9.8}{98 \times 2} = \frac{1}{20} = 0.05$$

131 **(b)**

1 mole $= M \times V_{\text{in } l}$

132 **(c)**

mM of $A = 100 \times 0.1 = 10$

mM of $B = 25 \times 0.2 = 5;$

$\therefore$ Total $mM = 10 + 5 = 15$

$\therefore \quad M = \frac{15}{100+25} = \frac{15}{125}$

133 **(c)**

Wt. of H : O in H_2O is 2 : 16

134 **(a)**

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

1 mol 1 mol

$CaCl_2 + Na_2CO_3 \rightarrow CaCO_3 + 2Na_2$

1 mol 1 mol

1 mol CaO $\cong$1 mol $CaCl_2$

$\frac{0.56}{56}$ mol CaO$\cong$0.01 mol $CaCl_2$

$= 0.01 \times 111$ g$CaCl_2$

$= 1.11$ g $CaCl_2$

Thus, in the mixture, weight of NaCl=4.44−1.11=3.33 g

$\therefore$ Percentage of NaCl$=\frac{3.33}{4.44} \times 100 = 75\%$

135 **(d)**

$$2Al(s) + 6HCl(aq) \rightarrow 2Al^{3+}(aq) + 6Cl^-(aq) + 3H_2(g)$$

3×22.4 L H_2(g) at STP is produced by 6 moles of HCl (aq)

Hence, 11.2 L H_2 (g) at STP is produced by 1 mole HCl (aq).

136 **(c)**

Molecular mass of Na_2CO_3

$= 2 \times 23 + 12 + 3 \times 16 = 106$

$\therefore$ 106 g Na_2CO_3 contains

$= 3 \times 6.023 \times 10^{23}$ oxygen atoms

$\therefore$ 10.6 g of Na_2CO_3 will contain

$$= \frac{3 \times 6.023 \times 10^{23}}{106} \times 10.6$$

$= 18.069 \times 10^{22}$

$= 1.806 \times 10^{23}$ oxygen atoms

137 **(c)**

$$m = \frac{wRT}{PV} = \frac{0.22 \times 0.0821 \times 293}{[(755 - 17.7)/760] \times [45/1000]} = 121.1$$

138 **(a)**

Number of moles $= \frac{weight}{olecular\ wt.} = \frac{0.0018}{18} \times 1 \times 10^{-4}$

$[\because 0.0018\ mL = 0.0018\ g]$

$\therefore$ Number of water molecules $= 1 \times 10^{-4} \times 6.02 \times 10^{23}$

$= 6.023 \times 10^{19}$

139 **(a)**

Mass of hydrogen $= \frac{0.7}{22.4} \times 2 = \frac{14}{224} g = 0.0625 g$

$\because$ 0.0625 g of hydrogen is displaced by x g metal.

$\therefore$ 1g of hydrogen is displaced by $= \frac{x}{0.0625}$ g of metal

$\Longrightarrow \frac{x}{0.0625} = 28$

Eq. mass of metal, $x = 28 \times 0.0625 = 1.75 g$

140 **(d)**

N_2O and NO verify the law of multiple proportions.

141 **(d)**

Butane and isobutance have same molecular formula.

Thus, $C_4H_{10} + \left(\frac{13}{2}\right) O_2 \longrightarrow 4CO_2 + 5H_2O$

$\because$ 58 g C_4H_{10} requires $O_2 = \frac{12}{2} \times 32$ g

$\because$ 1000 g C_4H_{10} requires O_2

$= \frac{13}{2} \times \frac{32 \times 1000}{58} = 3586.2 \text{ g} = 3.586 \text{ kg}$

143 **(b)**

g atom of $X = \frac{50}{10} = 5$;

g atom of $Y = \frac{50}{20} = 2.5$;

Ration of g atom of X and $Y = 2 : 1$.

144 **(b)**

Molarity means mole of solute in one litre solution.

145 **(c)**

Number of notes $= \frac{6.023. \times 10^{23} \times 24.8}{248}$

$= 6.023 \times 10^{22}$

Days for counting $= \frac{6.023 \times 10^{22}}{60 \times 10^{6}} = 10^{15}$

146 **(b)**

$\because$ g atom of S $= \frac{50}{32}$;

g atom of oxygen $= \frac{50}{16}$;

$\therefore$Ratio of g atoms of S and O = 1 : 2.

148 **(d)**

Amount of pure lime stone ($CaCO_3$)is 10 g of 90% sample

$= \frac{90}{100} \times 10 = 9$ g

$$\underset{100\text{ g}}{CaCO_3} \xrightarrow{\Delta} CaO + \underset{22.4\text{ L}}{CO_2}$$

100 g of lime stone gives 22.4 L of CO_2 at STP

$\therefore$ 9 g of lime stone will give

$= \frac{22.4}{100} \times 9 = 2.016$ L CO_2

149 **(c)**

Mass of 1 mole of methane (CH_4) = 16 g

Mass of 0.1 mole of methane = 16 × 0.1 g = 1.6 g

150 **(c)**

$\therefore$ 132 g $(NH_4)_2SO_4$ has $N = 28$ g

$\therefore$ 66 g $(NH_4)_2SO_4$ has $N = \frac{28 \times 66}{132} = 14$ g

151 **(a)**

wg $Fe_2O_3 = \frac{w}{160}$ mole $Fe_2O_3 = \frac{w}{160} \times 3$ mole O

wg FeO $= \frac{w}{72}$ mole FeO $= \frac{w}{72} \times 1$ mole O

$\therefore$ mole ration O in Fe_2O_3 and FeO $= \frac{3}{160} \times \frac{72}{1} = \frac{216}{160} = 1.35$

153 **(b)**

Mol. wt. of $(CH_2O)_n = 30 \times 2 = 60$

$\therefore \quad n = \frac{60}{30} = 2$

Empirical formula wt. (CH_2O) = 30

154 **(b)**

Weight of 11.2 dm^3 of CO_2 gas at STP=44/2 =22 g

$$\underset{56\text{ g}}{KOH} + \underset{44\text{ g}}{CO_2} \rightarrow KHCO_3$$

Mass of KOH required for complete neutralisation of 22 g

CO_2 is $= \frac{56}{44} \times 22 = 28$g

156 **(a)**

$Ag_2CO_3 \longrightarrow 2Ag + CO_2 + (1/2)O_2$

157 **(d)**

Equivalent weight

$= \frac{\text{Molecular mass}}{\text{Change in oxidation number per atom}}$

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

Equivalent weight of $K_2Cr_2O_7$

$= \frac{\text{molecular weight of } K_2Cr_2O_7}{2 \times \text{change in oxidation number}}$

$= \frac{M}{2 \times 3}$ [$\because$ Two Cr atoms are involved.]

$\therefore$ Equivalent weight of $K_2Cr_2O = \frac{M}{6}$

158 **(a)**

Calculate weight of each.

159 **(a)**

One molecule of $CH_3COOC_2H_5$ contains 14 atoms.

160 **(d)**

Meq. of HCl = Meq. of NaOH

$2 \times V = 1000$

$\therefore V = 500 \text{ mL} = \frac{1}{2}$ litre

161 **(d)**

Number of moles of oxygen $=\frac{80}{16}$

Number of atoms of oxygen $= \frac{80}{16} \times N_0 \times 2$

$= 5 \times N_0 \times 2$

Number of moles in 5 g of hydrogen $= \frac{5}{1}$

Number of atoms in 5 g of hydrogen $=5 \times N_0 \times 2$

Hence, the number of atoms in 80 g of oxygen is equal to the number of atoms in 5 g of hydrogen.

162 **(d)**

g atom of $A = \frac{75}{75} = 1$;

g atom of $B = \frac{25}{25} = 1$;

∴Ratio of g atom of A and $B = 1:1$

163 **(c)**

$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$

Gain electrons=5

Molecular weight=M

Equivalent weight=$\frac{\text{molecular weight}}{\text{gain electron}} = \frac{M}{5}$

164 **(b)**

$\text{Eq. wt.} = \frac{\text{mol. wt.}}{\text{basicity}}$

165 **(d)**

Meq. of HCl $= 5 \times 1 = 5$;

Meq. of $H_2SO_4 = 20 \times (1/2) = 10$;

Meq. of $HNO_3 = 30 \times (1/3)$ 10;

Thus, total Meq. of acid $= 5 + 10 + 10 = 25$

Total volume = 1000 mL.

Also Meq. $= N \times V$.

∴ $N = \frac{25}{1000} = \frac{1}{40}$

166 **(b)**

$CaCO_3 + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2O$

100 g 73 g 44g

100 mL of 20% HCl = 20 g =HCl

In this case, $CaCO_3$ is the limiting reactant.

∵ 100 g of $CaCO_3$ gives $CO_2 = 44$ g

∴ 20 g $CaSO_3$ will give $CO_2 = \frac{44 \times 20}{100} = 8.80$ g

167 **(a)**

Weight of empirical formula

$CH_2 = 12 + (1 \times 2)$

$= 12 + 2$

$= 14$

Mass of one mole of the compound=its molecular weight

=42

$n = \frac{\text{mol. wt.}}{\text{empirical formula wt.}} = \frac{42}{14} = 3$

∴ Mol. formula=(Empirical formula× n)

$= (CH_2) \times 3 = C_3H_6$

168 **(a)**

$C + O_2 \longrightarrow CO_2$;

12 g C needs 22.4 litre O_2 or 5×22.4 litre air.

169 **(a)**

Mixture X contains 0.02 moles of $[Co(NH_3)_5SO_4]Br$ and 0.02 moles of $[Co(NH_3)_5Br]SO_4$ was prepared in 2L of solution. So, the concentration of $[Co(NH_3)_5SO_4]Br$ and $[Co(NH_3)_5Br]SO_4$ in solution are 0.01 mol/L and 0.01 mol/L respectively. During the reaction with $AgNO_3$(excess), AgBr is precipitated as follows

$[Co(NH_3)_5\ SO_4]Br + AgNO_3$
$\rightarrow [Co(NH_3)_5SO_4]NO_3 + AgBr \downarrow$
0.01 mol/L (excess) soluble (Y)
0.01 mol/L

Hence, number of moles of y=0.01

On addition of excess $BaCl_2$, $BaSO_4$ is precipitated as follows

$[Co(NH_3)_5Br]SO_4 + BaCl_2 \rightarrow BaSO_4$
$\downarrow + [Co(NH_3)_5Br]Cl_2$
0.01 mol/L (excess) 0.01 mol/L soluble 'Z'

Hence, number of moles of Z =0.01

Thus, the number of moles of Y and Z are 0.01 and 0.01 respectively.

170 **(c)**

Meq. of NaOH $= 100 \times 0.5 = 50$

Meq. of HCl $= (1/5) \times 100 = 20$;

Meq. of $H_2SO_4 = (1/10) \times 100 = 10$;

Total Meq. of acid $= 20 + 10 = 30$

Total Meq. of NaOH = 50;

∴ Meq. of NaOH left $= 50 - 30 = 20$

Thus, resulting solution will be alkaline.

171 **(b)**

Eq. of $X = 1.5 \times a$

Eq. of HCl $= 2.5 \times 2 = 5.0$;

∴ $N_{\text{resultant}} = \frac{\text{total eq.}}{\text{total volume}}$

or $N = \frac{1.5 \times a + 5.0}{4}$ ∵$N = 5$

∴ $a = 10$

172 **(d)**

For water, 1 g= 1 mL (∵ d for water = 1)

∴ 18 g = 18 mL

18 mL water $= 6.02 \times 10^{23}$ molecules $= N_A$ molecules

$\because$ in 100 mL number of water molecules = $\frac{N_A \times 1000}{18}$
$= 55.55 N_A$

173 **(a)**
In 15 L of H_2 gas at STP, the number of molecules
$= \frac{6.023\times10^{23}}{22.4} \times 15$
$= 4.033 \times 10^{23}$

In 5 L of N_2 gas at STP, the number of molecules
$= \frac{6.023\times10^{23}\times5}{22.4} = 1.344 \times 10^{23}$

In 0.5 g of H_2 gas, the number of molecules
$= \frac{6.023\times10^{23}\times0.5}{2}$
$= 1.505 \times 10^{23}$

In 10 g of O_2 gas, the number of molecules
$= \frac{6.023\times10^{23}\times10}{32}$
$= 1.882 \times 10^{23}$

Hence, maximum molecules are present in 15L of H
.

