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SOME BASIC CONCEPTS OF CHEMISTRY,1.SOME BASIC CONCEPTS OF CHEMISTRY

Single Correct Answer Type

1. 3.011×10^{23} atoms of an element weights 1.15 g. The atomic mass of the element is
   a) 23 b) 10
   c) 16 d) 35.5
2. 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
3. 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*
4. How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 moles of oxygen atoms?
   a) 0.02 b) 3.125×10^{-2}
   c) 1.25×10^{-2} d) 2.5×10^{-2}
5. 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
6. The mass of 112 cm^3 of CH_4 gas at STP is
   a) 0.16 g b) 0.8 g
   c) 0.08 g d) 1.6 g
7. 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}
8. In the combustion of 5.00 g of a metal, 9.44 g of metal oxide are formed Hence, equivalent mass of the metal is
   a) 4.44 g b) 9.00 g
   c) 5.00 g d) 2.22 g
9. Sulphur forms the chlorides S_2Cl_2 and SCl_2; the equivalent mass of the sulphur in SCl_2 is 16 g equivalent $^{-1}$. Thus, equivalent mass of the sulphur in S_2Cl_2 is
   a) 8 g equivalent $^{-1}$ b) 16 g equivalent $^{-1}$
   c) 32 g equivalent $^{-1}$ d) 64 g equivalent $^{-1}$
10. 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}
11. 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
12. Number of atoms in 12 g $^{24}_{12}$ Mg is equal to
    a) oxygen atoms in 11 g CO_2 b) hydrogen atoms in 4 g CH_4
    c) nitrogen atoms in 46 g N_2O_4 d) sulphur atoms in 79 g $Na_2S_2O_3$
13. Vapour density of a volatile substance is 4 ($CH_4 = 1$). Its molecular weight would be:
    a) 8 b) 2
    c) 64 d) 128
14. 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*
15. Which of the following statement is correct about the reaction given below?
    $4Fe(s) + 3O_2(g) \longrightarrow 2Fe_2O_3(g)$
    a) Total mass of iron and oxygen in reactants = total mass of iron and oxygen in product therefore it follows law of conservation of mass b) Total mass of reactants = total mass of product, therefore, law of multiple proportions is followed
    c) Amount of Fe_2O_3 d) Amount of Fe_2O_3

can be increased by taking any one of the reactants (iron or oxygen) in excess

produced will decrease if the amount of any one of the reactants (iron or oxygen) is taken in excess

16. 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

17. One part of an element A combines with two parts of B (another element). Six parts of element C combine with four parts of element B. If A and C combine together, the ratio of their masses will be governed by
a) law of definite proportions
b) law of multiple proportions
c) law of reciprocal proportions
d) law of conservations of mass

18. 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

19. 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

20. 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

21. In the standardisation of $N_2S_2O_3$ using $K_2Cr_2O_7$ by iodometry, the equivalent weight of $K_2Cr_2O_7$ is
a) $\frac{\text{molecular weight}}{2}$
b) $\frac{\text{molecular weight}}{6}$
c) $\frac{\text{molecular weight}}{3}$
d) same as molecular weight

22. 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

23. What is the quantity of hydrogen gas liberated when 46 g sodium reacts with excess ethanol? (Given atomic mass of Na = 23)
a) 2.4×10^{-3} kg
b) 2.0×10^{-3} kg
c) 4.0×10^{-3} kg
d) 2.4×10^{-2} kg

24. Cyclohexanol is dehydrated to cyclohexene on heating with conc. H_2SO_4. If the yield of this reaction is 75%, how much cyclohexene will be obtained from 100 g of cyclohexanol?
a) 61.5 g
b) 75.0 g
c) 20.0 g
d) 41.0 g

25. 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

26. The same amount of a metal combines with 0.200 g of oxygen and with 3.17 g of a halogen. Hence, equivalent mass of halogen is
a) 127 g
b) 80 g
c) 35.5 g
d) 9 g

27. 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

28. 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

29. When 100 g of ethylene polymerizes to polyethylene according to the equation,
$n CH_2 = CH_2 \longrightarrow -(CH_3 - CH_2)-_n$.
The weight of polyethylene produced will be:
a) $\frac{n}{2}$ g
b) 100 g
c) $\frac{100}{n}$ g
d) $100n$ g

30. 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

31. 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

32. What is the mass of one molecule of yellow phosphorus? (Atomic mass, P = 30)
a) 1.993×10^{-22}mg b) 1.993×10^{-19}mg
c) 4.983×10^{-20}mg d) 4.983×10^{-23}mg

33. The molarity of 2 N $H_2SO_4$is:
a) 1 M b) 2 M
c) 3 M d) 4 M

34. 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

35. 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

36. 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

37. 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

38. 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

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

40. The mass of 11.2 L of ammonia gas at STP is
a) 8.5 g b) 85 g
c) 17 g d) 4.25 g

41. 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

42. 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

43. Polyethylene can be produced from calcium carbide according to the following sequence of reactions;
$CaC_2 + H_2O \longrightarrow CaO + HC \equiv CH$
$nHC \equiv CH + nH_2 \longrightarrow +CH_2-CH_2+_n$
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

44. 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

45. The number of moles of $(NH_4)_2SO_4Fe_2(SO_4)_3 \cdot 24\ H_2O$ formed from a sample containing 0.0056 g of Fe is
a) 10^{-4} mol b) 0.5×10^{-4} mol
c) 2×10^{-4} mol d) 0.33×10^{-4} mol

46. 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

47. 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

48. 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

49. 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

50. The number of Cl^-ions present in 222 g anhydrous $CaCl_2$ is
a) 1.2×10^{22} b) 6.023×10^{23}
c) 2.63×10^{22} d) 2.409×10^{24}

51. Any quantitative observation or measurement is represented by A followed by B in which it is measured. A and B respectively are
a) A → units, B → number b) A → alphabet, B → units.
c) A → number, B → units d) A → roman numeral, B → number

52. By heating 10 g $CaCO_3$, 5.6 g CaO is formed. The weight of CO_2 obtained in this reaction is
a) 2.4 g b) 5.6 g
c) 4.4 g d) 3.6 g

53. 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

54. 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

55. 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

56. Stoichiometric ratio of sodium dihydrogen orthophosphate and sodium hydrogen orthophosphate required for synthesis of $Na_5P_3O_{10}$ is
a) 1.5 : 3 b) 3 : 1.5
c) 1 : 1 d) 2 : 3

57. 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}

58. 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

59. Number of molecules in 1 L of water is close to
a) $\frac{18}{22.4} \times 10^{23}$ b) $55.5 \times 6.023 \times 10^{23}$
c) $\frac{6.023}{23.4} \times 10^{23}$ d) $18 \times 6.023 \times 10^{23}$

60. 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

61. Consider the following units of energy. A : 1 L atm, B : 1 erg, C : 1 J, D : 1 kcal, increasing order of these values is
a) A = B = C = D b) A < B < C < D
c) B < C < A < D d) D < A < C < B

62. 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

63. 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

64. The oxygen obtained from 72 kg of water is
a) 72 kg b) 46 kg
c) 50 kg d) 64 kg

65. How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atom ?
a) 0.02 b) 3.125×10^{-2}
c) 1.25×10^{-2} d) 2.5×10^{-2}

66. 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

67. 10^{21} molecules are removed from 200 mg of CO_2. The moles of CO_2 left are
a) 2.88×10^{-3} b) 28.8×10^{-3}
c) 288×10^{-3} d) 28.8×10^{3}

68. What is the SI unit for electrochemical equivalent?
a) Js^{-1} b) JC^{-1}
c) kgC d) kgC^{-1}

69. 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

70. 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) $1.2 \div 11.2$

71. If the density of methanol is 0.8 kg L^{-1}, what is its volume needed for making 4 L of its 0.25M solution?
a) 4 mL b) 8 mL
c) 40 mL. d) 80 mL

