1 Basic Concepts of Chemistry

Chemistry : According to Roald Hoffman Chemistry is study of molecules and their transformations. It is not only the science of 100 elements but it is a science of infinite varieties of molecules obtained from them.

Thus, chemistry is a science of molecules, variety of compounds and their transformations. Chemistry deals with the structure, composition and properties of the matter.

1. The full form of AZT is ....

(A) Azothymine (B) Azidotaxol (C) Azidothymine (D) Azidothymidine

2. Which of the following drug is useful for treatment of cancer ?

(A) cis-platin (B) trans-platin (C) Both (A) and (B) (D) None

3. Which drug is effective for treatment of patients suffering from AIDS ?

(A) Taxol (B) cis-platin (C) AZT (D) All of the given

4. Which substance is used in refrigerators nowadays instead of CFC ?

(A) 1, 1, 2, 2 - Tetrafluoroethane (B) 1, 1, 1, 2 - Tetrafluoroethane

(C) 1, 1, 2, 2 - Tetrachloroethane (D) 1, 1, 1, 2 - Tetrachloroethane

Answers : 1. (D), **2.** (A), **3.** (C), **4.** (B)

- **NATURE OF MATTER**

Matter

- Mixture
  - Homogeneous mixture
  - Heterogeneous mixture
- Pure substance
  - Elements
  - Compounds

(1) **Element :** According to Lavoisier, element is made up of same type of atoms.

(2) **Compound :** A compound is formed when two or more than two elements combine chemically.

(3) **Mixture :** A mixture contains two or more than two substances.

(4) **Homogeneous mixture :** The components of a homogeneous mixture mix well with each other and its composition is uniform throughout. The components of homogeneous mixture do not separate by a definite boundary.

(5) **Heterogeneous mixture :** The components of a heterogeneous mixture do not mix with each other and the components are separated by a definite boundary.

5. Which of the following statement is not true for compound ?
(A) The ratio of number of atoms of different elements present in compound is fixed.
(B) In a molecule of compound, atoms of different elements are there.
(C) The physical properties of component elements are not retained in compound.
(D) The component elements present in a compound can be separated using physical methods.

6. Which of the following statements are true ?
(i) The molecules of a compound are heteronuclear.
(ii) The molecules of an element are homonuclear.
(iii) A compound possess homogeneous nature.
(iv) A molecule never exists independently.
(A) (i), (iii), (iv) (B) (i), (ii), (iii) (C) (ii), (iii), (iv) (D) (i), (ii), (iv)

7. Which of the following is not a mixture ?
(A) Cement (B) Iodized salt (C) Ozone (D) Air

8. Which of the following is a heterogeneous mixture ?
(A) Petrol (B) Kerosene (C) Milk (D) Brass

Answers : 5. (D), **6.** (B), **7.** (C), **8.** (C)

- **PHYSICAL QUANTITIES**

SI unit system

Fundamental physical quantity	Symbol of quantity	Symbol of SI unit	Name of SI unit
Length	l	m	metre
Mass	m	kg	kilogram
Time	t	s	second
Thermodynamic temperature	T	K	kelvin
Amount of substance	n	mol	mole
Electric current	I	A	ampere
Luminous intensity	I_V	cd	candela

Prefixes used in SI system

No.	Multiple	Prefix	Symbol
1.	10^{-24}	yocto	y
2.	10^{-21}	zepto	z
3.	10^{-18}	atto	a
4.	10^{-15}	femto	f
5.	10^{-12}	pico	p
6.	10^{-9}	nano	n
7.	10^{-6}	micro	μ

No.	Multiple	Prefix	Symbol
8.	10^{-3}	milli	m
9.	10^{-2}	centi	c
10.	10^{-1}	deci	d
11.	10^{1}	deca	da
12.	10^{2}	hecto	h
13.	10^{3}	kilo	k
14.	10^{6}	mega	M

No.	Multiple	Prefix	Symbol
15.	10^{9}	giga	G
16.	10^{12}	tera	T
17.	10^{15}	peta	P
18.	10^{18}	exa	E
19.	10^{21}	zeta	Z
20.	10^{24}	yotta	Y

9. Which of the following is not an SI unit ?

(A) $(\text{metre})^3$ (B) litre (C) kgm^{-3} (D) kelvin

10. $1\ m^3 =$ .... ?