174 **(c)**
$\because$ 64 n kg CaC_2 will give 28 n kg polyethylene
$\therefore$ 20 kg CaC_2 will give $\frac{28n\times20}{64n} = 8.75$ kg

175 **(c)**
Wt. of N atom $= 6.644\times10^{-23}\times6.023\times10^{23} =$ 40 g
or 40 g = 1 g-atom;
$\therefore$ 40×10^3 g $= 10^3$ g-atom

176 **(d)**
$$m = \frac{15}{98\times\frac{(100\times1.1-15)}{1000}} = 1.6$$

177 **(d)**
$$N = \frac{34}{35\times\frac{100}{0.6\times1000}} = 5.82$$

178 **(a)**
$$M = \frac{171}{342\times\frac{(1000+171)}{1000\times d}} = 0.429\times1.1 = 0.47$$
$$m = \frac{171}{342\times1} = 0.5$$

179 **(a)**
$$2\text{Al} + \frac{3}{2}O_2 \longrightarrow Al_2O_3$$
54 g Al requires $\frac{3}{2}\times32$ g O_2

180 **(c)**
Mole of N_2 is $= \frac{4}{28} = \frac{1}{7}$ (the lowest value)

181 **(d)**
Cgraphite$+O_2(g) \rightarrow CO_2; \Delta H = -348$ kJ
12 g 32 g 44 g
In the above reaction, heat is evolved and mass of product is equal to mass of reactant.

182 **(a)**
Molarity × valence = normality
Valence or basicity of $H_2SO_4 = 2$

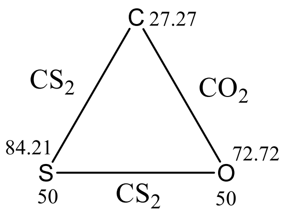
183 **(c)**
Titration of oxalic acid by $KMnO_4$ in the presence of HCl gives unsatisfactory result because HCl is a better reducing agent than oxalic acid and HCl reduces preferably MnO_4^- to Mn^{2+}.

184 **(c)**
$\because$ Mass of 22400 cm^3 $CH_4 = 16$g
$\therefore$ Mass of 112 $cm^3 CH_4 = \frac{16\times112}{22400} = 0.08$g

185 **(d)**
Combustion of propane takes place as follows
$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$
propane oxygen
$\because$ 1 L of propane required 5 L oxygen for combustion.
$\therefore$ 20 L propane required oxygen $= 5\times20 = 100$ L

186 **(d)**
1 mole = 1 g molar volume = 22.4 litre at S.T.P.

187 **(d)**
In CS_2
C : S mass ratio is 15.79 : 84.21
15.79 parts of carbon combine with sulphur = 84.21
$\therefore$ 27.27 parts of carbon will combine with
$$S = \frac{84.21}{15.79}\times27.27 = 145.434$$



Hence, ratio of $S:O$ is 145.434:72.73 *ie*, 2 : 1
In SO_2, the ratio of $S:O$ is 1 : 1
Since, the ratio of $S:O$ is a simple whole number ratio,
Therefore law of reciprocal proportions is proved.

188 **(c)**
$9 + 1 + 3.5 = 13.5$

$\because$ 13.5 g contains $\frac{9}{12}$ mole carbon

$\therefore$ Formula is $C_6H_8N_2$

189 **(b)**

Mole of $Cu^{2+} = 0.1 \times 1 = 0.1$

Mole of $SO_4^{2-} = 0.1 \times 1 = 0.1$

Mole of $Al^{3+} = 0.1 \times 2 = 0.2$

Mole of $SO_4^{2-} = 0.1 \times 3 = 0.3$

$\therefore$Total moles of ions present in 1 litre = 0.7

$\therefore$ Molarity of all ions = 0.7 M

190 **(a)**

Meq. of conc. HCl = Meq. of dil. HCl;

$$10 \times 10 = V \times \frac{1}{10}$$

$\therefore$ $V = 1000$ mL

Thus, 990 mL of water should be added to 10 mL of conc. HCl to get decinormal solution.

191 **(c)**

Calculate $m = \frac{dRT}{P}$ and then Vapour density = M/2 .

192 **(d)**

1 mole of water=18 g

193 **(d)**

$$H_2 + \frac{1}{2}O_2 \longrightarrow H_2O$$

30 20 0

0 5 15

194 **(b)**

Dalton, Avogadro coined the term atom and molecule respectively.

195 **(a)**

1. Mass of one atom of oxygen = $\frac{16}{6.022 \times 10^{23}} = 2.66 \times 10^{-23}$ g
2. Mass of one atom of nitrogen

$$= \frac{14}{6.022 \times 10^{23}} = 2.32 \times 10^{-23} \text{g}$$

3. Mass of 1×10^{-10}mole of oxygen

$$= 16 \times 10^{-10} \text{ g}$$

4. Mass of 1×10^{-10} mole of copper

$$= 63 \times 10^{-10}$$

Hence, masses of atoms in increasing order

II< I< III < IV

197 **(d)**

Meq. of oxide = Meq. of H;

$\frac{0.1596}{E+8} = \frac{6 \times 10^{-3}}{1}$ $\therefore E = 18.6$

$\therefore$ atomic wt. = $18.6 \times 3 = 55.8$ ($\because$ valence = 3)

198 **(d)**

$$\underset{100 \text{ g}}{CaCO_3 (s)} \xrightarrow{\Delta} \underset{56 \text{ g}}{CaO(s)} + CO_2 \text{ (g)}$$

$\therefore$ 56 g CaO is obtained from=100g $CaCO_3$

$\therefore$ 28 g CaO is obtained from=$\frac{100 \times 28}{56}$

=50 g $CaCO_3$

199 **(c)**

Stoichiometry represents mole ratio or volume ratio of reactants and products.

202 **(c)**

g atom of $N = \frac{28}{14} = 2$

g atom of oxygen $= \frac{80}{16} = 5$

203 **(d)**

1 mole Ca^{2+} =1 mole $CaCO_3$ = 100 g

Rating = mg of $CaCO_3$ needed per g chelating agent (mol. wt. = 380)

$$= \frac{100 \times 10^3}{380} = 263 \text{ mg}$$

205 **(c)**

Meq. of HCl = Meq. of $CaCO_3$;

$\therefore$ $N \times 50 = \frac{1}{50} \times 1000$ or $N = 0.4$

206 **(a)**

Weight of NH_3 = 4.25g

We know that number of atoms in 1 mole or 17 g of

$NH_3 = 4 \times 6.023 \times 10^{23}$

$\therefore$ Number of atom in 4.25 g of

$$NH_3 = \frac{4 \times 6.023 \times 10^{23}}{17} \times 4.25$$

$$= 6.023 \times 10^{23}$$

207 **(c)**

In acidic medium, MnO_4^- is reduced to Mn^{2+}

$$\overset{+7}{Mn}\,O_4^- \rightarrow Mn^{2+}$$

Change in oxidation number=7−2=5

Solution X Solution Y

$N_1V_1 = N_2V_2$

For Fe^{2+} For MnO_4^-

$N \times 25 = 5M \times V$ [$\because$ For MnO_4^-, $N = 5M$ in acidic medium]

25N= $5M \times 20$

25N=100M

...(i)

In neutral medium, MnO_4^- is reduced to MnO_2

$$\overset{+7}{Mn}\,O_4^- \rightarrow \overset{+4}{Mn}O_4^-$$

Change in oxidation number=7−4=3

Solution X Solution Y

$N_1V_1 = N_2V_2$
For Fe^{2+} For MnO_4^-
$25 \times N = 3M \times V$
[$\because$ For MnO_4^-, $N = 3M$ in neutral medium]
$25N = 3M \times V$
...(ii)
From Eqs (i) and (ii)
$100M = 3M \times V$
$V = \frac{100}{3} = 33.3$ mL

208 **(a)**
$\because$ 4 u = 1 He atom
$\therefore$ 1 u = $\frac{1}{4}$ He atom
Hence, 100 u = $\frac{1 \times 100}{4} = 25$ atoms

209 **(b)**
Mass = $0.8 \times 1 = 0.8$ g
$\therefore$ 180 g $C_6H_{12}O_6$ has 24 atom
$\therefore$ 0.8 g $C_6H_{12}O_6$ has $\frac{24 \times 0.8 \times N}{180} = 6.42 \times 10^{22}$

210 **(a)**
Mill mole of $H_2SO_4 = \frac{1}{10} \times 1000 = 100$
$\therefore$ $\frac{w}{98} \times 1000 = 100$
$\therefore$ w = 9.8 g

211 **(b)**
Average atomic weight
$$= \frac{54 \times 5 + 56 \times 90 + 57 \times 5}{100} = 55.95$$

212 **(a)**
$$m = \frac{0.5 \times 1000}{500} = 1$$

214 **(c)**
$CaCO_3 + 2HCl \xrightarrow{\Delta} CaCl_2 + H_2O + CO_2$
100 g 2×36.5g 44 g
1 L of 1 N HCl means=36.5 g HCl
Here, HCl is limiting reagent. Therefore, it reacts with 50 g
$CaCO_3$ and produces 22 g CO_2.

215 **(b)**
The mass of KI in 2g salt = $\frac{2 \times 1}{100} = 0.02g$
$= \frac{0.02}{39+127}$ mol
$= \frac{0.02}{166} \times 6.02 \times 10^{23}$ ions
$= 7.2 \times 19^{19}$ ions

216 **(a)**
22.4 L= 17 g
11.2 L=$\frac{17}{22.4} \times 11.2 = 8.5$g

217 **(b)**
Meq. of acid. Meq. of NaOH
$$\frac{0.52}{E} \times 1000 = 100 \times 0.1$$
$\therefore$ $E = 52$

218 **(d)**
In 100 tons of Fe_2O_3, pure Fe_2O_3
$$= 100 - \frac{100 \times 20}{100}$$
= 80 tons
$Fe_2O_3 + 3H_2 \longrightarrow 2Fe_2 + 3H_2O$
$2 \times 56 + 48$ 2×56
160 2×56
$\because$ 160 g Fe_2O_3 gives Fe = 2×56 g
$\therefore$ 80 tons Fe_2O_3 will give Fe = $\frac{2 \times 56 \times 80}{160}$
= 56 tons

219 **(c)**
Meq. Of $Ba(OH)_2$ = Meq. of HCl
$N \times 25 = 0.1 \times 35$
$N_{Ba(OH)_2} = \frac{3.5}{25}$
$$\therefore \quad M_{Ba(OH)_2} = \frac{3.5}{25 \times 2} = 0.07$$

220 **(b)**
1000 g H_2O = 1000 cm^3 H_2O
$\frac{1000}{18}$ mole H_2O = 1000 cm^3 H_2O
$\frac{1000}{18} \times 6.023 \times 10^{23}$ molecule of H_2O =
1000 cm^3 H_2O
$\therefore$ 1 molecule of $H_2O = 3 \times 10^{-23} cm^3$

221 **(c)**
As ratio of masses of nitrogen per gram of hydrogen in hydrazine and NH_3
$= 1\frac{1}{2} : 1$
$= \frac{3}{2} : 1$ or 3 : 2
ie, the law of multiple proportions.

223 **(a)**
Eq. of $H_2SO_4 = 0.5 \times 2 = 1.0$;
Eq. of $Ca(OH)_2 = 0.2 \times 2 = 0.4$;
Equal Eq. reacts and thus, Eq. of $CaSO_4$ formed = 0.4
$\therefore$ Mole of $CaSO_4$ formed $\frac{0.4}{2} = 0.2$

224 **(d)**
H_3PO_4 is tribasic acid and thus,
$N = M \times$ basicity

225 **(d)**
Empirical formula wt. =13
$$\therefore \quad n = \frac{\text{mol.wt.}}{\text{empirical formula wt.}} = \frac{78}{13} = 6$$
$\therefore$ Formula is $(CH)_6$, *i.e.*, C_6H_6

226 **(a)**
For first oxide,

Moles of oxygen=$\frac{22}{16} = 1.375$,

Moles of Fe= $\frac{78}{56} = 1.392$

Simpler molar ratio, $\frac{1.375}{1.375} = 1, \frac{1.392}{1.375} = 1$

∴ The formula of first oxide is FeO.