72. 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

73. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much? (Atomic weight, Mg = 24, O = 16)
a) Mg, 0.16 g b) O_2, 0.16 g

c) Mg, 0.44 g d) O_2, 0.28 g

74. 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

75. 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

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

77. 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

78. 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

79. The unit (JPa^{-1}) is equivalent to
a) m^3 b) cm^{-3}
c) dm^3 d) None of these

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

81. Equivalent mass of a metal is 12 g mol^{-1}. Hence, equivalent mass of its oxide is
a) 24 g mol^{-1} b) 28 g mol^{-1}
c) 20 g mol^{-1} d) 34gmol^{-1}

82. Rearrange the following (I to IV) in the order of increasing masses and choose the correct answer (atomic mass; O = 16, Cu = 63, N = 14)
I. 1 molecule of oxygen.
II. 1 atom of nitrogen.
III. 1×10^{-10} g molecular weight of oxygen.
IV. 1×10^{-10} g atomic weight of copper.
a) II < I < III< IV b) IV< III < II < I
c) II < III < I < IV d) III < IV < I < II

83. 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

84. 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

85. The total number of electrons in 18 mL of water (density = 1 g mL^{-1})
a) 6.023×10^{25} b) 6.023×10^{24}
c) $6.023 \times 18 \times 10^{23}$ d) 6.023×10^{23}

86. 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 of $CaCO_3$ bound per g of chelating agent is:
a) 100 mg b) 163 mg
c) 200 mg d) 263 mg

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

88. To prepare a standard solution of a substance, we use:
a) A pipette b) A burette
c) Measuring flask d) Measuring cylinder

89. 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

90. 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

91. 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

92. 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) $E = \frac{A \times 1.008 \times 22}{\text{volume of } H_2 \text{ displ}}$
c) $E = \frac{A \times}{\text{volume of } H_2 \text{ disp}}$ d) All of the above

93. For 14 g of CO, the wrong statement is
a) it occupies 2.24 L at NTP
b) it corresponds to 1/2 mole of CO
c) it corresponds to same mole of CO and nitrogen gas
d) it corresponds to 3.01×10^{23} molecules of CO

94. 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

95. Molecular weight of tribasic acid is W. Its equivalent weight will be:
a) $W/2$
b) $W/3$
c) W
d) $3W$

96. The number of water molecules in 1 L of water is
a) 18
b) 18×1000
c) N_A
d) $55.55\ N_A$

97. 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

98. Which of the following sets of compounds correctly illustrate the law of reciprocal proportions?
a) P_2O_3, PH_3, H_2O
b) P_2O_5, PH_3, H_2O
c) N_2O_5, NH_3, H_2O
d) N_2O, NH_3, H_2O

99. 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

100. 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) $N/40$

101. The number of Na atom in 46 g Na (Atomic weight of Na = 23) is.
a) 6.023×10^{23}
b) 2
c) 1
d) 12.046×10^{23}

102. 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

103. 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

104. 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

105. 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

106. A metal oxide has the formula A_2O_3. It can be reduced by hydrogen to give free metal and water. 0.1596 g of this metal oxide requires 6 mg of hydrogen for complete reduction. What is the atomic weight of metal?
a) 52.3
b) 57.3
c) 55.8
d) 59.3

107. 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

108. The number of mole of solute per kg of solvent is called:
a) Mole fraction of solute
b) Normality
c) Molarity
d) Molality

109. 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

110. The oxide of an element contains 67.67% of oxygen. Equivalent weight of the element is
a) 2.46 g
b) 3.82 g
c) 4.36 g
d) 4.96 g

111. 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

112. 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

113. 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

114. Mark the conversion factor which is not correct.
a) 1 inch = 254 cm b) 1 Litre = $10^{-3}m^3$
c) 1 m = 3.937 inches d) 1 atm = 101325×10^5 Pa

115. One mole electron means:
a) N electrons b) 6.023×10^{23} electrons
c) 0.55 mg electrons d) All of these

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

117. 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}

118. What is the unit of viscosity?
a) Nm^{-1} b) Nsm^{-2}
c) kg s^{-1} d) Kg s^{2}

119. 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

120. Mass of the solution of 1 molal glucose solution to get 0.2 mole of glucose is
a) 200 g b) 300 g
c) 236 g d) 108 g

121. 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

122. 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

123. 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

124. 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

125. 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

126. At a given temperature, 1 mole O_2 occupy $20dm^3$ of volume. Thus, volume occupied by 1 equivalent of O_2 is
a) $20dm^3$ b) $10dm^3$
c) $2.5dm^3$ d) $5.0dm^3$

127. 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

128. To make 0.01 mole, which of the following has maximum mass?
a) Sodium bicarbonate b) Sodium carbonate
c) Sodium sulphate d) Sodium oxalate

129. In the reaction, $N_2 + 3\ H_2 \longrightarrow 2NH_3$, the ratio of volumes of nitrogen, hydrogen and ammonia is 1: 3: 2. These ratio illustrate the law of
a) constant properties b) Gay-Lussac
c) multiple proportions d) reciprocal proportions

130. 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

131. Which one of the following will have largest number of atoms?
a) 1 g Au (s) b) 1 g Na (s)
c) 1 g Li (s) d) 1 g of Cl_2(g)

132. The system that contains the maximum number of atoms is
a) 4.25 g of NH_3 b) 8 g of O_2

c) 2 g of H_2 d) 4 g of He

133. Which term is to be correctly used for expressing concentration of electrolytes in solution?
a) Molarity b) Normality
c) Formality d) None of these

134. 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

135. 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

136. 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

137. 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

138. 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

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

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

141. 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

142. The percentage of nitrogen in urea is about:
a) 38.4 b) 46.6
c) 59.1 d) 61.3

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

144. 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

145. What is the SI unit of density?
a) g cm^{-3} b) g m^{-3}
c) kg m^{-3} d) kg cm^{-3}

146. 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

147. The molecular mass of a compound (X) if its 3.0115×10^9 molecules weigh 1.0×10^{-12} g is
a) 150 g b) 200 g
c) 630 g d) 500 g

148. 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

149. In a closed vessel, 5 moles of $A_2(g)$ and 7 moles of $B_2(g)$ are reacted in the following manner,
$A_2(g) + 3B_2(g) \longrightarrow 2AB_3(g)$
What is the total number of moles of gases present in the container at the end of the reaction?
a) 22/3 mol b) 7/3 mol
c) 14/3 mol d) 8/3 mol

150. 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

151. 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

152. Which symbol replaces the unit of atomic mass, amu?
a) u b) A
c) M d) n

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

154. 74.5 g of a metallic chloride contain 35.5 g of chlorine. The equivalent weight of the metal is

a) 19.5 b) 35.5
c) 39.0 d) 78.0

155. 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

156. Which of the following formulae expresses the law of equivalent correctly?
a) $\frac{m_1}{m_2} = \frac{E_2}{E_1}$ b) $E_1E_2 = m_1m_2$
c) $m_1E_2 = E_1m_2$ d) $\frac{(m_1 + m_2)}{= (E_1 + E_2)}$

157. 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

158. A divalent metal has 12 equivalent weight. The molecular weight of its oxide is
a) 16 g b) 32 g
c) 40 g d) 52 g

159. 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

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

161. 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}

162. 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%

163. 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

164. 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

165. 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

166. 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

167. 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

168. 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

169. 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}

170. Number of atoms of He in 100 u of He (atomic weight of He is 4) are
a) 25 atom b) 100 atom
c) 50 atom d) $100 \times 6 \times 10^{-23}$ atom

171. When 22.4 L of $H_2(g)$ is mixed with 11.2 L of $Cl_2(g)$, each at STP, the moles of HCl(g) formed is equal to
a) 1 mole of HCl (g) b) 2 moles of HCl (g)
c) 0.5 mole of HCl (g) d) 1.5 moles of HCl (g)