(A) $10^6\ cm^3$ (B) 10^3 L (C) $10^3\ dm^3$ (D) All of the given

11. For which value of temperature both Celcius and Farenheit scales show same value ?

(A) 32 (B) −40 (C) 50 (D) 65

12. $10\ \mathring{A} =$ .... nm.

(A) 1 (B) 0.1 (C) 100 (D) 0.01

13. How is 0.00506 expressed in scientific notation ?

(A) 0.0506×10^{-1} (B) 5.06×10^3 (C) 50.6×10^{-4} (D) 5.06×10^{-3}

14. Find the volume of a vessel having length 0.6 m, breadth 10 cm and depth 150 mm in litres.

(A) 90 L (B) 9 L (C) 0.9 L (D) 0.09 L

15. The density of a substance is 12.6 g/cm^3 Find the density of this substance in kilogram per litre.

(A) 12.6 (B) 1.26 (C) 12600 (D) 126000

16. Convert 1.8×10^{-2} km into centimetres.

(A) 180 (B) 1800 (C) 18000 (D) 180000

17. The difference in boiling points of two liquids 'X' and 'Y' is 40K. What will be the difference in their boiling points in Farenheit scale ?

(A) 72° F (B) 104° F (C) 40° F (D) 345° F

18. How many Gg is equal to $10^{12}\ \mu g$?

(A) 10^3 (B) 10^{-5} (C) 10^{31} (D) 10^{-3}

19. The difference in boiling points of two liquids is 18 °F. If boiling point of one of the liquids is 111°C, find the boiling point of another.

(A) 118.2° C (B) 101° C (C) 103.2° C (D) 93° C

20. State the number of significant digits in 0.050.

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

Answers : **9.** (B), **10.** (D), **11.** (B), **12.** (A), **13.** (D), **14.** (B), **15.** (A), **16.** (B), **17.** (A), **18.** (D), **19.** (B), **20.** (B)

- **PRECISION AND ACCURACY :** Precision indicates closeness between different measurements of same quantity whereas, accuracy indicates the agreement between the true value of result and given value of result.

21. Two students 'A' and 'B' measure a substance having mass 3.0 g. The measures obtained by them are shown below:

Student	**Observation**	
	(i) gram	**(ii) gram**
A	3.01	2.99
B	3.05	2.95

From the given data find correct option from the statements given below:

(A) The results of student A are both precise and accurate

(B) The results of student A are neither precise nor accurate

(C) The results of student B are both precise and accurate

(D) The results of both students are precise and accurate

Answers : **21.** (A)

- **THE LAWS OF CHEMICAL COMBINATION**

No.	Law	Scientist
1	Law of conservation of mass	Antonie Lavoisier
2	Law of definite composition	Joseph Proust
3	Law of multiple proportion	John Dalton
4	Law of combining weights	Richter
5	Law of combining volumes of gases	Gay-Lussac
6	Avogadro's law	Avogadro

22. Which of the following statement is correct for given reaction ?

$3Fe_{(s)} + 2O_{2(g)} \rightarrow Fe_3O_{4(s)}$

(A) The law of conservation of mass is followed because the total mass of reactants = total mass of products.

(B) The law of multiple proportion is followed because the total mass of reactants = total mass of products.

(C) The amount of product will decrease by taking one of the reactants in more quantity.

(D) The amount of product will increase by taking one of the reactants in less quantity.

23. Which reaction is not balanced according to the law of conservation of mass ?

(A) $4Fe + 3O_2 \rightarrow 2Fe_2O_3$ (B) $P_4 + 5O_2 \rightarrow P_4O_{10}$

(C) $2Ca + O_2 \rightarrow 2CaO$ (D) $CH_4 + O_2 \rightarrow CO_2 + 2H_2O$

24. How many grams of silver nitrate will combine with 7.45 g KCl to give 14.35 g silver chloride and 10.1 g potassium nitrate ?