Similarly for second oxide,

Moles of oxygen=$\frac{30}{16} = 1.875$,

Moles of Fe=$\frac{70}{56} = 1.25$

Simple molar ratio=$\frac{1.875}{1.25} = 1.5, \frac{1.25}{1.25} = 1$

∴ The formula of second oxide is Fe_2O_3.

Suppose in both the oxides, iron reacts with xg of oxygen.

∴ Equivalent weight of Fe in FeO

$$\frac{\text{weight of Fe}_{II}}{\text{weight of oxygen}} \times 8$$

$$\frac{56}{2} = \frac{\text{weight of Fe}_{II}}{x} \times 8 \quad \text{... (i)}$$

∴ Equivalent weight of Fe in Fe_2O_3

$$= \frac{\text{weight of Fe}_{III}}{\text{weight of oxygen}} \times 8$$

$$\frac{56}{3} = \frac{\text{weight of Fe}_{III}}{x} \times 8 \quad \text{... (ii)}$$

From Eq. (i) and (ii),

$$\frac{\text{weight of Fe}_{II}}{\text{weight of Fe}_{III}} = \frac{3}{2}$$

227 **(a)**

We know that protons in 1 mole $CaCO_3$

=atomic number of calcium + atomic number of carbon + 3 (atomic number of oxygen)

$= 20 + 6 + 3(8) = 50$ mol

∴ Proton in 10 g $CaCO_3 = \frac{10 \times 50}{100} \times 6.02 \times 10^{23}$

$= 3.01 \times 10^{24}$

228 **(b)**

$MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + cl_2$

2 mol   4 mol   1 mol

4 mol   22.4 L

But the yield is 11.2.

∴ % yield $= \frac{11.2}{22.4} \times 100 = 50\%$

229 **(b)**

$$N = \frac{1}{49 \times (100/1000)} = 0.2$$

230 **(c)**

One mole of electrons= 6.023×10^{23} electrons

Mass of one electron=9.1×10^{-28}g

Mass of one mole of electrons

$= 6.023 \times 10^{23} \times 9.1 \times 10^{-28}$g

$= 5.48 \times 10^{-4}$g= 0.548 mg

≈ 0.55 mg

231 **(c)**

Eq. of metal = Eq. of Cl

∴ $\frac{74.4 - 35.5}{E} = \frac{35.5}{35.5}$

∴ $E = 38.9$

232 **(a)**

Equivalent wt of acid

$$= \frac{\text{molecular weight of acid}}{\text{no. of H atoms replaced during reaction}}$$

∴ Equivalent weight of acid depends on the reaction involved because different number of acids are replaced during different reactions.

234 **(d)**

At. wt. $= 2 \times 31.82$

∴Wt. of one atom $= \frac{2 \times 31.82}{N} = \frac{63.64}{N}$

235 **(a)**

22.4 litre = 1 mole;

∴ $1\text{m}^3 = 10^3$ litre $= \frac{10^3}{22.4} = 44.6$

236 **(c)**

$2KClO_3 \longrightarrow 2KCl + 3O_2 \uparrow$;

245 g $KClO_3$ on heating shows a wt. loss = 96 g (of O_2)

∴100 g $KClO_3$ on heating shows a wt. loss

$= \frac{96 \times 100}{245}$g $= 39.18\%$

237 **(b)**

Meq. = Normality × V in mL

$= 500 \times 0.2 = 100$

238 **(a)**

Number of molecules $= \frac{mass \times N_A}{molar\ mass}$

239 **(d)**

$3F^- \equiv 1$ Formula unit (AlF_3)

$3.0 \times 10^{24} F^- = 1 \times 10^{24}$ Formula units (AlF_3)

240 **(d)**

One mole of CO_2 contains 6.02×10^{23} atoms of carbon and 6.023×10^{23} molecules of oxygen.

241 **(b)**

See mole ratio $A : B : C :: 1 : 2 : 1$

242 **(d)**

1 mg $C_4H_{10} = \frac{14N}{58} \times 10^{-3}$ atoms,

1 mg $N_2 = \frac{2N \times 10^{-3}}{28}$ atoms,

1 mg Na $= \frac{N \times 10^{-3}}{23}$ atoms,

1 mL = 1 g $H_2O = \frac{3N}{18}$ atoms,

(∵ M g of a substance = N molecules = $a \times N$ atoms; where a is number of atoms in one molecule).

243 **(c)**

An aromatic hydrocarbon (empirical formula C_5H_4)

$+H_2SO_4 \rightarrow$ monosulphonic acid

$\because$ 0.104 g of monosulphonic acid required 10 mL of $\frac{N}{20}$ NaOH for complete neutralisation

$$\therefore \quad \frac{0.104}{n(5 \times 12 + 4 \times 1)} = \frac{1}{20} \times 10 \times 10^{-3}$$

$$n = \frac{104}{32} = 3.25 \approx 3$$

The molecular formula of hydrocarbon will be $C_{15}H_{12}$.

244 **(a)**

In 12 g carbon, mass of C-14 isotope $= 12 \times \frac{2}{100} = 0.24g$

$\therefore$ Number of C-14 atoms in 12 g of $C = \frac{0.24}{14} \times 6.02 \times 10^{23}$

$= 1.032 \times 10^{22}$

245 **(b)**

To prepare 20 g zinc sulphate crystals, zinc required

$$= \frac{22.65}{100} \times 20$$

$= 4.53g$

246 **(b)**

Number of gram molecules $= \frac{6.02 \times 10^{25}}{6.02 \times 10^{23}} = 100$

247 **(a)**

Ferrous is Fe^{2+}

248 **(b)**

$$M = \frac{5}{34 \times 100/1000} = 1.47$$

249 **(b)**

4.6×10^{22} atoms weight $= 13.8$ g

Hence, 6.02×10^{23} atoms will weigh

$= \frac{13.8 \times 6.02 \times 10^{23}}{4.6 \times 10^{22}} = 108.6$ g (molar mass)

250 **(c)**

Eq. of HCl = Eq. of $CaCO_3$

Thus, $\frac{w}{36.5} = \frac{100}{50}$;

$\therefore \quad w = 73$ g HCl;

50 g HCl is present in 100 g HCl solution and thus, volume of solution required for,

73 g HCl $= \frac{73 \times 100}{50} = 146$g.

252 **(d)**

The law of constant composition—According to this law, "A chemical compound is always found to be made up of the same elements combined together in the same proportions by weights".

This law is same as law of definite proportions.

253 **(d)**

Atomic weight of the element

$X = 6.643 \times 10^{-23} \times N_A = 40$

No. of moles of $X = \frac{20 \times 1000}{40} = 500$

254 **(a)**

Limiting reagent is one which is completely consumed in reaction.

255 **(d)**

ppm = wt. of solute in 10^6 g H_2O

10^3 g H_2O contains 10 g $CaCO_3$

$\therefore$ 10^6 g H_2O contains $= \frac{10 \times 10^6}{10^3} = 10{,}000$ ppm $CaCO_3$

256 **(d)**

	$BaCl_2$ +	H_2SO_4 $\longrightarrow$	$BaSO_4$ +	2HCl
mm	20× 0.5	20 × 1		
taken	= 10	20	0	0
mm formed	0	10	10	20

Milli mole of $BaSO_4 = 10$

or Mole of $BaSO_4 = 10^{-2}$

257 **(d)**

Percentage of element M in $M_2O_3 = 53$

Let the atomic mass of $M = x$

Mass of M in $M_2O_3 = 2x$

Total atomic mass of $M_2O_3 = 2x + 16 \times 3$

$= 2x + 48$

Percentage of an element

$$= \frac{\text{Mass of an element in a compound}}{\text{Total mass of compound}} \times 100$$

$$53 = \frac{2x}{2x + 48} \times 100$$

$53(2x + 48) = 200x$

$x = 27$

258 **(a)**

H_3BO_3 accepts OH^- ions to act as weak monobasic Lewis acid.

$H_3BO_3 + H_2O \longrightarrow B(OH)_4^- + H^+$; $\quad K_a = 10^{-9}$

259 **(a)**

Meq. of KOH added = 25 × 0.4210 = 10.525

Meq. of KOH left = 8.46 × 0.2732 × 2 = 4.623

$\therefore$ Meq. of KOH used by oil = 10.525 – 4.623 = 5.902

or $\quad \frac{w}{56} \times 1000 = 5.902$

or $\quad w_{KOH} = 0.3305$ g

$\therefore$ Saponification no.

= wt. of KOH used in mg per g of oil

$= \frac{0.3305}{1.5763} \times 1000$

$= 209.6$

260 **(c)**

$(NH_4)_2SO_4 \longrightarrow 2NH_3 + H_2O + SO_3$

$3NH_3 + 2HCl \longrightarrow 2NH_4Cl$

$(NH_4)_2SO_4 \equiv 2NH_3 \equiv 2HCl$

132 g 73g

$73 gHCl \equiv 132 g(NH_4)_2SO_4$

$292 \text{ g HCl} \equiv \frac{132\times292}{73} g(NH_4)_2SO_4$

$= 528 \text{ g}(NH_4)_2SO_4$

261 **(d)**

Silica	Water	Clay	Mineral
45	12	43	Initial %
a	8	(92 - a)	% after heating

The % ratio of silica and clay remains constant on heating

i.e., $\frac{45}{43} = \frac{a}{92-a}$

$\therefore$ $a = 47\%$

262 **(b)**

N atom = 1 g atom

263 **(a)**

Meq. of conc. HCl = Meq. of dil. HCl

$10 \times V_1 = 100 \times 1$

$\therefore$ $V_1 = 10 mL$

Thus, 10 mL of conc. HCl should be added 90 mL to make at 100 mL of desired normality.

264 **(a)**

$CaF_2 = 146.4$ g

Molecular weight of $CaF_2 = 78.08 g/mol$

Moles of $CaF_2 = \frac{\text{weight}}{\text{molecular weight}}$

$= \frac{146.4}{78.08} = 1.875$ mol

Number of formula units of

CaF_2 in 146.4 g of CaF_2

$=$ No. of moles $\times 6.022 \times 10^{23}$

$= 1.875 \times 6.022 \times 10^{23}$

$= 11.29 \times 10^{23}$

$= 1.129 \times 10^{24}$ CaF_2

265 **(a)**

$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

28 g 96 g

$\because$ The weight of oxygen required for complete combustion of 28 g ethylene=96 g.

$\therefore$ Weight of oxygen required for combustion of 2.8 kg ethylene

$= \frac{96\times2.8\times1000}{28\times1000}$ kg=9.6 kg

267 **(b)**

$2Na_2HPO_4 + NaH_2PO_4 + 2(NH_2)_2CO$

$\rightarrow Na_5P_3O_{10} + 4NH_3 + 2CO_2$

Hence, the stoichoimetric ratio of sodium dihydrogen orthophosphate and sodium hydrogen orthophosphate is 2 : 1 or 3 : 1.5

268 **(b)**

44 g $CO_2 = N$ molecules,

$\therefore$4.4 g $CO_2 = N/10$ molecules,

22.4 litre H_2at STP $= N$ molecules,

$\therefore$ 2.24 litre H_2at STP $= N/10$ molecules,

Thus, total molecules $= \frac{N}{10} + \frac{N}{10} = \frac{N}{5}$.

269 **(c)**

Molecular mass of $CO_2 = 12 + 32 = 44$

$44 g$ of CO_2 has $= 6.023\times 10^{23}$ molecule

$0.2 g$ of CO_2 has $= \frac{6.023\times10^{23}}{44} \times 0.2$

$= 0.0273 \times 10^{23}$

If 10^{21} molecules are removed then number of molecules

$= 1.73 \times 10^{21}$

$\because 6.023 \times 10^{23}$ molecules = 1 mol

$\therefore 1.73 \times 10^{21}$ molecules $= \frac{1}{6.023\times10^{23}} \times 1.73 \times 10^{21}$

$= 0.0028$ mol

270 **(a)**

24 g carbon has $2N$ atoms. Rest all have I mole atoms.