172. 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*

173. 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

174. 18.72 g of a substance X occupies 1.81 cm^3. What will be its density measured in correct significant figures?

a) 10.3 g/cm^3 b) 10.34 g/cm^3
c) 10.4 g/cm^3 d) 10.3425 g/cm^3

175. 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

176. 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

177. The vapour density of a gas is 11.2. The volume occupied by one gram of the gas at STP is
a) 1.0 L b) 11.2 L
c) 22.4 L d) None of these

178. 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

179. The weight of 112 mL of oxygen at NTP is
a) 0.64 g O_2 b) 0.96 g O_2
c) 0.32 g O_2 d) 0.16 g O_2

180. A jug contains 5 L of milk. Calculate the volume of milk in m^3.
a) 5×10^{-3} b) 5×10^3
c) 5×10000 d) 5×10^5

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

182. 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

183. 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

184. 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

185. The number of gram atoms of oxygen in 6.02×10^{24} CO molecules is
a) 1 b) 0.5
c) 5 d) 10

186. A measured temperature on Fahrenheit scale is 200°F. What will this reading be on Celsius scale?
a) 40°C b) 94°C
c) 93.3°C d) 30°C

187. 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

188. The number of atoms present in a molecule is called:
a) Atomicity b) Molecularity
c) Poison's ratio d) None of these

189. 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

190. A metal oxide contains 20% oxygen by weight. Equivalent weight of metal is
a) 32 b) 40
c) 64 d) 72

191. 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

192. 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

193. 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

194. Few quantities with their units are given below. Mark the unit which is not correctly converted.
a) 1 km $= 10^6$ mm b) 1mg $= 10^{-6}$ kg
c) 1mg $= 10^{10}$ng d) 1 mL $= 10^{-3}$dm^3

195. 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}

196. Which of the following is correct?
a) Meq. $= N \times V_{\text{in mL}} =$ $\frac{\text{wt.}}{\text{Eq.wt.}} \times 1000$ b) Eq. $= N \times V_{\text{in mL}} =$ $\frac{\text{wt.}}{\text{Eq.wt.}}$
c) Equal equivalent or d) All of the above

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

197. 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

198. The correct conversion of the following into basic units.
(i) 28.7pm
(ii) 15.15μs
(iii) 25365mg
a) (i) → 28.7×10^{-11} m, (ii) → 1515×10^{-6} s, (iii) → 2.5365×10^{-3} kg
b) (i) → 2.87×10^{-11} m, (ii) → 1515×10^{-5} s, (iii) → 2.5365×10^{-2} kg
c) (i) → 2.87×10^{-10} m (ii) → 1515×10^{-5} s, (iii) → 2.5365×10^{-3} kg
d) (i) → 2.87×10^{-10} m, (ii) → 1515×10^{-6} s, (iii) → 2.5365×10^{-2} kg

199. 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

200. Excess of carbon dioxide is passed through 50 mL of 0.5 m calcium hydroxide solution. After completion of the reaction, the solution 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

N.B.Navale

Date : 01.04.2025 **TEST ID: 67**
Time : 03:00:00 **CHEMISTRY**
Marks : 200

SOME BASIC CONCEPTS OF CHEMISTRY,1.SOME BASIC CONCEPTS OF CHEMISTRY

: ANSWER KEY :

1)	a	2)	a	3)	c	4)	b	105)	b	106)	c	107)	c	108)	d
5)	c	6)	c	7)	a	8)	b	109)	b	110)	b	111)	a	112)	b
9)	c	10)	d	11)	c	12)	a	113)	b	114)	c	115)	d	116)	c
13)	c	14)	b	15)	a	16)	c	117)	b	118)	b	119)	a	120)	c
17)	c	18)	a	19)	a	20)	a	121)	a	122)	b	123)	d	124)	c
21)	b	22)	a	23)	b	24)	a	125)	c	126)	d	127)	c	128)	c
25)	c	26)	a	27)	d	28)	d	129)	b	130)	c	131)	c	132)	c
29)	b	30)	c	31)	d	32)	b	133)	c	134)	c	135)	d	136)	d
33)	a	34)	b	35)	b	36)	b	137)	a	138)	d	139)	a	140)	a
37)	b	38)	a	39)	b	40)	a	141)	a	142)	b	143)	b	144)	a
41)	d	42)	c	43)	c	44)	a	145)	c	146)	b	147)	b	148)	b
45)	b	46)	d	47)	a	48)	a	149)	a	150)	c	151)	d	152)	a
49)	b	50)	d	51)	c	52)	c	153)	b	154)	c	155)	d	156)	c
53)	a	54)	a	55)	c	56)	a	157)	c	158)	c	159)	d	160)	a
57)	c	58)	c	59)	b	60)	b	161)	a	162)	c	163)	d	164)	d
61)	c	62)	c	63)	b	64)	d	165)	c	166)	b	167)	a	168)	d
65)	b	66)	d	67)	a	68)	d	169)	d	170)	a	171)	a	172)	b
69)	d	70)	a	71)	c	72)	a	173)	d	174)	b	175)	c	176)	c
73)	a	74)	a	75)	a	76)	d	177)	a	178)	d	179)	d	180)	a
77)	b	78)	b	79)	a	80)	d	181)	b	182)	a	183)	a	184)	a
81)	c	82)	a	83)	c	84)	b	185)	d	186)	c	187)	c	188)	a
85)	b	86)	d	87)	a	88)	c	189)	b	190)	a	191)	d	192)	b
89)	b	90)	d	91)	c	92)	d	193)	d	194)	c	195)	d	196)	d
93)	a	94)	c	95)	b	96)	d	197)	d	198)	b	199)	a	200)	c
97)	b	98)	a	99)	c	100)	d								
101)	d	102)	a	103)	c	104)	a								

N.B.Navale

Date : 01.04.2025 **TEST ID: 67**
Time : 03:00:00 **CHEMISTRY**
Marks : 200

SOME BASIC CONCEPTS OF CHEMISTRY,1.SOME BASIC CONCEPTS OF CHEMISTRY

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 **(a)**
From Avogadro's law,
6.023×10^{23} atoms or Avogadro's number of an element contains mass = Atomic mass of the element
$\because$ 3.011×10^{22} atoms of an element weight 1.15 g
$\therefore$ 6.023×10^{23} atoms of an element will weight
$= \frac{1.15 \times 6.023 \times 10^{23}}{3.011 \times 10^{22}} = 23$
Hence, atomic mass of the element is 23.

2 **(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

3 **(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 = $M \times V_{\text{in mL}}$
$\frac{120}{60} \times 1000 = M \times \frac{1120}{1.15}$
$\therefore$ $M = 2.05$

4 **(b)**
In $Mg_3(PO_4)_2$; 1 moles of O-atoms are present in 1 mole of $Mg_3(PO_4)_2$
Hence, 0.25 mole of O-atom are contained
$= \frac{1}{8} \times 0.25$
$= 3.125 \times 10^{-2}$

5 **(c)**
100 g sample $\equiv$ 0.33 g iron
$\therefore$ 67200 g $\equiv$ 221.8 g iron
$\therefore$ Number of iron atoms per molecule of haemoglobin
$= \frac{221.8}{56} \approx 4.$

6 **(c)**
At STP, 22400 cm^3 of $CH_4 = 12 + 4 = 16$ g
At STP, 112 cm^3 of $CH_4 = \frac{16 \times 112}{22400} = 0.08$ g

7 **(a)**
4 g He $= N$ atoms.