(A) 31.9 (B) 17 (C) 34 (D) 21.8

25. Which law is followed while balancing a chemical equation ?

(A) Law of conservation of mass (B) Law of definite composition

(C) Law of multiple proportion (D) Avogadro's law

26. Which of the following pair is an illustration of law of multiple proportion ?

(A) MgO and $Mg(OH)_2$ (B) H_2O and D_2O

(C) CO and CO_2 (D) KCl and KBr

27. 2L H_2 gas combines with 1 L O_2 gas and forms 2 L water vapour. Which law is illustrated by this statement?

(A) Gay-Lussac's law of combining volumes of gases (B) Law of combining weights.

(C) Law of definite composition (D) Law of multiple proportion

Answers : 22. (A), **23.** (D), **24.** (B), **25.** (A), **26.** (C), **27.** (A)

- **Atomic mass, molecular mass, molar mass and mole concept :**
  - 1 amu = 1.66056×10^{-24} gram
  - 1 mole = 6.022×10^{23}

- mass of ^{12}C atom = 1.992648×10^{-23} gram
- Number of moles = $\frac{\text{mass}}{\text{molar mass}}$
- Number of moles of particles of gaseous substance = $\frac{\text{Volume of gas at STP (L)}}{22 \cdot 4}$
- Average atomic mass = $\frac{m_1 a + m_2 b}{a+b}$

  Where, m_1 and m_2 = atomic masses

  a and b = percentage proportion
- % of element in compound = $\frac{nA \times 100}{\text{Molar mass}}$

  Where, n = Number of atoms of element

  A = Atomic mass

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28. What will be the mass of 3.01×10^{21} oxygen molecules ?

(A) 16 amu (B) 0.16 amu (C) 0.16 gram (D) 16 gram

29. The two isotopes of Boron are ^{10}B (19 %) and ^{11}B (81 %). Calculate average atomic mass of Boron.

(A) 10.0 (B) 10.2 (C) 11.2 (D) 10.8

30. Calculate the number of valence electrons in 4.2 g N_3^{1-} ion.

(A) 2.1 N_A (B) 4.2 N_A (C) 1.6 N_A (D) 3.2 N_A

31. There is 21 % by volume oxygen gas in 1 litre air at STP. Calculate number of moles of oxygen.

(A) 2.10 Mole (B) 0.0093 Mole (C) 0.186 Mole (D) 0.21 Mole

32. Calculate percentage proportion of Zn in $ZnSO_4.7H_2O$

[Zn = 65, S = 32, O = 16, H = 1]

(A) 33.65 % (B) 32.56 % (C) 23.65 % (D) 22.65 %

33. Hemoglobin contains 0.33 %. Iron by mass. Molar mass of Hemoglobin is 67,200. Calculate the number of iron atoms in a molecule of Hemoglobin. [Atomic mass : Fe = 56]

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

34. Calculate the number of atoms in 4.25 g NH_3.

(A) 4×10^{23} (B) 2×10^{23} (C) 1×10^{23} (D) 6×10^{23}

35. Peroxydase anhydrase - enzyme contain 0.5 % Se by mass. What will be the minimum molecular weight of peroxydase anhydrase enzyme ?

(A) 1.568×10^4 (B) 1.568×10^5 (C) 1.568×10^2 (D) 1568

36. The specific volume of a cylindrical virus particle is 6.02×10^{-2} cc/g, radius is 7 Å and length is 10 Å. If $N_A = 6.02 \times 10^{23}$, then calculate molecular weight of virus.

(A) 15.4 kg/mol (B) 1.54×10^4 kg/mol (C) 3.08×10^4 kg/mol (D) 3.08×10^3 kg/mol

37. Which of the following contain maximum number of molecules ?

(A) 7 g N_2 (B) 2 g H_2 (C) 16 g NO_2 (D) 6 g O_2

38. Which of the following contains maximum number of molecules ?

(A) 15L H_2 gas at STP (B) 5L N_2 gas at STP (C) 0.5 gram H_2 gas (D) 10 gram O_2 gas

39. The percentage proportions of isotopes of element 'X' is as follows.

^{200}X : 90 %, ^{199}X : 8.0 %, ^{202}X : 2.0 %

Calculate average atomic mass of element X.