271 **(b)**

$CuSO_4\ 5H_2O$ has 1 mole of copper and 9 moles of oxygen atoms,

63.5 g Cu $= 9 \times 16\ g$ of oxygen

8.64 g of oxygen $= \frac{63.5\times8.64}{9\times16}$

$= 3.81 g$

272 **(c)**

Meq. of H_3PO_3 = Meq. of KOH

$20 \times 0.1 \times 2 = 0.1 \times 1 \times V$

(H_3PO_3 is dibasic, KOH is monobasic)

$\therefore$ $V = 40$ mL

273 **(a)**

Given mass of $O_2 = 2$ g at 0°C and 760 mm Hg

32 g of $O_2 = 22.4$ L at STP

$\therefore$ 2 g of $O_2 = \frac{22.4}{32} \times 2 = 1.4$ L

274 **(a)**

Ratio of atoms

$C:H:N:O :: \frac{20.0}{12} : \frac{6.66}{1} : \frac{47.33}{14} : \frac{26.01}{16}$

$= 1.67: 6.66: 3.38: 1.63$

$= 1: 4: 2: 1$

Empirical formula $= CH_4N_2O$
Molar empirical formula mass = 60g
Molecular formula $= CH_4N_2O$

275 **(b)**
Molarity $= \frac{\text{moles of solute}}{\text{volume of solution}}$; $V_{solution} >$ 1 litre water.

277 **(d)**
Number of atoms = moles × N_A × atomicity
Here, N_A= Avogadro's number
(a) Number of oxygen atoms in 1 g of O
$$= \frac{1}{16} \times N_A \times 1$$
$$= \frac{N_A}{16}$$
(b)Number of oxygen atoms in 1 g of O_2
$$= \frac{1}{32} \times N_A \times 2$$
$$= \frac{N_A}{16}$$
(c) Number of oxygen atoms in 1 g of O_3
$$= \frac{1}{48} N_A \times 3 = \frac{N_A}{16}$$
Hence, all have the same number of oxygen atoms.

278 **(b)**
$$N = \frac{4 \times 1000}{40 \times 100} = 1.0$$

279 **(c)**
Mohr's salt is $FeSO_4.(NH_4)_2SO_4.6H_2O$
Only oxidizable part is Fe^{2+}.
$[Fe^{2+} \rightarrow Fe^{3+} + e^-] \times 6$
$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$
$6Fe^{2+} + Cr_2O_7^{2-} + 14H^+$
$\rightarrow 6Fe^{3+} + 2Cr^{3+} + 7H_2O$
Millimoles of $Fe^{2+} = 750 \times 0.6 = 450$
Moles of $Fe^{2+} = \frac{450}{1000} = 0.450$ mol
6 mol Fe^{2+}=1 mol $Cr_2O_7^{2-}$
$\therefore$ 0.450 mol $Fe^{2+} = \frac{0.450}{6}$
$= 0.075$ mol $Cr_2O_7^{2-}$
$= 0.075 \times 294$ g
$= 22.05$ g

280 **(d)**
$3BaCl_2 + 2Na_3PO_4 \longrightarrow Ba_3(PO_4)_2 + 6NaCl$
See mole ratio from stoichiometry.
$BaCl_2 : Na_3PO_4 : Ba_3(PO_3)_2 : NaCl$ ::3 :2 :1: 6

281 **(d)**
Mole of Ca $= \frac{30}{40}$ (the largest value)

282 **(a)**
Meq. of NaOH = 0.1 V
Meq. of $CH_3COOH = 0.1\ V$
$\therefore$Meq. of CH_3COONa formed = 0.1 V
The solution will be alkaline due to hydrolysis of CH_3COONa.

283 **(b)**
According to law of conservation of mass,
Mass of reactants = mass of products
$\therefore$ 6.3+15.0=18.0+x
Or $x = 21.3 - 18.0 = 3.3\ g$

284 **(d)**
Mole of glucose $= \frac{6.02 \times 10^{22}}{6.02 \times 10^{23}} = 0.1$
$\therefore \quad M_{glucose} = \frac{0.1 \times 1000}{50} = 2$

285 **(b)**
$M > m$ provided d solvent $\lessgtr 1$

286 **(b)**
$$m = \frac{4}{40 \times 0.996} = 0.1$$

287 **(c)**

	PbO	+ 2HCl	$\longrightarrow PbCl_2$	$+ H_2O$
Eq. at $t = o$	$\frac{6.5 \times 2}{224}$	$\frac{3.2}{36.2}$	0	0
	=0.058	0.088	0	0
Eq. after reaction	0	0.030	0.058	0.058

$\therefore$ Mole of $PbCl_2$ formed $= \frac{0.058}{2} = 0.029$

288 **(a)**
Meq. of $H_2SO_4 = 50 \times 0.1 \times 2 = 10$;
Meq. of NaOH $= 50 \times 0.1 = 5$
$\therefore$Meq. of H_2SO_4 left = 10-5;
Solution is acidic.

289 **(a)**
18 mL H_2O or 18 g H_2O has 10N electrons.

290 **(b)**
The compound is $C_4H_8O_2$;
Mol. wt. = 88
$\therefore$ Vapour density = 44

291 **(b)**
Meq. of oxalic acid = Meq. of NaOH:
$\therefore \frac{w}{126/2} \times 1000 = 1000 \times 1$;
$\therefore \quad w = 63$ g

292 **(b)**
Mole of sucrose $= \frac{\text{mass of sucrose (in gram)}}{\text{molecular weight of sucrose}}$
$$= \frac{25.6}{342.3} = 0.0747882$$

Formula of sucrose $= C_{12}H_{22}O_{11}$

Number of H atoms in 1 mole of sucrose

$= 22 \times 6.023 \times 10^{23}$

Number of H atoms in 0.0747882 mole of sucrose

$= 22 \times 6.023 \times 10^{23} \times 0.074788$

$= 9.9 \times 10^{23}$

293 **(c)**

Liquid HCl is 100% pure

$\therefore M = \frac{100 \times 1.17 \times 1000}{36.5 \times 100} = 32.05$

294 **(a)**

Meq. of NaOH=Meq. of acid;

$20 \times 0.4 = 40 \times N$;

$\therefore \quad N = 0.2 \quad \text{or} \quad M = 0.1$

295 **(c)**

Mass of solute = 120 g

Mass of water = 1000 g

Mass of solution = 1120 g

$\therefore$ Volume of solution $\left(\frac{m}{d}\right) = \frac{1120}{1.15}$ mL

Milli mole $= M \times V_{\text{in mL}}$

$\frac{120}{60} \times 1000 = M \times \frac{1120}{1.15}$

$\therefore \quad M = 2.05$

296 **(a)**

Eq. wt. $= \frac{\text{mol. wt.}}{\text{acidity}}$

NH_3 is monoacidic base.

297 **(b)**

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

20 mL of 0.1 M $KMnO_4 = 20 \times 0.1 = 2$m mol

$\because$ 2 mmol of $KMnO_4 \equiv$ 5 mmol of $C_2O_4^{2-}$

50 mL of 0.1 M $H_2C_2O_4 = 50 \times 0.1 = 5$mmol

Hence, 20 mL of 0.1 M $KMnO_4$

$\equiv$ 50 mL of 0.1 M $H_2C_2O_4$

298 **(c)**

Solutions of known strength are prepared by dissolving solute in solvent in a measuring flask.

299 **(a)**

Let the percent abundance of lighter isotope is x.

$\therefore$ Atomic mass, $z = \frac{x(z-1)+(100-x)(z+2)}{z+100-x}$

$3x = 200$ or $x = 66.6\%$

300 **(a)**

$$\frac{\text{Wt. of metal oxide}}{\text{Wt. of metal chloride}} = \frac{\text{Eq. wt. of metal + Eq. wt. of oxide}}{\text{Eq. wt. of metal + Eq. wt. of chloride}}$$

$$\frac{3}{5} = \frac{E+8}{E+35.5}$$

$E = 33.25$

301 **(d)**

Volume of 100 g solution, $V = \frac{m}{\rho}$

$= \frac{100g}{1.14g\ cm^{-3}} = 87.72cm^3$

Amount of sulphuric acid in 100 g solution,

$n = \frac{m}{M} = \frac{20.0g}{98\ g\ mol^{-1}} = 0.207\ mol$

Molarity of sulphuric acid,

$M = \frac{n}{V} = \frac{0.207\ mol}{87.72 \times 10^{-3} dm^3} = 2.32\ mol\ dm^{-3}$

302 **(b)**

Meq. of Fe^{2+} = Meq. of $FeCl_2$

= Meq. of HCl $= 50 \times 4 = 200$;

$\therefore$ Mole of $Fe^{2+} = \frac{200}{2} \times 10^{-3} = 0.1$

303 **(c)**

Meq. of HCl $= 100 \times 0.3 = 30$

Meq. of $H_2SO_4 = 200 \times 0.6 = 120$

$\therefore \quad N_{\text{mixture}} = \frac{30+120}{300} = \frac{1}{2}$

304 **(b)**

Meq. of acid = Meq. of caustic potash

$\therefore \frac{45}{90/n} \times 1000 = 200 \times 5$,

$\therefore \quad n = 2$

305 **(c)**

$2Cr(OH)_3 + 4OH^- + KIO_3 \rightarrow 2CrO_4^{2-} + 5H_2O + KI$

Change in oxidation number of effective element (I) in

$KIO_3 = (+5) - (-1) = 6$

Equivalent weight of oxidation$= \frac{\text{mol. wt.}}{6}$

306 **(c)**

No. of atoms in 1g of $O_2(g) = 2 \times \frac{1}{32} \times 6.023 \times 10^{23}$

$= 0.38 \times 10^{23}$

No. of atoms in 1g of $Ni(s) = \frac{1}{58.2} \times 6.023 \times 10^{23}$

$= 0.10 \times 10^{23}$

No. of atoms in 1g of $B(s) = \frac{1}{10.8} \times 6.023 \times 10^{23}$

$= 0.58 \times 10^{23}$

No. of atoms in 1g of $N_2(g) = 2 \times \frac{1}{28} \times 6.023 \times 10^{23}$

$= 0.43 \times 10^{23}$

Alternative: Smaller the atomic mass, larger will be the no. of atoms in sample.

307 **(d)**

Follow stoichiometry of reaction.

308 **(c)**

Mole of $O_2 = \frac{3.2}{32} = \frac{1}{10}$

$\therefore$atoms of O $= 2N \times \frac{1}{10} = 12.04 \times 10^{22}$

309 **(a)**

No. of molecules in n mole $= n \times$ Av. no; Also no. of atom in 1 molecule = atomicity.

310 **(d)**

$$\text{Moles} = \frac{\text{mass}}{\text{molecular mass}}$$

Given, mass of $Al_2(SO_4)_3 = 50g$

Molecular mass of $Al_2(SO_4)_3 = 342$ g

$\therefore$ Moles of $Al_2(SO_4)_3 = \frac{50}{342} = 0.14$ mol

311 **(c)**

In air

Molecular weight of $N_2 = \frac{28\times78}{100} = 21.84$

Molecular weight of $O_2 = \frac{32\times21}{100} = 6.72$

Molecular weight of $Ar = \frac{18\times0.9}{100} = 0.162$

Molecular weight of $CO_2 = \frac{44\times0.1}{100} = 0.044$

So, molecular weight of air = 21.84 + 6.72 + 0.162 +0 .044

= 28.766

312 **(d)**

Meq. of oxide = Meq. of hydroxide;

Thus, $\frac{0.995}{E+8} = \frac{1.520}{E+17}$ $\therefore E = 9$

313 **(d)**

Per cent loss of H_2O in one mole of

$$Na_2SO_4 \cdot nH_2O = \frac{18n \times 100}{(142+18n)} = 55$$

$\therefore$ $n = 10$

315 **(c)**

VD of substance = 4 (when VD of CH_4 = 1)

$\therefore$VD of substance = 8 × 4 (when VD of CH_4 = 8)

$\therefore$mol. wt. of substance = 32 × 2 = 64

316 **(d)**

According to Dulong and Petit's law

At. mass of element× specific heat (in cal/g)=6.4(app.)