8 **(b)**
Metal = 5.00 g
Metal Oxide = 9.44 g
Oxygen combined = 4.44 g
4.44 g of oxygen combined with = 5.00 g metal
$\therefore$ 8 g oxygen combined with $= \frac{5.00}{4.44} \times 8$ g metal
$= 9.00$ g

9 **(c)**
$SCl_2 \equiv 2Cl, 2Cl \equiv S$
$1Cl = \frac{S}{2} = 16$
$\therefore$ Atomic mass of sulphur = 32
$S_2Cl_2 \equiv 2\,S \equiv 2Cl$
$2Cl \equiv 64$ g S
$1Cl = 32$ g S

10 **(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

11 **(c)**
Meq. of H_2S = Meq. of Cu^{2+}
$\frac{w}{34/2} \times 1000 = \frac{63.5}{63.5/2} \times 1000$

12 **(a)**
Number of atoms = number of molecules $\times$ specific atoms in molecules
In 12g $^{24}_{12}$Mg number of atom $= \frac{12}{24} \times 6.022 \times 10^{23} \times 1$
$= 3.011 \times 10^{23}$ atoms

13 **(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 = $32 \times 2 = 64$

14 **(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 $V = 2V$

$\therefore \quad [NO_3^-] = \frac{0.1 \times V}{2V} = 0.05$

15 **(a)**

According to the law of conservation of mass,
Total mass of reactants = Total mass of products
Amount of Fe_2O_3 is decided by limiting reagent.

16 **(c)**

Stoichiometry represents mole ratio or volume ratio of reactants and products.

17 **(c)**

The ratio of given masses will be governed by law of reciprocal proportions.

18 **(a)**

2 mole of H_2O = 36 g H_2O = $2N$ molecules .

19 **(a)**

$$M = \frac{171}{342 \times \frac{(1000+171)}{1000 \times d}} = 0.429 \times 1.1 = 0.47$$

$$m = \frac{171}{342 \times 1} = 0.5$$

20 **(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

21 **(b)**

$$Cr_2O_7^{2-} + 14H^+ + 6\,e^- \longrightarrow 2Cr^{3+} + 7H_2O$$
$$6\,I^- \longrightarrow 3I_2 + 6\,e^-$$
$$2Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$$

In this reactions,

$Cr_2O_7^{2-} \equiv 3I_2 \equiv 6$l atom

$\therefore$ 1 I atom $= \frac{Cr_2O_7^{2-}}{6}$

Equivalent weight of $K_2Cr_2O_7 = \frac{\text{Molecular weight}}{6}$

22 **(a)**

Mass of hydrogen $= \frac{0.7}{22.4} \times 2 = \frac{14}{224} g = 0.0625g$

$\because$ 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, $x = 28 \times 0.0625 = 1.75g$

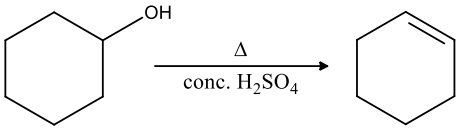
23 **(b)**

The reaction of ethanol with water is as follows:

$2C_2H_5OH(l) + 2Na(s) \longrightarrow 2C_2H_5O\,Na^+ + H_2(g) \uparrow$

2 mole of Na(46 g) = 1 mole of H_2
$= 2$ g $= 2 \times 10^{-3}$ kg

24 **(a)**



100 g $\qquad$ 82 g

100 g cyclohexanol produces = 82 g of cyclohexene

1 g cyclohexanol produces = $\frac{82}{100}$ g of cyclohexene

If reaction occurs 75%, then 100 g of cyclohexanol produces

$= \frac{82}{100} \times 100 \times \frac{75}{100} = 61.5$ g

The weight of cyclohexene formed

$= \frac{82 \times 100}{100} \times \frac{75}{100} = 61.5$ g

25 **(c)**

Meq. of NaOH = Meq. oxalic acid;

$0.1 \times 1 \times V = 20 \times 0.05 \times 2;$

$\therefore \quad V = 20$ mL

26 **(a)**

0.200 g oxygen $\equiv$ 3.17 g halogen

$\therefore$ Equivalent mass of halogen $\equiv \frac{3.17}{0.200} \times 8 =$ 126.8 g

$\simeq 127$ g

27 **(d)**

$C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$

2 mole CO_2 is formed.

28 **(d)**

Per cent loss of H_2O in one mole of

$$Na_2SO_4 \cdot nH_2O = \frac{18n \times 100}{(142+18n)} = 55$$

$\therefore \quad n = 10$

30 **(c)**

Liquid HCl is 100% pure

$\therefore M = \frac{100 \times 1.17 \times 1000}{36.5 \times 100} = 32.05$

31 **(d)**

Mole of glucose $= \frac{6.02 \times 10^{22}}{6.02 \times 10^{23}} = 0.1$

$\therefore \quad M_{\text{glucose}} = \frac{0.1 \times 1000}{50} = 2$

32 **(b)**

Yellow phosphorus is an impure form of white phosphorus (P_4).

Molecular mass of yellow phosphorus (P_4)
$= 4 \times 30 = 120$ g mol^{-1}

∴ According to Avogadro's hypothesis,
Mass of 6.022×10^{23} molecules of $P_4 = 120$ g
and mass of 1 molecule of $P_4 = \frac{120 \times 1}{6.022 \times 10^{23}}$
$= 19.926 \times 10^{-23}$ g
$\approx 1.993 \times 10^{-22}$ g
$= 1.993 \times 10^{-19}$mg

33 **(a)**
Molarity × valence = normality
Valence or basicity of $H_2SO_4 = 2$

34 **(b)**
$$M = \frac{5.85 \times 1000}{58.5 \times 500} = 0.2$$

35 **(b)**
$$m = \frac{18 \times 1000}{60 \times (1500 \times 1.052 - 18)} = 0.19$$

36 **(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 0.03394×143.4(for AgCl) $= 4.87$g

37 **(b)**
$$M = \frac{\text{moles of urea}}{\text{volume in litre}} = \frac{6.02 \times 10^{20}}{6.02 \times 10^{23} \times \frac{100}{1000}}$$
$= 0.01\ M$

38 **(a)**
$2PH_3(g) \longrightarrow 2P(s) + 3H_2(g)$

100	0	0	Before dissociation
0	-	150	After dissociation

39 **(b)**
$$\text{M. f.} = \frac{\text{moles of solute}}{\text{moles of solute + moles of water}}$$
$$= \frac{1}{1+\frac{1000}{18}} = 0.018$$

40 **(a)**
Molar mass of $NH_3 = 14 + 3 \times 1 = 17$ g mol^{-1}
∴ mass of 22.4 L of NH_3 at STP = 17 g
∴ mass of 11.2 L of NH_3 at STP = 8.5 g

41 **(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, $E = 9.0$

42 **(c)**
Meq. of NaOH = Meq. of HCl
$100 \times 0.1 = 10$
$\therefore \frac{wt.}{40} \times 1000 = 10$; $\therefore w_{NaOH} = 0.4$g

43 **(c)**
∵ 64 n kg CaC_2 will give 28 n kg polyethylene
∴ 20 kg CaC_2 will give $\frac{28n \times 20}{64n} = 8.75$ kg

44 **(a)**
111 g $CaCl_2$ contains N ions of Ca^{2+} and $2N$ ions of Cl^-.

45 **(b)**
Number of moles of Fe $= \frac{0.0056}{56} = 10^{-4}$ mol
2 moles of Fe is present in 1 mole of $(NH_4)_2SO_4Fe_2(SO_4)_3$.
Therefore, 10^{-4} mole of Fe is present in
$= \frac{10^{-4} \times 1}{2}$ mol $= 0.5 \times 10^{-4}$ mol

46 **(d)**
$H_2 + \frac{1}{2}O_2 \longrightarrow H_2O$

30	20	0
0	5	15

47 **(a)**
Meq. of oxalic acid = Meq. of NaOH
$\frac{6.3}{63} \times \frac{1000}{250} \times 10 = 0.1 \times V$
$\therefore \quad V = 40$ mL

48 **(a)**
$Ag_2CO_3 \longrightarrow 2Ag + CO_2 + (1/2)O_2$

49 **(b)**
Eq. of metal = Eq. of oxide
$\frac{1.6}{E} = \frac{2}{E+8}$; $E = 32$

50 **(d)**
$CaCl_2 \longrightarrow Ca^{2+} + 2Cl^{\ominus}$
1 mole of $CaCl_2 = 40 + 35.5 \times 2 = 111$ g
111 g mole of $CaCl_2 = 2$ mol of $Cl^{\ominus}$
222 g of $CaCl_2 = \frac{2}{111} \times 222 = 4$ mol of $Cl^{\ominus}$
Therefore, number of Ca^{2+} ions = 2 × N = 2N or $2 \times 6.023 \times 10^{23}$
Number of $Cl^{\ominus}$ ions = 4 × N
$= 4 \times 6.023 \times 10^{23}$
$= 2.409 \times 10^{24}$

51 **(c)**
Any quantitative measurement or observation is represented by number followed by units in which it is measured.