(A) 201u (B) 202u (C) 199u (D) 200u

40. What will be the volume of one molecule of water ? (density of water = 1 g cm^{-3})

(A) 9.0×10^{-23} cm^3 (B) 6.023×10^{-23} cm^3

(C) 3.0×10^{-23} cm^3 (D) 5.5×10^{-23} cm^3

41. In a gaseous mixture the ratio by masses of oxygen and nitrogen is 1:4 then what will be the ratio of their number of molecules ?

(A) 1:4 (B) 1:8 (C) 7:32 (D) 3:16

42. How many moles of electrons weights 1 kilogram ?

(A) 6.023×10^{23} (B) $\frac{1}{9.108} \times 10^{31}$ (C) $\frac{6.023}{9.108} \times 10^{54}$ (D) $\frac{1}{9.108 \times 6.023} \times 10^{8}$

43. Calculate the total number of electrons in 18 mL water.

(A) 6.02×10^{23} (B) 6.02×10^{24} (C) 1.8×10^{23} (D) 1.8×10^{24}

44. Calculate the mass of 1×10^{22} $CuSO_4.5H_2O$ molecules in grams.

(Cu = 63.5 $\frac{g}{mol}$, S = 32 $\frac{g}{mol}$, O = 16 $\frac{g}{mol}$)

(A) 249.5 gram (B) 2.41×10^{22} gram (C) 4.14 gram (D) 41.2×10^{22} gram

Answers : **28.** (C), **29.** (D), **30.** (C), **31.** (B), **32.** (D), **33.** (C), **34.** (D), **35.** (A), **36.** (A), **37.** (B), **38.** (A), **39.** (D), **40.** (C), **41.** (C), **42.** (D), **43.** (B), **44.** (C)

- **EMPIRICAL FORMULA, MOLECULAR FORMULA AND STOICHIOMETRY OF CHEMICAL REACTIONS**
  - **Empirical formula :** It indicates simple whole number ratio of different atoms present in a compound.
  - **Molecular formula :** It shows exact number of different atoms present in a compound.
  - **Molecular formula** = (Empirical formula) × n

    Where, n is a simple whole number
  - $n = \dfrac{\text{Molecular weight}}{\text{Empirical formula weight}}$
  - **The word stoichiometry is derived from two Greek words :** 'Stoicheion' means element and 'metron' means to measure. Thus, stoichiometry means calculation of masses (sometimes volumes also) of reactants and products involved in chemical reaction.

45. The percentage proportion of Fe and O in oxide of iron was found to be 69.94 % and 30.06 % respectively. Find empirical formula of oxide. (Fe = 56, O = 16)

(A) FeO (B) Fe_2O_3 (C) Fe_3O_4 (D) FeO_2

46. If percentage proportion of nitrogen in its oxide is 30.4 % then find empirical formula of that oxide.

(A) N_2O (B) NO (C) NO_2 (D) N_2O_3

47. In a substance there are 2.65×10^{22} carbon atoms, 2.04 gram sodium and 0.132 mole oxygen atoms, find empirical formula of substance. (Na = $23 \frac{g}{mol}$)

(A) $Na_2C_2O_4$ (B) Na_2CO_3 (C) $NaCO_4$ (D) $Na_2C_2O_2$

48. An organic substance contains C, H and O elements. Combustion of 1.8 gram of this substance gave 2.64 gram CO_2 and 1.08 gram H_2O. Find empirical formula of organic substance.

(A) CH_2O (B) C_2HO (C) $C_2H_4O_3$ (D) $C_3H_2O_3$

49. The percentage of C, H and O in an organic substance are 54.55, 9.06 and 36.39 respectively. If molar mass of this substance is 88 gram/mole, then find its molecular formula.

(A) C_2H_4O (B) $C_4H_2O_2$ (C) $C_4H_8O_2$ (D) $C_6H_8O_2$

50. When 1.615 gram anhydrous salt was placed in a moist air its mass was found to be 2.875 gram. The percentage amount of elements in anhydrous salt is as follows. Zn = 40.6, S = 19.8 and O = 39.6. If complete hydration of a salt is taking place, then calculate the number of molecules of water of crystallisation.