This law is applicable only to solid elements excepts Be, B, C and Si.

317 **(a)**

$$M_{H_2O} = \frac{\frac{1000\times d}{18}}{1} = 55.6 \times d$$

$\therefore$ $d = 1$ $\therefore M = 55.6$

318 **(a)**

Follow definition of molality.

319 **(a)**

1 mole (g mol. wt.) of a substance displaces 22.4 litre air at NTP.

320 **(d)**

$$M = \frac{\text{wt.}\times\text{ density} \times 1000}{\text{m. wt.}\times\text{ wt. of solution}}$$

$3.6 = \frac{29\times d\times1000}{98\times100}$

$d = 1.22$g/mL

321 **(c)**

Mass of 1 atom $= 1.8 \times 10^{-22}$g

Mass of 6.02×10^{23} atoms

$= 6.02 \times 10^{23} \times 1.8 \times 10^{-22}$g

$= 6.02 \times 1.8 \times 10$g

= 108.36g

$\therefore$ Atomic mass of element = 108.36

322 **(d)**

9.108×10^{-31}kg = 1electron

$\therefore$ 1kg $= \frac{1}{9.108\times10^{-31}}$ electron

$= \frac{1}{9.108\times10^{-31}} \times \frac{1}{6.023\times10^{23}}$ mole electron

323 **(c)**

244 g $BaCl_2 \cdot 2H_2O$ contains 2 moles of water.

324 **(b)**

16 g CH_4 = 1 mole CH_4 = N molecules of CH_4

325 **(c)**

$2(NH_4)_2HPO_4 \equiv P_2O_5$

264g 142g

% of $P_2O_2 = \frac{\text{wt.of } P_2O_5}{\text{wt.of salt}} \times 100$

$= \frac{142}{264} \times 100$

= 53.78%

326 **(d)**

$KMnO_4$ reacts with oxalic acid according to the following equation.

$2MnO_4^- + 5C_2O_4^{2-} + 16H^+$

$\rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

Eq. mass of $KMnO_4 = \frac{\text{mol.mass}}{7-2}$

$N_{KMnO_4} = 5 \times$molarity$=5 \times 10^{-4}$

Eq. mass of $C_2O_4^{2-} = \frac{\text{mol. mass}}{2(4-3)} = \frac{\text{mol. mass}}{2}$

$N_{C_2O_4^{2-}} = 2 \times$molarity$=2 \times 10^{-2}$

$N_1V_1 = N_2V_2$

$5 \times 10^{-4} \times V_1 = 2 \times 10^{-2} \times 0.5$

$$V_1 = \frac{2 \times 10^{-2} \times 0.5}{5 \times 10^{-4}} = 20 \text{ L}$$

328 **(a)**

Mohr's salt is $(NH_4)_2SO_4.FeSO_4.6H_2O$

The equation is

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

Total change in oxidation number of iron

= (+3) − (+2)

= +1

So, equivalent wt. of Mohr's salt

$= \frac{\text{Mol. wt. of Mohr's salt}}{1}$

$= \frac{392}{1}$

$= 392$

331 **(c)**

For minimum molecular mass, there must be one S atom per insulin molecule.

If 3.4 g S is present, the molecular mass = 100

$\therefore$ If 32 g S is present, the molecular mass $= \frac{100 \times 32}{3.4}$

$= 941.176$

332 **(d)**

200 cc of NH_3 at STP contains maximum number of molecules because NH_3 compound has lowest molecular weight and highest volume than other compounds.

333 **(a)**

N molecule of $H_2O = 18$ g

334 **(d)**

$2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$

2 cc   5 cc

100 cc   250 cc

Hence, air will be needed $= \frac{100}{20} \times 250$

=1250 cc

335 **(a)**

Eq. of ca = Eq. of O;

$\frac{1.35}{E} = \frac{0.53}{8}$

$\therefore \quad E = 20.37$

336 **(b)**

$$N = \frac{2.7 \times 1000}{(98/3) \times 250} = 0.33$$

337 **(c)**

Elements react in same number of equivalent and give same number of equivalents of products.

Also equivalent $= \frac{\text{weight}}{\text{equivalent weight}}$

338 **(c)**

$$W_{N_2} = \frac{1 \times P \times 28}{RT}; W_{CO} = \frac{1 \times P \times 28}{RT}; W_{O_2} = \frac{7}{8} \times \frac{P \times 32}{RT}$$

339 **(c)**

Meq. of NaOH = Meq. oxalic acid;

$0.1 \times 1 \times V = 20 \times 0.05 \times 2;$

$\therefore \quad V = 20$ mL

340 **(b)**

$$\text{M. f.} = \frac{\text{moles of solute}}{\text{moles of solute + moles of water}}$$

$= \frac{1}{1 + \frac{1000}{18}} = 0.018$

341 **(b)**

It remains unchanged.

342 **(d)**

Given, % of C=54.55%

% of H=9.09%

%of O=36.36%

Element	%	At. no.	Ratio of atoms	Simplest ration
C	54.55	12	54.55/12=4.54	4.54/2.27=2
H	9.09	1	9.09/1=9.09	9.09/2.27=4
O	36.06	16	36.16/16=2.27	2.27/2.27=1

$\therefore$ Empirical formula is C_2H_4O.

343 **(a)**

${}_6C^{12}$ contains 6 N protons, 6 N electrons and 6 N neutrons.

344 **(d)**

Meq. of H_3PO_4 = Meq. of $Ca(OH)_2$;

$0.25 \times 3 \times V = 25 \times 0.03 \times 2$

$\therefore \quad V = 2$ mL

345 **(a)**

$2PH_3(g) \longrightarrow 2P(s) + 3H_2(g)$

100	0	0	Before dissociation
0	-	150	After dissociation

346 **(c)**

$$m = \frac{\text{moles of } CH_3COOH}{\text{wt. of solvent in kg}} = \frac{2.05 \times 1000}{897} = 2.285$$

wt. of solvent = wt. of solution-wt. of solute

$= [1000 \times 1.02 - 2.05 \times 60] =$ 897 g

347 **(c)**

Meq. of NaOH = Meq. of HCl

$100 \times 0.1 = 10$

$\therefore \frac{wt.}{40} \times 1000 = 10$; $\quad \therefore w_{NaOH} = 0.4$g

348 **(a)**

Meq. of $Na_2CO_3 = 250 \times 0.25 \times 2 = 125$

$\therefore \quad \frac{w}{53} \times 1000 = 125$

$\therefore \quad w = 6.625$

349 **(a)**

$\frac{n}{n+N} = 0.2;$

$\therefore \quad \frac{N}{n+N} = 0.8$

Thus, $\quad \frac{n}{N} = \frac{1}{4}$

or $\quad \frac{n \times 18 \times 1000}{W \times 1000} = \frac{1}{4}$

or $\quad \frac{\text{molality} \times 18}{1000} = \frac{1}{4}$

350 **(a)**

$$\%\text{by weight} = \frac{\text{weight of solute}}{\text{weight of solution}} \times 100$$

or $20 = \frac{w}{(w+60)} \times 100$

or $w = 15\text{g}$

351 **(b)**

$C_3H_8 + 5\,O_2 \longrightarrow 3CO_2 + 4H_2O$

1 mol or 22.4 L C_3H_8 at STP requires 5 mole or 5×22.4 O_2 at STP.

352 **(d)**

22.4 litre refers for mol. wt.

$\therefore$ 11.2 litre refers for $\frac{\text{mol.wt.}}{2}$ = vapour density.

353 **(c)**

$N = \frac{10 \times 1000}{60 \times 100} = 1.66$

354 **(c)**

$K_2S_2O_8\,(aq) + 2KI\,(aq) \rightarrow 2K_2SO_4(aq) + I_2(aq)$

In this reaction one mole of $K_2S_2O_8$ reacts with 2 moles of KI,

Hence the stoichiometry of this reaction is 1:2.

355 **(d)**

$$\text{Mole fraction} = \frac{\text{moles of alcohol}}{\text{total moles}} = \frac{2}{2+6} = \frac{2}{8} = 0.25$$

356 **(b)**

	$Ba(HO)_2$	$+ 2HCl$	$\longrightarrow$ $BaCl_2$	$+ 2H_2O$
meq.	$30 \times 0.1 \times 2$ =6	20×0.05 =1	0	0
	5	0	1	1

$\therefore$ $[OH^-] = \frac{5}{50} = 0.1$ M

357 **(a)**

$NaHCO_3$ being an acid salt will react with NaOH as,

$NaOH + NaHCO_3 \longrightarrow Na_2CO_3 + H_2O$

358 **(b)**

Eq. of metal oxide = Eq. of oxygen

$\frac{100}{E} = \frac{20}{8}$ $\therefore E = 40$

359 **(b)**

According to the equation,

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl$

No. of moles of NaCl $= \frac{4.77}{58.5} = 0.08154$

No. of moles of $AgNO_3 = \frac{5.77}{170} = 0.03394$

Thus, $AgNO_3$ is the limiting reagent in the reaction.

Now, applying POAC for Ag (as Ag atoms are conserved in the reaction)

Moles of Ag in $AgNO_3$ = moles of Ag in AgCl

Or $1 \times$ moles of $AgNO_3 = 1 \times$ moles of AgCl

Or $0.03394 \times 143.4(\text{for AgCl}) = 4.87\text{g}$

360 **(d)**

100 ML O_2, NH_3 and $CO_2 = \frac{0.1}{22.4} = \frac{1}{224}$ mol

For O_2 no. of molecules $= \frac{1}{224} \times 6.023 \times 10^{23}$

For NH_3 no. of molecules $= \frac{1}{224} \times 6.023 \times 10^{23}$

For CO_2 no. of molecules $= \frac{1}{224} \times 6.023 \times 10^{23}$

361 **(d)**

It is the basic definition of equivalent weight.

364 **(c)**

Mole fraction of $H_2O = 0.85$;

Mole fraction of $H_2SO_4 = 0.15$;

$\therefore \frac{\text{M. f. of } H_2SO_4}{\text{M. f. of } H_2O} = \frac{\text{mole of } H_2SO_4}{\text{mole of } H_2O} = \frac{0.15}{0.85}$;

$$m = \frac{\text{mole of } H_2SO_4}{\text{wt. of } H_2O \text{ in kg}} = \frac{\text{mole of } H_2SO_4 \times 1000}{18 \times (\text{wt. of } H_2O/18)}$$

or $m = \frac{\text{mole of } H_2SO_4}{\text{mole of } H_2O} \times \frac{1000}{18} = \frac{0.15 \times 1000}{0.85 \times 18} = 9.8$

365 **(b)**

0.1 mole has atoms $= 0.1 \times 6.02 \times 10^{23} \times 3 = 1.806 \times 10^{23}$

366 **(d)**

16 g O contains N atoms of O

32 g O_2 contains $2N$ atoms of O

48 g O_3 contains $3N$ atoms of O

367 **(b)**

We know that, $E = F.z$

$\therefore$ $E = 96500 \times x$

368 **(c)**

Victor meyer's method is used for volatile substances.

369 **(a)**

Per cent of oxygen in NaOH $= \frac{16 \times 100}{40} = 40$.

370 **(d)**

71 g Cl_2 reacts with 64 g S,

$\therefore$35.5 g Cl_2 reacts with 32 g S.

371 **(d)**

$$\frac{\text{Wt. of metal hydroxide}}{\text{Wt. of metal oxide}} = \frac{\text{Eq. wt. of metal} + \text{Eq. wt. of } OH^-}{\text{Eq. wt. of metal} + \text{Eq. wt. of } O_2^{2-}}$$

$\Rightarrow \frac{1.520}{0.995} = \frac{E+17}{E+8}$

On solving, $E = 9.0$

372 **(d)**

Dulong Petit's law: at. wt. $\times$ sp. heat $\approx$ 6.4

373 **(c)**

$3H_2 + N_2 \longrightarrow 2NH_3$;

Initial volume or mole = 4

Final volume or mole = 2

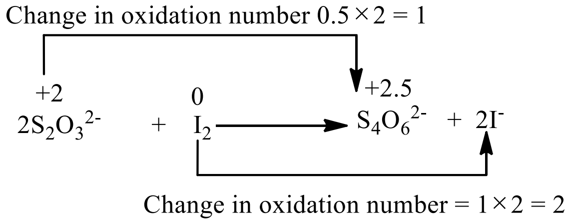
374 **(b)**

As, we know that least count of the instrument is equal to the most possible error of the instrument hence, least count of the instrument will be 0.01 cm.