Thus, A and B are number and units, respectively.

52 **(c)**

$$\underset{(40+12+16\times3)=100\text{ g}}{CaCO_3} \rightarrow \underset{+(40+16)=56\text{ g}}{CaO} + \underset{(12+16\times2)=44\text{ g}}{CO_2}$$

100 g of $CaCO_3 \Rightarrow$ 56 g of CaO

10 g of $CaCO_3 \Rightarrow$ 5.6 g of CaO

100 g of $CaCO_3 \Rightarrow$ 44 g of CO_2

10 g of $CaCO_3 \Rightarrow$ 4.4 g of CO_2

53 **(a)**

Mole fraction $= \frac{1}{1+\frac{1000}{18}} = 0.0177$

54 **(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 $= \frac{3}{160} \times \frac{72}{1} = \frac{216}{160} = 1.35$

55 **(c)**

Meq. of NaH_2PO_4 = Meq. of NaOH;

Thus, $\frac{12}{120/2} \times 1000 = 1 \times V$

$\therefore \quad V = 200$ mL

56 **(a)**

$$\underset{\text{Sodium dihydrogen orthophosphate}}{3NaH_2PO_4} + \underset{\text{Sodium hydrogen orthophosphate}}{6Na_2HPO_4} \rightarrow 3Na_5P_3O_{10} + 6H_2O$$

Hence, stoichiometric ratio = 1.5 : 3

57 **(c)**

Mole of $O_2 = \frac{3.2}{32} = \frac{1}{10}$

$\therefore$atoms of $O = 2N \times \frac{1}{10} = 12.04 \times 10^{22}$

58 **(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 $\quad m = \frac{\text{mole of } H_2SO_4}{\text{mole of } H_2O} \times \frac{1000}{18}$

$= \frac{0.15 \times 1000}{0.85 \times 18} = 9.8$

59 **(b)**

1 mole of water means 18 g of water which means 6.023×10^{23} molecules.

1 L of water means = 1000 g

1000 g of water $= \frac{1000}{18}$ mol

As 1 mol of water $= 6.02 \times 10^{23}$ molecules

$\therefore \frac{1000}{18}$ mol of water $= \frac{1000}{18} \times 6.023 \times 10^{23}$

$= 55.5 \times 6.023 \times 10^{23}$

60 **(b)**

Eq. wt. $= \frac{\text{mol.wt.}}{\text{basicity}}$

61 **(c)**

R = 0.0821 L atm mol^{-1} K^{-1}

$= 8.314 \times 10^7$ ergs mol^{-1} K^{-1}

[1 K Pa d $m^3 = 10^7$ erg or 1 J $= 10^7$erg

$= 8.314$ J mol^{-1} K^{-1}

$= 0.002$ kcal mol^{-1} K^{-1} = x (Assume)

$\therefore \quad 1$ L atm $= \frac{x}{0.0821} = A$

$\Rightarrow \quad 1$erg $= \frac{x}{8.314 \times 10^7} = B$

1 J $= \frac{x}{8.314} = C$

$\Rightarrow \quad 1$ kcal $= \frac{x}{0.002} = D$

Thus, B < C < A < D.

62 **(c)**

$$\underset{(1-x)}{\overset{1}{CO_2}} + \underset{0}{C} \rightarrow \underset{2x}{2CO}$$

$\therefore 1 - x + 2x = 1.4$ find x.

63 **(b)**

Mole fraction of $O_2 = \frac{8/32}{7/28 + 8/32} = 0.5$

64 **(d)**

$$\underset{2(1\times2+16)=36\text{kg}}{2H_2O} \rightarrow \underset{2\times2=4\text{kg}}{2H_2} + \underset{2\times16=32\text{kg}}{O_2}$$

$\because$ 36 kg H_2O produces oxygen = 32 kg

$\therefore$ 72 kg H_2O produces oxygen $= \frac{32}{36} \times 72 = 64$ kg

65 **(b)**

As 8 moles of O-atoms are contained by 1 mole $Mg_3(PO_4)_2$

$\therefore$ 0.25 mole of O-atoms are present in $Mg_3(PO_4)_2$

$= \frac{1}{8} \times 0.25 = 3.125 \times 10^{-2}$ mol

66 **(d)**

Conc. Of $Na^+ = \frac{100 \times 0.1}{200} + \frac{100 \times 0.1 \times 2}{200} = 0.15M$

$\therefore$ Ionic strength of $Na^+ = \frac{1}{2}\sum C\,Z^2 = \frac{1}{2} \times$

$[0.15 \times 1^2] = 0.075$

67 **(a)**

6.02×10^{23} molecules $= 1$ mol

1×10^{21} molecule $= \frac{1 \times 10^{21}}{6.02 \times 10^{23}}$ mol

$= 1.66 \times 10^{-3}$ mol

$200\text{mg}CO_2 = \frac{200 \times 10^{-3}}{44}$ mol $= 4.54 \times 10^{-3}$ mol

Thus, CO_2 left $= (4.54 - 1.66) \times 10^{-3}$

$= 2.88 \times 10^{-3}$ mol

68 **(d)**

The SI unit for electrochemical equivalent is $kg\ C^{-1}$.

Electrochemical equivalent

$$(Z) = \frac{\text{mass}}{1 \text{ coulomb of electrical charge}} = \frac{kg}{C}$$
$$= kg\ C^{-1}$$

The electrochemical equivalent, sometimes abbreviated E_q or Z of a chemical element is the mass of that element transported by 1 coulomb of electrical charge. It is measured with a voltameter.

70 **(a)**

1.12 litre $H_2 \equiv 1.2$ g

$\therefore$ 11.2 litre $H_2 = 12$ g

71 **(c)**

4 L of 0.25M $= 4 \times 0.25$ mol CH_3OH

$= 1$ mol CH_3OH

$= 32$ gCH_3OH

0.8 kg L^{-1} $= 0.8$ g mL^{-1}

0.8 g CH_3OH is in $= 1$ mL

$\therefore$ 32 g CH_3OH is in $= 40$ mL

72 **(a)**

$C + O_2 \longrightarrow CO_2$;

12 g C needs 22.4 litre O_2 or 5×22.4 litre air.

73 **(a)**

The balanced chemical equation is

$$Mg + \frac{1}{2}O_2 \longrightarrow MgO$$
$$24\text{ g} \quad 16\text{ g} \quad 40\text{ g}$$

From the above equation, it is clear that 24 g Mg reacts with 16 g O_2.

Thus, 1.0 g Mg reacts with $\frac{16}{24}O_2 = 0.67$ g O_2

But only 0.56 g O_2 is available which is less than 0.67 g.

Thus, O_2 is the limiting reagent.

Further, 16 g O_2 reacts with 24 g Mg.

$\therefore$ 0.56 g O_2 will react with Mg $= \frac{24}{16} \times 0.56 =$ 0.84 g

$\therefore$ Amount of Mg left unreacted $= 1.0 - 0.84 =$ 0.16 gMg

Hence, Mg is present in excess and 0.16 g Mg is left behind unreacted.

74 **(a)**

H_3BO_3 accepts OH^- ions to act as weak monobasic Lewis acid.