(A) 2 (B) 5 (C) 6 (D) 7

51. Calculate the ratio of volumes of hydrogen gas produced when same amount of Zinc is reacted separately with excess of sulphuric acid and sodium hydroxide.

(A) 1:1 (B) 1:2 (C) 2:1 (D) 9:4

52. Calculate the mass of residue left on strongly heating 2.76 gram silver carbonate.
(Ag = 108, C = 12, O = 16)

(A) 2.16 gram (B) 2.48 gram (C) 2.32 gram (D) 2.64 gram

53. A mixture 'X' containing 0.02 mole $[Co(NH_3)_5SO_4]$ Br and 0.02 mole $[Co(NH_3)_5Br]SO_4$ in 2L solution was prepared.

1 L mixture X + $AgNO_{3(aq)}$ (excess) $\rightarrow$ Y

1 L mixture X + $BaCl_{2(aq)}$ (excess) $\rightarrow$ Z

Calculate the number of moles of Y and Z.

(A) 0.01, 0.01 (B) 0.02, 0.01 (C) 0.01, 0.02 (D) 0.02, 0.02

54. What mass of oxygen would require for complete combustion of 2.8 kilogram ethene (C_2H_4) ?

(A) 2.8 kg (B) 6.4 kg (C) 9.6 kg (D) 96 kg

55. Combustion reaction of liquid benzene (C_6H_6) with oxygen is as follows :

$2C_6H_{6(l)} + 15\ O_{2(g)} \rightarrow 12CO_{2(g)} + 6H_2O_{(l)}$

How many litres of O_2 at STP would require for combustion of 39 gram liquid benzene ?

(A) 74 L (B) 11.2 L (C) 22.4 L (D) 84 L

Answers :	**45.** (B), **46.** (C), **47.** (B), **48.** (A), **49.** (C), **50.** (D), **51.** (A), **52.** (A), **53.** (A), **54.** (C), **55.** (D)

- **DIFFERENT METHODS OF EXPRESSING CONCENTRATION OF SOLUTION**

(1) Molarity = $\frac{W \times 1000}{M \times V(ml)}$

Where, W = mass of solute in grams
M = Molar mass of solute,
V = Volume of solute

(2) Normality = $\frac{W \times 1000}{E \times V(ml)}$

Where, E = Equivalent weight of solute

(3) Molality = $\frac{W \times 1000}{M \times Wo}$

Where, Wo = mass of solvent in grams

(4) Formality = $\frac{W \times 1000}{FM \times V(ml)}$

Where, FM = Empirical formula mass

(5) Mole fraction of solute = $\frac{n}{n+N}$

Where, n = Number of moles of solute
N = Number of moles of solvent

(6) % w/w = $\frac{W \times 100}{W + Wo}$

(7) % V/V = $\frac{V \times 100}{V + V_0}$

V = Volume of solute in mL
Vo = Volume of solvent in mL

(8) % W/V = $\frac{W \times 100}{V}$

Where, W = mass of solute in grams
V = Volume of solute in mL

(9) ppm = $\frac{W \times 10^6}{V}$ or $\frac{W \times 10^6}{W'}$

Where, W = mass of solute in grams
V = volume of solution in mL
W' = mass of solution in grams

(10) Molarity = $\frac{\%W / W \times d \times 10}{M}$

Where, d = density of solution in gm/mL
M = Molecular mass of solute

(11) Equivalent weight of acid = $\frac{\text{Molecular weight of acid}}{\text{Basicity}}$

(12) Equivalent weight of base = $\frac{\text{Molecular weight of base}}{\text{Acidity}}$

(13) Equivalent weight of salt = $\frac{\text{Molecular weight of salt}}{\text{Total positive charge of positive ion}}$

(14) Normality Formula : $N_1 V_1 = N_2 V_2$

Where, N_1 = Initial normality of solution
V_1 = Initial volume of solution
N_2 = Final normality of solution
V_2 = Final volume of solution

(15) Equivalent weight of element = $\frac{\text{Atomic mass}}{\text{Oxidation number}}$