375 **(a)**

M_2HPO_4 means valence of metal is one and thus, sulphate of metal is M_2SO_4.

376 **(b)**



Equivalent mass of $Na_2S_2O_3 = \frac{M_1}{1} = M_1$

Equivalent mass of $I_2 = \frac{M_2}{2}$

377 **(b)**

$$\frac{(29.2-20.2)(1.79\times10^5)}{1.37} = \frac{9.0\times1.79\times10^5}{1.37}$$

Since, there are two SF in 9. 0, the answer must also have two significant figures.

378 **(c)**

In 100 g haemoglobin, mass of iron = 0.33 g

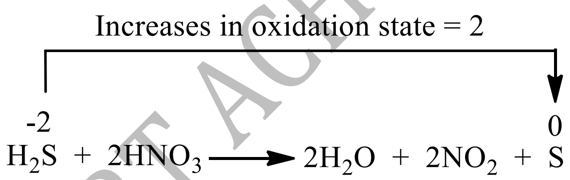
∴ in 67200 g haemoglobin, mass of iron = $\frac{67200\times0.33}{100}$

∴ the number of Fe atoms in one Hb molecule

$= \frac{672\times0.33}{56}$

$= 4$

379 **(d)**



Hence, the equivalent weight of

$H_2S = \frac{\text{molecular weight}}{\text{change in oxidation number}} = \frac{34}{2} = 17.$

380 **(c)**

C	H	N
9	1	3.5
9/12=0.75	1/1=1	3.5/14=0.25
$\frac{0.75}{0.25}=3$	$\frac{1}{0.25}=4$	$\frac{0.25}{0.25}=1$

So, empirical formula=C_3H_4N

$n = \frac{108}{54} = 2$

Molecular formula=$(C_3H_4N)_2 = C_6H_8N_2$

381 **(c)**

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

The heat of combustion of 10 g CH_4

$= -560$ kJ

So, the heat of combustion of 16 g CH_4

$= \frac{-560}{10} \times 16$

$= -896$ kJ/mol

382 **(b)**

Meq. of H_2SO_4 = Meq. of NaOH

$0.1 \times 2 \times V = 50 \times 0.2 \times 1$

∴ $V = 50$ mL

383 **(c)**

$\underset{\substack{1\\(1-x)}}{CO_2} + \underset{0}{C} \longrightarrow \underset{2x}{2CO}$

∴ $1 - x + 2x = 1.4$ find x.

384 **(b)**

Follow definition of equivalent weight.

385 **(b)**

In first oxide,

Mass of arsenic = 65.2

Mass f oxygen = 34.8

∴ Eq. mass of arsenic $= \frac{65.2}{34.8} \times 8 = 14.99$

In second oxide,

Mass of arsenic = 75.7 g

Mass of oxygen = 24.3 g

∴ Eq. mass of arsenic $= \frac{75.7}{24.3} \times 8 = 24.92$

Eq. mass of arsenic : Eq. mass of arsenic

(oxide I) (oxide II)

14.99 : 24.92

Or 3 : 5

386 **(a)**

Meq. of metal = Meq. of oxygen

$\frac{60}{E} = \frac{40}{8}$

∴ $E = 12$

Now, Meq. of metal = Meq. of bromide

$\frac{100-a}{12} = \frac{a}{80}$

∴ $a \approx 87\%$

387 **(a)**

Meq. of oxalic acid = Meq. of NaOH

$\frac{6.3}{63} \times \frac{1000}{250} \times 10 = 0.1 \times V$

∴ $V = 40$ mL

388 **(d)**

The combustion of methane can be represented by the following equation

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + 890$ kJ

16 g

$\therefore$ 16 g CH_4 burns in air to liberate=890 kJ of heat

$\therefore$ 3.2 g CH_4 will liberate=$\frac{890\times3.2}{16}$

=178 kJ of heat

390 **(a)**

1.12 litre $H_2 \equiv 1.2$ g

$\therefore$ 11.2 litre $H_2 = 12$ g

391 **(a)**

Amount of H_2O_2 in 1 mL. = $\frac{34}{1120}$ g

Also, 34 g H_2O_2 gives 16 g O_2 of 11.2 litre O_2 at STP

$\therefore \quad \frac{34}{1120}$ g $H_2O_2 = \frac{11.2\times34}{1120\times34}$ litre O_2

$= \frac{1}{100}$ litre$_{O_2}$ = 10 mL O_2

392 **(c)**

$CaCl_2 + CO_3^{2-} \longrightarrow CaCO_3 + 2Cl^-$

111 g 100g

$CaCO_3 \longrightarrow CaO + CO_2$

100 g 56g

$\because$ 56 g CaO is obtained by decomposition of $CaCO_3$ = 100g

$\therefore$ 0.959 g CaO will be obtained by the decomposition of

$CaCO_3 = \frac{100 \times 0.959}{56}$

= 1.71g

Further,

100 g $CaCO_3 \equiv$ 111g$CaCl_2$

1.71g $CaCO_3 = \frac{111 \times 1.71}{100}$

=1.89 g $CaCl_2$

% of $CaCl_2$ in the mixture = $\frac{1.89}{4.22} \times 100$

= 44.78

= 45%

393 **(d)**

1 mole $NH_3 \equiv$ 10 N electron

$\frac{11.2}{22.4}$ mole $NH_3 \equiv 10 \times N \times \frac{1}{2} = 3.01 \times 10^{24}$ electron

394 **(a)**

Number of atoms in $N_2 = \frac{11.2\times10^{-3}\times6.023\times10^{23}\times2}{22.4}$

$= 6.023 \times 10^{20}$

Number of atoms in NO = $\frac{0.015\times2\times6.023\times10^{23}}{30}$

$= 6.023 \times 10^{20}$

395 **(a)**

For poly atomic molecules, mol. wt. = at. wt. × atomicity .

396 **(a)**

(a) Density of water = 1g cm^{-3}

Mass of water=1 $m^3 = 10^6$ cm^{-3}

Mass = volume × density

$= 10^6 cm^{-3} \times 1$ g cm^{-3}

$=10^6$

$= \frac{10^6}{10^3}$ kg

= 1000 kg

(b) Mass of normal adult man = 65 kg

(c) Density of Hg = 13.6 g cm^{-3}

Volume of Hg = 10L = 10 × 1000 cm^{-3}

$\therefore$ Mass of Hg = 13.6 × 10 × 1000

= 136000 g

= 13.6 kg

$\therefore$ Mass of 1m^3 water is highest.

397 **(c)**

Equivalent weight of metal

$= \frac{\text{wt. of metal}}{\text{wt. of chlorine}} \times 35.5$

$= \frac{(74.5 - 35.5) \times 35.5}{35.5} = 39$

398 **(c)**

Element	%	% At. wt.	Ratio
N	30.5	30.5/14=2.18	1
O	69.5	69.5/16=4.34	2

Empirical formula=NO_2

Empirical formula weight=46

$n = \frac{92}{46} = 2$

$\therefore$ Molecular formula=$(NO_2)_2 = N_2O_4$

401 **(c)**

Empirical formula of glucose = CH_2O;

Molecular formula of glucose = $(CH_2O)_6$.

402 **(a)**

1 mole of CH_3COOH has 24 carbon = 2 g atom of carbon or 2 mole of carbon atoms, 4 mole of H atom and two mole of oxygen atoms.

403 **(d)**

Mass of one molecule of water

$= \frac{\text{mol. mass}}{N_0} = \frac{18}{6.02 \times 10^{23}}$ g

$\therefore$ Volume of 1 molecule of water = $\frac{mass}{density}$

$= \dfrac{18 \times 10^{-23}}{6.02 \times 1}$

$= 3 \times 10^{-23}$ mL

404 **(b)**

Meq. of NaOH $= 0.45 \times 2V + 0.6 \times V$

Total volums $= 3V$

$\therefore \quad N \times 3V = 0.45 \times 2V + 0.6V;$

$\therefore \quad N = 0.5$

405 **(d)**

In a chemical reaction, coefficient represents mole of that substance.

$X + 2Y \longrightarrow Z$

This indicates 1 mole of X reacts with 2 moles of Y to form 1 mole of$Z$.

So, 5 moles of X will require 10 moles of$Y$. But we have taken only 9 moles of Y.

Hence, Y is in limiting quantity. Hence, we determine product from Y.

Thus, 5 moles of X react with 9 moles of Y to form 4 moles of Z.

406 **(c)**

Average value $= \frac{25.2+25.25+25.0}{1} = \frac{75.45}{3}$

$= 25.15 = 25.2$ mL

Number of significant figure is 3.

407 **(b)**

$BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O$

208 g 98g 233 g

100 mL of 20.8% $BaCl_2$ solution contains = 20.8 g $BaCl_2$

50 mL of 9.8% H_2SO_4 solution contains = 4.9 g H_2SO_4

Here, H_2SO_4 is the limiting reactant.

$\because$ 98g H_2SO_4 gives $BaSO_4 = 233$ g

$\therefore$ 4.9 g H_2SO_4 will give $BaSO_4 = \frac{233 \times 4.9}{98}$

409 **(b)**

Meq. of NaOH left

$= 20 \times 0.1 - 10 \times 0.1 = 1;$

Thus, solution is alkaline and phenolphthalein gives pink colour in alkaline medium.

410 **(a)**

558.5 g Fe $\dfrac{558.5}{55.85}$ mole Fe $= 10$ mole Fe

$= 2 \times 5$mole C $= 2 \times 60$ g C

411 **(d)**

20 g N, then mol. wt. $= 100$

14 g N, then mol. wt. $= \frac{100 \times 14}{20} = 70;$

At least one N atom must present in one molecule.

412 **(a)**

$\underset{\text{mol. wt. } 102}{C_6H_{13}OH} \xrightarrow{-H_2O} \underset{\text{mol. wt. } 84}{C_6H_{12}}$

$\because$ 102 g cyclohexanol gives 84 g C_6H_{12}

$\because$ 102 g cyclohexanol will give $= \frac{84 \times 100}{102}$ g C_6H_{12}

Also % yield is 75%

$\because$ 100 g cyclohexanol will give $= \frac{84 \times 100}{102} \times \frac{75}{100}$ g C_6H_{12}

$= 61.769$ g C_6H_{12}

413 **(a)**

$H_2 + \frac{1}{2} O_2 \longrightarrow H_2O$

$\frac{100}{2}$ $\frac{100}{32}$ 0 Mole before reaction;

$\left[\frac{100}{2} - \frac{100 \times 2}{32}\right]$: 0 : $\frac{100 \times 2}{32}$ Mole ratio aftre reaction,

[Now mole ratio for $H_2 : O_2 : H_2O$: 1: 1/2 : 1;

Also, $O_2$is limiting reagent thus]

$\therefore$ wt. of H_2O formed $= \frac{100 \times 2}{32} \times 18 = 112.5$ g

414 **(b)**

Number of molecules in n moles of substance= $n \times N_0$

$= n \times 6.023 \times 10^{23}$

$\dfrac{N \text{ (no. of molecules)}}{n \text{ (no. of moles)}} = ?$

$= \dfrac{n \times 6.023 \times 10^{23}}{n} = 6.023 \times 10^{23}$

415 **(d)**

Conc. Of $Na^+ = \frac{100 \times 0.1}{200} + \frac{100 \times 0.1 \times 2}{200} = 0.15M$

$\therefore$ Ionic strength of $Na^+ = \frac{1}{2} \sum C Z^2 = \frac{1}{2} \times [0.15 \times 1^2] = 0.075$

416 **(a)**

98 g H_2SO_4 contains 32 g S or 1 mole of S

417 **(d)**

$\underset{276g}{Ag_2CO_3} \longrightarrow \underset{216g}{2Ag} + CO_2 + \frac{1}{2}O_2$