$H_3BO_3 + H_2O \longrightarrow B(OH)_4^- + H^+$; $\quad K_a = 10^{-9}$

75 **(a)**

$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$

77 **(b)**

Weight of solvent = weight of solution – weight of NaCl

$= 1.0585 \times 1000 - 58.5$

$= 1058.5 - 58.5 = 1000$ g $= 1$ kg

$$m = \frac{\text{mole of NaCl}}{\text{weight of solvent in kg}} = \frac{1}{1} = 1$$

78 **(b)**

Meq. = Normality $\times$ V in mL

$= 500 \times 0.2 = 100$

79 **(a)**

$$JPa^{-1} = \frac{J}{Pa} = \frac{\text{Work}}{\text{Pressure}} = \frac{N - m}{N/m^2} = m^3$$

Thus, unit (JPa^{-1}) is equivalent to m^3.

80 **(d)**

1 mole of water=18 g

81 **(c)**

Equivalent mass of metal $= 12$

Equivalent mass of oxygen $= 8$ g mol^{-1}

$\therefore$ Equivalent mass of metal oxide $= 20$ g mol^{-1}

82 **(a)**

I. 1 molecule of $O_2 = \frac{32}{6.022 \times 10^{23}\text{ g}}$

$= 5.3 \times 10^{-23}$ g

II. 1 atom of N $= \frac{14}{6.022 \times 10^{23}\text{ g}} = 2.3 \times 10^{-23}$ g

III. 10^{-10} g mol. wt. of oxygen

$= 10^{-10} \times 32 = 3.2 \times 10^{-9}$ g

IV. 10^{-10} g atomic weight of copper

$= 10^{-10} \times 63.5 = 6.35 \times 10^{-9}$ g

$\therefore$ Order of increasing mass is

II < I < III < IV.

83 **(c)**

Mole fraction of alcohol $= \frac{1}{1+4} = \frac{1}{5}$;

$\therefore$ M. f. of water $= 4/5$

84 **(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.

85 **(b)**

18 mL $H_2O = 18$ g $H_2O = \frac{18}{18} = 1$ mol H_2O

$= 6.023 \times 10^{23}$ molecules

electron in 1 mol $= 10$

$\therefore$ Total electrons in 18 mL H_2O

$= 6.02 \times 10^{23} \times 10$

$= 6.02 \times 10^{24}$

86 **(d)**

1 mole Ca^{2+} =1 mole $CaCO_3 = 100$ g

Rating = mg of $CaCO_3$ needed per g chelating

agent (mol. wt. = 380)

$$= \frac{100 \times 10^3}{380} = 263 \text{ mg}$$

87 **(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 = $10M$.

88 **(c)**

Solutions of known strength are prepared by dissolving solute in solvent in a measuring flask.

89 **(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.

90 **(d)**

Valence of $M = \frac{27}{9} = 3$,

Thus, formula of chloride is MCl_3.

91 **(c)**

X is AB_4.

93 **(a)**

28 g of CO occupies = 22.4 L of CO at NTP

$\therefore$ 14 g of CO occupies = $\frac{22.4}{28} \times 14$ L of CO at NTP

$= 11.2$ L of CO at NTP

Thus, 14 g of CO occupies 11.2 L volume at NTP.

Thus, given statement is wrong.

94 **(c)**

Gram molecular weight is expressed in g mol^{-1}, *i. e.*, weight of one mole of substance.

95 **(b)**

$$\text{Eq. wt.} = \frac{\text{mol. wt.}}{\text{basicity}}$$

96 **(d)**

For water, 1 g= 1 mL ($\because$ d for water = 1)

$\therefore$ 18 g = 18 mL

18 mL water = 6.02×10^{23} molecules = N_A molecules

$\because$ in 100 mL number of water molecules = $\frac{N_A \times 1000}{18}$

$= 55.55N_A$

97 **(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.

98 **(a)**

P_2O_3, PH_3 and H_2O illustrates the law of reciprocal proportions. Ratio in the number of atoms of H and O combining with one P is 3 : 1.5, i.e. 2 : 1.

99 **(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 $M = 1.344$

100 **(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. = $N \times V$.

$\therefore$ $N = \frac{25}{1000} = \frac{1}{40}$

101 **(d)**

$\because$ 23 g of Na contains = 6.023×10^{23} atoms

$\therefore$ 1 g of contains = $\frac{6.023 \times 10^{23}}{23}$ atoms

$\therefore$ 46 g of Na contains = $\frac{6.023 \times 10^{23}}{23} \times 46$ atoms

$= 12.046 \times 10^{23}$ atoms

102 **(a)**

Follow definition of molality.

103 **(c)**

Meq. of $Na_2CO_3 \cdot xH_2O$ in 20 mL =$19.8 \times \frac{1}{10}$

$\therefore$ Meq. of $Na_2CO_3 \cdot xH_2O$ in 100 mL = $19.8 \times \frac{1}{10} \times 5$

$\therefore$ $\frac{w}{E} \times 1000 = 19.8 \times \frac{1}{10} \times 5$

or $\frac{0.7}{M/2} \times 1000 = \frac{19.8}{2}$

$\therefore$ $M = 141.41$

$\therefore$ $23 \times 2 + 12 + 3 \times 16 + 18x = 141.41$

$\therefore$ $x = 2$

104 **(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 after 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

105 **(b)**

The compound is $C_4H_8O_2$;

Mol. wt. = 88

$\therefore$ Vapour density = 44

106 **(c)**

$\underset{0.1596\text{ g}}{A_2O_3} + \underset{0.006\text{ g}}{3H_2} \longrightarrow 2A + 3H_2O$

0.006 g of H_2 reduces 0.1596 g of A_2O_3.

6 g of H_2 will reduce $= \frac{0.1596 \times 6}{0.006} = 159.6$ g of A_2O_3

Thus, molar mass of $A_2O_3 = 159.6$ g

Let, atomic weight of A = x

$\therefore\ 2x + 3 \times 16 = 159.6$

$2 = 159.6 - 48 = 111.6 \Rightarrow x = 55.8$

107 **(c)**

22.4 litre O_2 at STP = 1 mole.

109 **(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.

$\because$ 100 g of $CaCO_3$ gives $CO_2 = 44$ g

$\therefore$ 20 g $CaSO_3$ will give $CO_2 = \frac{44 \times 20}{100} = 8.80$ g

110 **(b)**

Oxygen = 67.67 g

Metal = 32.33 g

67.67 g oxygen $\equiv$ 32.33 g metal

8 g Oxygen $= \frac{32.33}{67.67} \times 8.0$

$= 3.82$ g

111 **(a)**

Meq. of metal = Meq. of oxygen

$$\frac{60}{E} = \frac{40}{8}$$

$\therefore\ E = 12$

Now, Meq. of metal = Meq. of bromide

$$\frac{100 - a}{12} = \frac{a}{80}$$

$\therefore\ a \approx 87\%$

112 **(b)**

Meq. of H_2SO_4 = Meq. of NaOH

$0.1 \times 2 \times V = 50 \times 0.2 \times 1$

$\therefore\ V = 50$ mL

113 **(b)**

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

Mole ratio of $CH_4 : O_2 :: 1 : 2$

114 **(c)**

Option (c) is incorrect. It's correct form is as follows :

1 m = 39.37 inches

115 **(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.