(16) Equivalent weight of compound in redox reaction =

$$\frac{\text{Molecular weight}}{\text{Change in oxidation number per mole of compound}}$$

(17) Molality = $\frac{\text{Molarity} \times 1000}{(1000\ d) - (\text{Molar mass of solute} \times \text{Molarity})}$

(18) Mole fraction of solute = $\frac{\text{Molality} \times \text{Molar mass of solute}}{1000 + \text{molality} \times \text{Molar mass of solute}}$

(19) If a reaction takes place between A and B then, $\frac{W_A}{E_A} = \frac{W_B}{E_B}$

(20) **Limiting reagent :** In a chemical reaction, the reactant taken in lesser amount is consumed after some time and reaction does not proceed further however larger amount of another

reactant is taken. Therefore, the reactant which gets consumed and limits the amount of products is called limiting reactant or reagent. This matter should be considered while doing stoichiometric calculations.

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56. The density of 98 % W/W aqueous solution of H_2SO_4 is 1.8 gm/mL. What would be its molarity ?

(A) 20 M (B) 10 M (C) 18 M (D) 24 M

57. Calculate normality of aqueous solution of 0.5M $Al_2\ (SO_4)_3$.

(A) 1.0 N (B) 1.5 N (C) 2.5 N (D) 3.0 N

58. How much water should be added to a mixture of 1500 mL 0.8 M and 500 mL 0.4 M aqueous solutions so that the resulting solution will have molarity 0.5 M ?

(A) 800 mL (B) 700 mL (C) 2800 mL (D) 2000 mL

59. Calculate the molality of a solution formed by mixing 500 gram solution of 25 % W/W NaOH and 500 gram solution of 15 % W/W NaOH. (Na = 23, O = 16, H = 1)

(A) 5.0 m (B) 9.0 m (C) 6.25 m (D) 0.0625 m

60. Calculate % $\frac{W}{W}$ of NaCl in 1.2 m NaCl aqueous solution. (NaCl = $58.5\frac{g}{mol}$)

(A) 3.27 (B) 5.62 (C) 4.67 (D) 6.56

61. Calculate the molality of resulting solution when aqueous solutions of 400 gram 0.5m, 100 gram 0.8 m and 600 gram 1.5 m urea are mixed.

(A) 1.2 m (B) 1.26 m (C) 1.06 m (D) 1.60 m

62. How many number of moles of $KMnO_4$ will be required to react with 1 mole sulphite ion in acidic solution ?

(A) $\frac{4}{5}$ (B) $\frac{2}{5}$ (C) 1 (D) $\frac{3}{5}$

63. How much oxygen would be required at $0^{\circ}C$ temperature and 1 atmospheric pressure for complete combustion of 1L propane (C_3H_8) gas ?

(A) 7 L (B) 6 L (C) 5 L (D) 10 L

64. How many moles of Lead (II) chloride will form by reaction of 6.5 gram PbO and 3.2 gram HCl ? (Pb = 207, O = 16, Cl = 35.5, H = 1)

(A) 0.044 (B) 0.333 (C) 0.011 (D) 0.029

65. How many moles of MnO_4^{-1} will be required for the oxidation of 1 mole ferrous oxalate in acidic medium?

(A) 0.6 Mole (B) 0.4 Mole (C) 7.5 Mole (D) 0.2 Mole

66. How many moles of water will form by reaction between 10 gram hydrogen and 64 gram oxygen ?

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

67. How much mass of a dibasic acid (Molecular weight = 200) will be required to form 100 mL 0.1N aqueous solution ?

(A) 1 gram (B) 2 gram (C) 10 gram (D) 20 gram

68. What will be the molarity of liquid HCl if its density is 1.17 gram / cm^3.

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

69. Calculate the molarity of a resultant mixture when 1 M 2.5 L NaOH and 0.5 M 3 L NaOH are mixed ?

(A) 0.8 M (B) 1.0 M (C) 0.73 M (D) 0.50 M

70. The density of a concentrated solution of sulphuric acid is 1.80 gm/mL and it contains 98 % by mass of sulphuric acid. What volume of this acid will be required to prepare 1L 0.1 M H_2SO_4 solution ?