As 276 g of Ag_2CO_3 will give = 216g of Ag

So, 2.76 g of Ag_2CO_3 will give $= \frac{2.76 \times 216}{276} = 2.16$g

418 **(b)**

Mole fraction of $O_2 = \frac{8/32}{7/28 + 8/32} = 0.5$

419 **(c)**

Meq. of H_2SO_4 + Meq. of SO_3 = Meq. of NaOH

$\dfrac{(0.5 - a)}{49} \times 1000 + \dfrac{a}{80/2} \times 1000 = 26.7 \times 0.4$

$\therefore \quad a = 0.103$

$\therefore \quad$ % of $SO_3 = \frac{0.103}{0.5} \times 100 = 20.6\%$

420 **(b)**

Given, moles of $Ba(OH)_2$=0.205

$Ba(OH)_2 + CO_2 \rightarrow BaCO_3 + H_2O$

$\therefore$ 0.205 moles of $Ba(OH)_2$ ≡0.205 moles of $BaCO_3$

$\therefore$ Mass of $BaCO_3$=moles of $BaCO_3 \times$ molecules mass of $BaCO_3$

$= 0.205 \times 197.3$

$= 40.5$ g

422 **(b)**

$$M = \frac{5.3}{106 \times 1} = \frac{1}{20}$$

423 **(a)**

Meq. of conc. $AgNO_3$ = Meq. of dil. $AgNO_3$

i.e., $\frac{40 \times 10^{-3}}{170} \times 1 = \frac{16 \times 10^{-3}}{170} \times V$,

$\therefore$ $V = 2.5$ mL

426 **(b)**

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

Mole ratio of $CH_4 : O_2 :: 1 : 2$

427 **(b)**

Meq. of CO_2 in mixture $= \frac{20}{40} \times 1000 = 500$

$\therefore$Mole of CO_2 in mixture

$= \frac{500}{2 \times 1000} = \frac{1}{4}$ (Eq. wt. of $CO_2 = M/2$)

$\therefore$Mole of CO in mixture $= \frac{3}{4}$

If this CO is completely oxidised to CO_2 then mole of CO_2 formed $= \frac{3}{4}$

$\therefore$ Total mole of $CO_2 = \frac{1}{4} + \frac{3}{4} = 1$

$\therefore$ Mole of NaOH required

$= 2 \times$ mole of $CO_2 = 2 \times 1 = 2$

$\therefore$Wt. of NaOH required $= 2 \times 40 = 80$ g

428 **(b)**

Eq. wt. $= \frac{\text{mol. wt.}}{\text{basicity}} = \frac{M}{2} = \frac{98}{2} = 49$;

Basicity = 2; Only two H are replaced.

429 **(a)**

4 g He = N atoms.

430 **(a)**

ppm a unit to express hardness is amount of $CaCO_3$ present in 10^6 g H_2O of a given sample.

431 **(a)**

Eq. of metal = Eq. of oxygen

$\therefore$ $\frac{80}{E} = \frac{20}{8}$

$\therefore$ $E = 32$

432 **(a)**

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

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

Thus, H_2S is also needed in the same ratio.

433 **(c)**

22.4 litre O_2 at STP = 1 mole.

434 **(a)**

$$N_{HCl} = \frac{0.03659 \times 1000}{36.5} = 1.002\ N$$

$$N_{CH_3COOOH} = \frac{0.04509 \times 1000}{60} = 0.7515\ N$$

435 **(b)**

Eq. wt. $= \frac{\text{mol.wt.}}{\text{basicity}}$

436 **(c)**

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

1 mol 3 mol

Volume of 1 mole carbon monoxide

=22.4 L (at STP)

1 mole of ferric oxide is reduced by=3 moles of CO

$= 3 \times 22.4$ L of CO

$= 67.2$ dm^3 of CO

437 **(c)**

$$PV = \frac{w}{m} RT$$

$\therefore$ $1 \times \frac{224}{1000} = \frac{1}{m} \times 0.0821 \times 273$

$\therefore$Mol. wt. of gas =100

Now 3 N atoms (triatomic gas) weighs 100 g

$\therefore$ 1 atom of gas weights

$= \frac{100}{3N} = \frac{100}{3 \times 6.023 \times 10^{23}}$ g

$= 5.53 \times 10^{-23}$ g

438 **(b)**

Weight of empirical formula CH_2=14

Mass of 1 mole=molecular weight=56

$$n = \frac{\text{molecular weight}}{\text{empirical formula weight}} = \frac{56}{14} = 4$$

Molecular formula=$(CH_2)_4$

$= C_4H_8$

439 **(c)**

5. Atoms in 2.0 mol of

$S_8 = 2 \times 8 \times 6.02 \times 10^{23}$

$= 9.632 \times 10^{24}$

2. Atoms in 6.0 mol of S$=6 \times 6.02 \times 10^{23}$

$= 3.612 \times 10^{24}$

6. Atoms in 5.5 mol of

$SO_2 = 3 \times 5.5 \times 6.02 \times 10^{23} = 9.93 \times 10^{24}$

7. Atoms in 4.48 L of CO_2 at STP$= \frac{3 \times 4.48 \times 6.02 \times 10^{23}}{22.4}$

$= 3.612 \times 10^{23}$

440 **(a)**

The definition of % by weight.

441 **(a)**

1 mole of $MgSO_4 = M$ g ≈ 120 g

442 **(c)**

Mole fraction of alcohol $= \frac{1}{1+4} = \frac{1}{5}$;

$\therefore$ M. f. of water $= 4/5$

443 **(d)**

Valence $= \frac{26.89}{8.9} \approx 3$

$\therefore$ Exact at. wt. $= 8.9 \times 3 = 26.7$

444 **(c)**

As both the reactants are consumed completely, thus the ratio of stoichiometric coefficients would be 0.75 : 2 or 3:8

So,

$3A_4 + 8O_2 \longrightarrow$ Product

Now as final pressure is half of oxygen initially, thus the molecular formula will be A_3O_4 to balance the equation correctly, *ie*,

$3A_4 + 8O_2 \longrightarrow 4A_3O_4$

445 **(b)**

$M_{Na_2CO_3} = M_{Na^+} \times 2 = M_{CO_3^{2-}}$

and $M_{Na_2CO_3} = \frac{25.3 \times 1000}{106 \times 250} = 0.955$

Thus (b) is correct.

446 **(c)**

$2NO + O_2 \longrightarrow 2NO_2$

32g 2×46g

$\because$ 92 g NO_2 uses $O_2 = 32$g

$\therefore$ 10 g NO_2 uses $O_2 = \frac{32}{92} \times 10 = 3.48$g

447 **(c)**

Milli mole, in of I $= 480 \times 1.5 = 720$

Milli mole, in of II $= 520 \times 1.2 = 624$

$\therefore$ Total mm $= 720 + 624 = 1344$

Total $V = 480 + 520$

$= 1000$ ML

$\therefore$ $M \times 1000 = 1344$

or $M = 1.344$

449 **(c)**

Camphor is used in molecular mass determination due to volatile nature. The method is called Rast's camphor method. Camphor acts as a solid solvent which is volatile, hence can be removed easily.

450 **(b)**

Weight of solvent = weight of solution – weight of NaCl

$= 1.0585 \times 1000 - 58.5$

$= 1058.5 - 58.5 = 1000$ g =1 kg

$$m = \frac{\text{mole of NaCl}}{\text{weight of solvent in kg}} = \frac{1}{1} = 1$$

451 **(c)**

Element	%	Relative no. of atom	Simplest ratio
C	49.3	$\frac{49.3}{12} = 4.1$	$\frac{4.1}{2.74} = 1.5 \times 2 = 3$
H	6.84	$\frac{6.84}{1} = 6.84$	$\frac{6.84}{2.74} = 2.5 \times 2 = 5$
O	43.86	$\frac{43.86}{16} = 2.74$	$\frac{2.74}{2.74} = 1 \times 2 = 2$

The empirical formula is $C_3H_5O_2$

Empirical formula weight

$= (3 \times 12) + (5 \times 1) + (2 \times 16)$

$= 36 + 5 + 32$

$= 73$

Molecular wt. of the compound

$= 2 \times VD$

$= 2 \times 73$

$=146$

$$n = \frac{\text{mol. wt.}}{\text{empirical formula wt.}}$$

$= \frac{146}{73}$

$= 2$

Molecular formula=empirical formula$\times$ 2

$= (C_3H_5O_2) \times 2$

$= C_6H_{10}O_4$

452 **(c)**

10 % glucose means 10 g glucose is present in 100 mL solution.

453 **(b)**

1 molecules of $Ca(OH)_2$ contains 5 atoms;

$\therefore$1 mole contains $5N$ atoms

454 **(d)**

H_3PO_3 is diabasic acid, thus.

$N = 2 \times M = 2 \times 0.3 = 0.6$

455 **(c)**

Meq. of carbonate = Meq. of acid;

$\therefore$ $\frac{0.84}{E} \times 1000 = 40 \times \frac{1}{2}$

$\therefore$ $E = 42$

456 **(c)**

Avogadro's number depends upon the basis of atomic weight scale

12g C $\equiv 6.023 \times 10^{23}$ atoms

6g C $\equiv \frac{6.023 \times 10^{23} \times 6}{12} = \frac{1}{2} \times 6.023 \times 10^{23}$atoms

or 1 amu $= \frac{1}{N} = \frac{2}{6.023 \times 10^{23}} = 3.3 \times 10^{-24}$g

Let mol. mass of an element be M amu

Then M amu $=$ M $\times 3.3 \times 10^{-24}$g

Mass of 1 mole $=$ M $\times 3.3 \times 10^{-24} \times$ Av. no.

$= M \times 3.3 \times 10^{-24} \times \frac{1}{2} \times 6.023 \times 10^{23}$g

$= M$ g

457 **(c)**

Given, vapour density=70

∴ Molecular weight=2 × vapour density

$= 2 \times 70 = 140$

$[CO]_x = (12+16)_x = (28)_x$

∵ $(28)_x = 140$

$x = \frac{140}{28} = 5$

∴ Formula is $(CO)_5$.

458 **(d)**

Number of gram equivalents of

$HCl = \frac{100 \times 0.1}{1000} = 0.01$

Number of gram equivalents of HCl=Number of gram equivalents of metal carbonate

0.01=0.01

Therefore, mass of 1 g equivalents of carbonate salt

$= \frac{2}{0.01} = 200$g

Equivalent mass of metal carbonate=200

460 **(d)**

By using

Valency of an element=$\frac{\text{approximate weight}}{\text{equivalent weight}}$

$= \frac{26.8/\text{specific heat}}{\text{equivalent weight}}$

$= \frac{26.8/1.05}{9} = 2.835 \cong 3$

Now, by using

Atomic weight=equivalent weight× valency

$9 \times 3 = 27$

461 **(a)**

2 mole of H_2O = 36 g H_2O = $2N$ molecules .

462 **(c)**

Mol. wt. of chloride $= 66 \times 2 = 132$

Let metal chloride be MCl_n

Eq. of metal = Eq. of O

∴ $\frac{53}{E} = \frac{47}{8}$

∴ $E = 9$

∴ $9 \times n + 35.5n = 132$

∴ $n \approx 3$

∴ At. wt. of metal = 27

463 **(a)**

111 g $CaCl_2$ contains N ions of Ca^{2+} and $2N$ ions of Cl^-.

464 **(a)**

% by weight $= \frac{\text{weight of solute}}{\text{weight of soultion}} \times 100$

Or $40 = \frac{w}{(w+60)} \times 100$

$w = 40$ g

465 **(a)**

$JPa^{-1} = \frac{J}{Pa}$

$= \frac{\text{work}}{\text{pressure}} = \frac{N-m}{N/m^2}$

$= m^3$

466 **(a)**

$N = \frac{(24.5 \times 1000)}{(98/2) \times 250} = 2;$

$M = \frac{(24.5 \times 1000)}{98 \times 250} = 1$

467 **(c)**

mol. wt. of $MCl_2 = 2 \times 32.7 + 71 = 136.4$

468 **(a)**

3.4 g S = 100 g insulin

∴ 32 g S $= \frac{100 \times 32}{3.4} = 941.176$

Insulin must contain at least one atom of S in its one molecule.