116 **(c)**

Wt. of H : O in H_2O is 2 : 16

117 **(b)**

0.1 mole has atoms $= 0.1 \times 6.02 \times 10^{23} \times 3$

$= 1.806 \times 10^{23}$

118 **(b)**

Unit of viscosity is Nsm^{-2}.

$$\text{Viscosity}(\mu) = \frac{\text{Force} \times \text{Time}}{(\text{Length})^2}$$

$$= \frac{\text{Newton} \times \text{Second}}{(\text{Metre})^2} = Nsm^{-2}$$

119 **(a)**

Meq. of NaOH=Meq. of acid;

$20 \times 0.4 = 40 \times N;$

$\therefore\ N = 0.2$ or $M = 0.1$

120 **(c)**

1 molal glucose solution means

1000 g H_2O has = 1 mol glucose = 180 g glucose

Total mass of solution = 1180 g

1 mol glucose is = 1180 g

Thus, 0.2 mol glucose is = 236 g solution

121 **(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}

122 **(b)**

$N = \frac{2.7 \times 1000}{(98/3) \times 250} = 0.33$

123 **(d)**

Meq. of H_3PO_4 = Meq. of $Ca(OH)_2$;

$0.25 \times 3 \times V = 25 \times 0.03 \times 2$

$\therefore\ V = 2$ mL

125 **(c)**

X_2O has $X : O :: 14 : 16$

$\therefore$ At. wt. of $X = 7$

126 **(d)**

1 mol O_2 = 4 equivalent = 20 dm^3

$\therefore$ Volume of 1 equiv of $O_2 = 5$ dm^3

127 **(c)**

Let a g of Cu be oxidised to give CuO,

i. e., $\frac{(63.6 + 16)a}{63.6}$ g

Thus, final weight

$$= (3.18 - a) + \frac{(63.6 + 16)a}{63.6} = 3.92$$

$\therefore\ a = 2.94$ g

Thus, % of Cu left unoxidised

$$\frac{(3.18-2.94)}{3.18}\times 100 = 7.55\%$$

129 **(b)**

$N_2 + 3H_2 \rightarrow 2NH_3$

The ratio of volumes of nitrogen, hydrogen and ammonia is 1 : 3 : 2. These ratio illustrate the law of Gay-Lussacc.

130 **(c)**

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

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

131 **(c)**

$$\text{Number of moles} = \frac{\text{mass}}{\text{atomic mass}} = \text{X moles}$$

$$= \text{x } N_0 \text{atom}$$

Thus, $\text{atoms} \propto \frac{1}{\text{atomic mass}}$

Least atomic mass is that of lithium.

Thus, Li have largest number of atoms.

132 **(c)**

$$\text{Number of moles} = \frac{\text{mass}}{\text{molar mass}} \times N_A$$

$\therefore$ Number of atoms in 4.25 g NH_3

$$= \frac{4.25}{17} \times N_A \times 4 = N_A$$

Number of atoms in 8 g O_2

$$O_2 = \frac{8}{32} \times N_A \times 2 = \frac{N_A}{2}$$

Number of atoms in 2 g H_2

$$H_2 = \frac{2}{2} \times N_A \times 2 = 2\,N_A$$

Number of atoms in 4 g He

$$He = \frac{4}{4} \times N_A \times 1 = N_A$$

Thus, 2 g of H_2 contains the maximum number of atoms among the given.

133 **(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.

134 **(c)**

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

135 **(d)**

	$BaCl_2$	+ H_2SO_4	$\longrightarrow BaSO_4$	+ 2HCl
mm	20×0.5	20×1		
taken	$= 10$	20	0	0
mm	0	10	10	20

formed

Milli mole of $BaSO_4 = 10$

or Mole of $BaSO_4 = 10^{-2}$

136 **(d)**

71 g Cl_2 reacts with 64 g S,

$\therefore$35.5 g Cl_2 reacts with 32 g S.

137 **(a)**

Mill mole of $H_2SO_4 = \frac{1}{10} \times 1000 = 100$

$$\therefore \quad \frac{w}{98} \times 1000 = 100$$

$$\therefore \quad w = 9.8 \text{ g}$$

138 **(d)**

$$\text{M. f.} = \frac{5.85/58.5}{\frac{5.85}{58.5}+\frac{90}{18}} = 0.0196$$

139 **(a)**

$N = M \times \text{acidity} = 1 \times 2 = 2$ (Na_2CO_3 is diacidic base)

140 **(a)**

$$M_{H_2O} = \frac{\frac{1000\times d}{18}}{1} = 55.6 \times d$$

$\therefore \quad d = 1 \quad \therefore M = 55.6$

141 **(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 $\frac{0.4}{2} = 0.2$

142 **(b)**

60 g NH_2CONH_2 has 28 g N

$\therefore$ 100 g urea has $N = \frac{28\times 100}{60}$

143 **(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.

144 **(a)**

Meq. of conc. HCl = Meq. of dil. HCl

$$10 \times V_1 = 100 \times 1$$

$$\therefore \quad V_1 = 10\text{mL}$$

Thus, 10 mL of conc. HCl should be added 90 mL to make at 100 mL of desired normality.

145 **(c)**

Density of substance is defined as its amount of mass per unit volume. So, SI unit of density can be obtained by using the following relation.

SI unit of density $= \frac{\text{SI unit of mass}}{\text{SI unit of volume}} = \frac{\text{kg}}{\text{m}^3}$ or kgm^{-3}

146 **(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 $= \frac{108\times2.87}{143.5}$

$= 2.16$g

147 **(b)**

3.0115×10^9 molecules of X $= 10^{-12}$ g

6.023×10^{23} molecules of X $= \frac{10^{-12}\times 6.023\times 10^{23}}{3.0115\times10^9} =$ 200 g

148 **(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 $49.23 + n \times 35.5 = 190$

$\therefore$ $n = 3.9 \approx 4$;

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

149 **(a)**

$$\underset{\text{Initial 5 mol}}{A_2} + \underset{\text{7 mol}}{3B_2} \longrightarrow \underset{0}{2AB_3}$$

By reaction 1 mol A_2 requires 3 mol B_2.

Hence, 7 mol B_2 will react with $\frac{7}{3}$ moles A_2

A_2 left $= 5 - \frac{7}{3} = 8/3$ mol A_2(g)

1 mol A_2 produces 2 mol AB_3.

Hence, $\frac{7}{3}$ mol A_2 will produce $\frac{7}{3} \times 2$ mol AB_3

Total mol of gases in vessel

$= \frac{8}{3}$ mol A_2(g) $+ \frac{14}{3}$ mol AB_3(g) $= \frac{22}{3}$ mol

150 **(c)**

$M_{HCl} = 1$;

$M_{H_2SO_4} = \frac{0.4}{2} = 0.2$

$M_{Na_2CO_3} = \frac{0.1}{2} = 0.05$

151 **(d)**

In 1 L air, volume of $O_2 = 210\ cc$

$\because$ 22400 cm^3 = 1 mol

$\therefore$ 210 $cm^3 = \frac{210}{22400} = 0.0093$ mol

152 **(a)**

Presently the new symbol used is ' u ' (known as unified mass) in place of amu. It is defined as mass exactly equal to 1/12 th the mass of one C − 12 atom.

153 **(b)**

1 mole $= M \times V_{\text{in } l}$

154 **(c)**

Equivalent weight of metal

$= \frac{\text{Weight of metal}}{\text{Weight of chlorine combined}} \times 35.5$

$\therefore$ Equivalent weight of metal

$= \frac{(74.5 - 35.5)}{35.5} \times 35.5 = 39.0$

155 **(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

156 **(c)**

The correct formulae that expresses the law of equivalent correctly is $m_1E_2 = E_1m_2$

157 **(c)**

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

158 **(c)**

Equivalent weight of metal = 12

Equivalent weight of oxygen = 8

Equivalent weight of MO (oxide) with divalent metal = 20

Thus, molecular weight of metal oxide = 40

159 **(d)**

1 mole $P_4 = N$ molecules of $P_4 = 4\ N$ atoms of P_4.

160 **(a)**

22.4 litre = 1 mole;

$\therefore$ 1$m^3 = 10^3$ litre $= \frac{10^3}{22.4} = 44.6$

161 **(a)**

18 mL H_2O or 18 g H_2O has $10N$ electrons.