469 **(b)**

$Mg_3(PO_4)_2$; mole

8 mole of O-atom are contained by 1 mole $Mg_3(PO_4)_2$.

Hence, 0.25 moles of O-atom $= \frac{1}{8} \times$ 0.25 mole $Mg_3(PO_4)_2$

$= 3.125 \times 10^{-2}$

470 **(c)**

Gram molecular weight is expressed in g mol^{-1}, *i.e.*, weight of one mole of substance.

471 **(d)**

Number of oxygen atom in 2 g of CO

$= \frac{2}{28} \times 6.022 \times 10^{23} \times 1$

Number of oxygen atom in 2 g of CO_2

$= \frac{2}{44} \times 6.022 \times 10^{23} \times 2$

Number of oxygen atom in 2 g of SO_2

$= \frac{2}{64} \times 6.022 \times 10^{23} \times 2$

Number of oxygen atom in 2 g of H_2O

$= \frac{2}{18} \times 6.022 \times 10^{23} \times 1$

Hence, 2 g of H_2O has maximum number of atoms of oxygen.

472 **(b)**

mM of $AgNO_3 = 0.1 \times V$

mM of $NaCl = 0.2 \times V$

$\therefore$ mM of $NO_3^- = 0.1 \times V$ and total $V = 2V$

$\therefore \quad [NO_3^-] = \frac{0.1 \times V}{2V} = 0.05$

473 **(a)**

Eq. mass of copper chloride = 99

Eq. mass of chlorine = 35.5

$\therefore$ Eq. mass of copper = 99 −35.5 = 63.5

$\therefore$ Valency of copper $= \frac{\text{at mass of copper}}{\text{eq.mass of copper}} = 1$

$\therefore$ Formula of copper chloride is CuCl.

475 **(d)**

g-atom of $X = \frac{75.8}{75}$

g-atom of $Y = \frac{24.2}{16}$; find simple ratio.

476 **(a)**

(a) 0.1 mole of CO_2

(b) $\frac{11.2}{22.4} = 0.5$ mole of CO_2

(c) $\frac{22}{44} = 0.5$ mole of CO_2

(d) $\frac{22.4 \times 10^3}{22400} = 1$ mole of CO_2

Equal numbers of moles have equal number of molecules.

Hence, the smallest number of molecules of CO_2 is in 0.1 mole of CO_2.

477 **(b)**

Required equation is given below,

$Zn + 2OH^- \rightarrow ZnO_2^{2-} + 2H^+ + 2e^-$

$NO_3^- + 8H^+ + 8e^- \rightarrow OH^- + 2H_2O + NH_3$

From the above equation

$\because$ 8 moles of electron absorbed by 85 g of $NaNO_3$

$\therefore$ 1 mole of electron absorbed by $\frac{85}{8}$ g of $NaNO_3$ = 10.625 g

478 **(b)**

60 g NH_2CONH_2 has 28 g N

$\therefore$ 100 g urea has $N = \frac{28 \times 100}{60}$

479 **(d)**

m mole $= M \times V$

$\therefore \quad V = \frac{0.1}{0.8} = 0.125$ mL

480 **(a)**

At. wt. × specific heat (in cal/g) $\simeq 6.4$ and $E = \frac{\text{mol. wt.}}{\text{valency}}$

481 **(c)**

1 g-atom Ag = 108 g

482 **(b)**

4.523 + 2.3 + 6.24 = 13.063. As 2.3 has least number of decimal places $i.e.$, one, therefore sum should be reported to one decimal place only. After rounding off, reported sum=13.1 which has three significant figures.

483 **(a)**

249.6 g $CuSO_4 \cdot 5H_2O$ contains 90 g H_2O.

484 **(a)**

Mole = 3;

Wt. of solvent = 1000 g;

$\therefore \quad$ Wt. of solution = 1000 + 3 × 40 = 1120 g:

$\therefore \quad$ Volume of solution $= \frac{1120}{1.110}$ mL

$\therefore \quad M = \frac{3}{\frac{1120}{1.110 \times 1000}} = 2.9732$

485 **(b)**

g-atom of metal $= \frac{60}{24}$;

g-atom of oxygen $= \frac{40}{16}$; find simple ratio.

487 **(a)**

$$\overset{+5}{3HClO_3} \longrightarrow \overset{+7}{HClO_4} + \overset{0}{Cl_2} + 2O_2 + H_2O$$

Equivalent mass of $HClO_3 = \frac{\text{molar mass}}{\text{change in oxidation no.}}$

$= \frac{84.45}{5} = 16.89$

(When it acts as an oxidising agent)

488 **(a)**

1 molecule of CH_3COOH contains 8 atoms;

$\therefore$ 1 mole contains 8 N atoms

489 **(a)**

specific gravity $= \frac{\text{wt. of solution}}{\text{volume of solution}}$

491 **(b)**

$$m = \frac{18 \times 1000}{60 \times (1500 \times 1.052 - 18)} = 0.19$$

492 **(b)**

Average atomic weight

$= \frac{\text{at. wt.} \times \text{relative abundance} + \text{at. wt.} \times \text{relative al}}{100}$

$= \frac{85 \times 75 + 87 \times 25}{100}$

= 85.5

493 **(a)**

A molar solution has molarity =1; A centimolar solution has molarity = $M/100$. A decimolar solution has molarity $M/10$; A decamolar solution has molarity = $10M$.

494 **(d)**

$$\frac{2.568 \times 5.8}{4.168} = \frac{15}{4.168} = 3.6057$$

Answer in significant figures = 3.6

495 **(c)**

X_2O has $X : O :: 14 : 16$
$\therefore$ At. wt. of $X = 7$

496 **(c)**
X is AB_4.

497 **(d)**
1 mole $P_4 = N$ molecules of $P_4 = 4\,N$ atoms of P_4.

498 **(b)**

$$M_{NaCl} = \frac{5.85}{58.5 \times 1} = 0.1$$

499 **(c)**
$M_{HCl} = 1$;

$$M_{H_2SO_4} = \frac{0.4}{2} = 0.2$$

$$M_{Na_2CO_3} = \frac{0.1}{2} = 0.05$$

500 **(d)**
The amu represents atomic mass unit. It is used in place of unified mass unit.
1 u = 1 Avogram = 1 Aston = 1 Dalton

$$1\text{ u} = \frac{1}{12} \times \text{mass of C} - 12\text{ atom}$$

$$= \frac{1}{12} \times 1.9924 \times 10^{-23}\text{ g}$$

$$= 1.66 \times 10^{-24}\text{ g} = 1.66 \times 10^{-27}\text{ kg}$$

501 **(a)**
1 mole of Ag ≈ 108 g $= M$ g

502 **(a)**
wt. of $Cl_2 = 1$ mole $= 71$ g
wt. of chloride $= 111$ g
$\therefore$ wt. of metal $= 111 - 71 = 40$ g
Now Eq. of Cl = Eq. of metal
$\therefore \frac{71}{35.5} = \frac{40}{E}$ or $E_{metal} = 20$;
Now E g metal will displace 1 g H_2 and since 2 g H_2 is displaced by same amount, Thus 2 E g of metal are used. Therefore, $2E$ is at. wt. of metal.

503 **(a)**
Oxalic acid is $H_2C_2O_4$ and it is dibasic and thus, $E = M/2$

504 **(b)**
Molarity is mole of solute present in one litre solution.

505 **(c)**
Meq. of NaH_2PO_4 = Meq. of NaOH;
Thus, $\frac{12}{120/2} \times 1000 = 1 \times V$
$\therefore$ $V = 200$ mL

506 **(a)**
Atoms in 1 molecule of $C_{12}H_{22}O_{11} = 45$;
$\therefore$ atom in N molecule $= 45\,N$

507 **(c)**

$$S + O_2 \rightarrow SO_2$$

32 g 32 g
1 mole 22.4 L
1 mole of S required volume of
$O_2 = 22.4$ L
So, 1.5 mole of S required volume of
$O_2 = 22.4 \times 1.5 = 33.60$ L

508 **(c)**
H_2O is the limiting reagent for the above equation.

509 **(a)**
1 mole=molecular mass in gram=6.02×10^{23} molecules
Given mass of $CO_2 = 44$ g
Molecular mass of $CO_2 = 12 + 16 \times 2 = 44$
$\therefore$ No. of molecules in 44 g of CO_2
$= 6.02 \times 10^{23}$

510 **(a)**
Given, volume of $O_2 = 1$L
$\because$ 22.4 L of O_2 at STP $= 32$ g
$\therefore$ 1 L of O_2 at STP $= \frac{32}{22.4}$ g
$= 1.43$ g

511 **(a)**
Number of atoms in 24 g of C $= \frac{24}{12} \times 6.02 \times 10^{23}$
$= 2 \times 6.02 \times 10^{23}$
Number of atoms in
56 g of Fe $= \frac{56}{56} \times 6.02 \times 10^{23}$
Number of atoms in
26 g of Al $= \frac{26}{27} \times 6.02 \times 10^{23}$
$\approx 6.02 \times 10^{23}$
Number of atoms in 108 g of Ag $= \frac{108}{108} \times 6.02 \times 10^{23}$
$= 6.02 \times 10^{23}$

513 **(d)**
On dilution since volume of solution changes and this normality, molarity molality changes. The equivalent $\left(\frac{\text{wt.}}{\text{eq.wt.}}\right)$, mole $\left(\frac{\text{wt.}}{\text{mol..wt.}}\right)$ do not change .

514 **(d)**
In 1 L air, volume of $O_2 = 210\ cc$
$\because 22400\text{ cm}^3 = 1$ mol

$\therefore 210\ cm^3 = \frac{210}{22400} = 0.0093$ mol

515 **(b)**

According to Avogadro's hypothesis one gram mole of a gas at NTP occupies 22.4 L.

516 **(a)**

$SnCl_2 + Cl_2 \rightarrow SnCl_4$

190 71

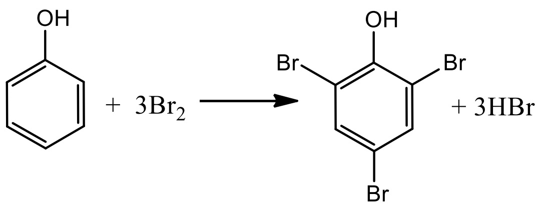
$$\frac{190}{E_1} = \frac{71}{35.5}$$

$$E_1 = 95$$

517 **(b)**

The standard adopted for the determination of atomic weight of elements is based on C^{12}.

518 **(d)**



Molecular weight of $C_6H_5OH = 94$

Atomic weight of Br=80

Amount of Br utilized=480 g

$\because$ 94 g of C_6H_5OH reacts with 480 g of bromine.

$\therefore$ 2g of C_6H_5OH will react with$=\frac{480\times2}{94}$

=10.2 g

519 **(a)**

$NaOH + H_2SO_4 \longrightarrow NaHSO_4 + H_2O$;

Eq. wt. of H_2SO_4 = Mol. wt./1

$2NaOH + H_2SO_4 \longrightarrow NaHSO_4 + H_2O$;

Eq. wt. of H_2SO_4 = Mol. wt./2

520 **(d)**

1 mole of O_2 has 32 g; the highest value in all the given data.

521 **(b)**

17 g $NH_3 = N$ molecules.

522 **(a)**

wt. of V mL $= w$g.

$\therefore$ wt. of 22400 mL $= \frac{W \times 22400}{V}$ = Mol. wt.

(since I mole occupies 22400 mL at STP)

523 **(a)**

$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$

2 mol 1 mol

$\because$ 2 mole $NaHCO_3$ on decomposition gives= 1 moles Na_2CO_3

$\therefore$ 0.2 mole $NaHCO_3$ on decomposition will give

$$= \frac{1}{2} \times 0.2$$

=0.1 mol Na_2CO_3

524 **(a)**

$Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2$

$22400 cm^3$

8 g of calcium will produce $= \frac{22400\times8}{40}$

$= 4480\ cm^3$

525 **(a)**

Weight of C-14 isotope in 12 g sample $=\frac{2 \times 12}{100}$

$\therefore$ No. of C-14 isotopes $= \frac{2 \times 12 \times N}{100 \times 4}$ $=1.032 \times 10^{22}$ atoms