162 **(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 $CaCO_3 = 100$g

$\therefore$ 0.959 g CaO will be obtained by the decomposition of

$CaCO_3 = \frac{100 \times 0.959}{56}$

$= 1.71$g

Further,

100 g $CaCO_3 \equiv 111$g$CaCl_2$

1.71g $CaCO_3 = \frac{111 \times 1.71}{100}$

$=1.89$ g $CaCl_2$

% of $CaCl_2$ in the mixture $= \frac{1.89}{4.22} \times 100$

$= 44.78$

$= 45\%$

163 **(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

$= \frac{13}{2} \times \frac{32 \times 1000}{58} = 3586.2$ g $= 3.586$ kg

164 **(d)**

g-atom of $I_2 = \frac{254}{127} = 2$;

g-atom of oxygen $= \frac{80}{16} = 5$

$\therefore$ compound is I_2O_5.

165 **(c)**

g atom of I$= \frac{25.4}{127} = 0.2$

g atom of oxygen $= \frac{8}{16} = 0.5$

$\therefore$Ratio of g atoms I : O : : 2 : 5

166 **(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.

167 **(a)**

249.6 g $CuSO_4 \cdot 5H_2O$ contains 90 g H_2O.

168 **(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 $CaCO_3$

169 **(d)**

Formula of sodium ferrocyanide, $Na_4[Fe(CN)_6]$ suggests that it has four sodium atoms.

Number of Na-atoms = Number of moles × number of atoms per molecule × Avogadro's number

$= 2 \times 4 \times 6.023 \times 10^{23}$Na-atoms

$= 48 \times 10^{23}$Na-atoms

170 **(a)**

Mass of one He-atom = 4 u,

4 u = 1 He-atom

$\therefore$ 100 u $= \frac{100}{4} = 25$ He $-$ atom

171 **(a)**

The limiting reagent gives the moles of product formed in the reaction.

$H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$

22.4 L 11.2 L 2 mol

$\because$ 22.4 volume at STP is occupied by $Cl_2 = 1$ mol

$\therefore$ 11.2 L volume will be occupied by

$Cl_2 = \frac{1 \times 11.2}{22.4}$ mol $= 0.5$ mol

Thus, $\underset{1\text{ mol}}{H_2(g)} + \underset{0.5\text{ mol}}{O_2(g)} \rightarrow 2HCl\ (g)$

Since, Cl_2 possesses minimum number of moles, thus it is the limiting reagent.

As per equation, mol Cl_2 = 2 mol HCl

$\therefore$ 0.5 mol $Cl_2 = 2 \times 0.5$ mol HCl $= 1.0$ mol HCl

Hence, 1.0 mole of HCl(g) is produced by 0.5 mole of Cl_2 (or 11.2 L).

172 **(b)**

$M = \frac{9.8}{98 \times 2} = \frac{1}{20} = 0.05$

174 **(b)**

Density $= \frac{\text{Mass}}{\text{Volume}} = \frac{18.72\text{ g}}{1.81\text{ cm}^3} = 10.34$ g/cm^3

175 **(c)**

g atom of $N = \frac{28}{14} = 2$

g atom of oxygen $= \frac{80}{16} = 5$

176 **(c)**

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

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

177 **(a)**

Here, vapour density of gas = 11.2

$\therefore$ Molecular weight = 2 × vapour density

$= 2 \times 11.2 = 22.4$ g

22.4 g of gas occupied volume at STP = 22.4 L

$\therefore$ 1 g gas occupied volume at STP = 1 L

178 **(d)**

Empirical formula wt. =13

$\therefore$ $n = \frac{\text{mol.wt.}}{\text{empirical formula wt.}} = \frac{78}{13} = 6$

$\therefore$ Formula is $(CH)_6$, $i.e.$, C_6H_6

179 **(d)**

22400 mL of O_2 at NTP occupied by = 32 g O_2

$\therefore$ 112 mL of O_2 at NTP occupied by

$= \frac{32}{22400} \times 112$ mL $O_2 = 0.16$ g O_2

180 **(a)**

Since, 1 L = 1000 cm^3 and 1 m = 100 cm

$\frac{1\text{ m}}{100\text{ cm}} = 1 = \frac{100\text{ cm}}{1\text{ m}}$

or $\left(\frac{1\text{ m}}{100\text{ cm}}\right)^3 = \frac{1\text{ m}^3}{10^6\text{ cm}^3} = 1^3 = 1$

Hence, 5 L $= 5 \times 1000$ cm$^3 \times \frac{1\text{ m}^3}{10^6\text{ cm}^3} = \frac{5\text{ m}^3}{10^3} = 5 \times 10^{-3}$ m^3

181 **(b)**

$N = \frac{1}{49 \times (100/1000)} = 0.2$

182 **(a)**

$N = \frac{(24.5 \times 1000)}{(98/2) \times 250} = 2$;

$M = \frac{(24.5 \times 1000)}{98 \times 250} = 1$

183 **(a)**

No. of molecules in n mole $= n \times$

Av. no; Also no. of atom in 1 molecule = atomicity.

184 **(a)**

$$m = \frac{0.5 \times 1000}{500} = 1$$

185 **(d)**

6.02×10^{23} molecules of CO = 1 mole of CO

6.02×10^{24} moles of CO = 10 mles of CO

1 mole of CO contains 1 g atom of oxygen

10 moles of CO contains 10 g atoms of oxygen.

186 **(c)**

$$F = \frac{9}{5}t°C + 32$$

$$(200 - 32) = \frac{9}{5}t°C \Rightarrow \frac{9}{5}t°C = 168$$

$$t°C = \frac{168 \times 5}{9} = 93.3°C$$

187 **(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)

$\therefore \quad V = 40$ mL

188 **(a)**

For poly atomic molecules, mol. wt. = at. wt. × atomicity .

189 **(b)**

Meq. of acid. Meq. of NaOH

$$\frac{0.52}{E} \times 1000 = 100 \times 0.1$$

$\therefore \quad E = 52$

190 **(a)**

Oxygen = 20 g

Metal = 80 g

20 g oxygen ≡ 80 g metal

∴ 8 g oxygen ≡ 32 g metal

191 **(d)**

22.4 litre refers for mol. wt.

∴ 11.2 litre refers for $\frac{\text{mol.wt.}}{2}$ = vapour density.

192 **(b)**

1 molecules of $Ca(OH)_2$ contains 5 atoms;

∴1 mole contains $5N$ atoms

193 **(d)**

$$m = \frac{15}{98 \times \frac{(100 \times 1.1 - 15)}{1000}} = 1.6$$

194 **(c)**

The incorrect option is (c). It's correct form is as follows:

$1\text{mg} = 10^{+6}\text{ng}$

$(1\text{mg} = 10^{-6}\text{kg} = 10^{+6}\text{ng})$

195 **(d)**

$$C_aH_b + \left(a + \frac{b}{4}\right)O_2 \longrightarrow aCO_2 + (b/2)H_2O$$

10	Excess	-	-
0		$10a$	$5b$

$\therefore \quad 10a = 40 \quad \therefore a = 4$

$5b = 50 \quad \therefore b = 10$

197 **(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 .

198 **(b)**

(i) $28.7 \text{ pm} \times \frac{10^{-12} \text{ m}}{1 \text{ pm}} = 2.87 \times 10^{-11}$ m

(ii) $15.15 \text{ μ s} \times \frac{10^{-6} \text{ s}}{1 \text{ μ s}} = 1.515 \times 10^{-5}$ s

(iii) $25365 \text{ mg} \times \frac{1 \text{ g}}{1000 \text{ mg}} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 2.5365 \times 10^{-2}$ kg

199 **(a)**

98 g H_2SO_4 contains 32 g S or 1 mole of S

200 **(c)**

Number of millimoles of $Ca(OH)_2$

$= 50 \times 0.5 = 25$

Number of millimoles of $CaCO_3 = 25$

Number of milliequivalents of $CaCO_3 = 50$

∴ Volume of 0.1N HCl $= \frac{50}{0.1} = 500$ cm^3