(A) 11.10 mL (B) 16.65 mL (C) 22.20 mL (D) 5.55 mL

71. How many maximum number of moles of $Ba_3(PO_4)_2$ will form if 0.5 mole $BaCl_2$ and 0.2 mole Na_3PO_4 are mixed ?

(A) 0.70 (B) 0.50 (C) 0.2 (D) 0.1

72. 250 mL aqueous solution containing 6.3 gram oxalic acid dihydrate was prepared. What volume of 0.1 N NaOH will be required for complete neutralisation of 10 mL of this acid ?

(A) 40 mL (B) 20 mL (C) 10 mL (D) 4 mL

Answers : **56.** (C), **57.** (D), **58.** (A), **59.** (C), **60.** (D), **61.** (C), **62.** (B), **63.** (C), **64.** (D), **65.** (B), **66.** (D), **67.** (A), **68.** (C), **69.** (C), **70.** (D), **71.** (D), **72.** (A)

73. The vapour density of a mixture of NO_2 and N_2O_4 at 26.7 °C is 38.3. Calculate number of moles of NO_2 in 100 gram mixture. (NO_2 = 46, N_2O_4 = 92)

(A) 1.74 (B) 0.437 (C) 0.21 (D) 0.87

74. Calculate the equivalent weight of H_3PO_4 in a reaction given below :

$Ca(OH)_2 + H_3PO_4 = CaHPO_4 + 2H_2O$

(A) 98 (B) 32.66 (C) 49 (D) 24.5

75. A compound contains 28 % nitrogen and 72 % metal by mass. Three atoms of metal combines with two atoms of nitrogen. Calculate atomic mass of metal.

(A) 12 (B) 24 (C) 28 (D) 72

76. The density of 3 M aqueous solution of sodium thiosulphate ($Na_2S_2O_3$) is 1.25 gram/mL. Calculate molality of Na^+ and $S_2O_3^{2-}$ ions in this solution.

(A) 3.865, 3.865 (B) 7.732, 7.732 (C) 3.865, 7.732 (D) 7.732, 3.865

77. How many millilitres of 0.5 M H_2SO_4 will be required to dissolve 0.5 gram copper (II) carbonate ?

(Cu = $63.5\frac{g}{mol}$)

(A) 8.097 mL (B) 20.0 mL (C) 7.77 mL (D) 10.0 mL

78. On mixing 45 mL 0.25 M lead nitrate and 25 mL 0.1 M chromic sulphate solutions, lead sulphate is precipitated. How many moles of lead sulphate is produced ? What will be the molarity of lead nitrate after the reaction ?

(A) 2.5×10^{-3} mole, 0.0714 M (B) 2.5×10^{-3} mole, 0.0536 M

(C) 7.5×10^{-3} mole, 0.0536 M (D) 7.5×10^{-3} mole, 0.0714 M

79. A reaction between 2320 kilogram Fe_3O_4 and 280 kilogram CO is as follows:

(Fe = 56, O = 16, C = 12)

$Fe_3O_{4(s)} + 4CO_{(g)} \rightarrow 3Fe_{(s)} + 4CO_{2(g)}$ Calculate the mass of iron produced during the reaction.

(A) 420 kg (B) 1680 kg (C) 168 kg (D) 3360 kg

80. How much CaO will be obtained by decomposition of 200 kg $CaCO_3$ having purity 95% ?

(A) 190 kg (B) 106 kg (C) 109 kg (D) 60 kg

81. 1 litre hard water contains 12.00 milligram Mg^{2+}, then calculate number of milli equivalents of washing soda required for removal of hardness of water.

(A) 1 (B) 12.16 (C) 1×10^{-3} (D) 12.16×10^{-3}

82. If 5.0 mL conc. H_2SO_4 (d = 1.8 gram/mL) is neutralised by 82.4 mL of 2.0 M NaOH, then what will be the percentage purity of acid ?

(A) 89.72 (B) 92.12 (C) 98.2 (D) 85.7

83. Find the volume of ammonia at STP that must be passed through 30 mL 0.5 M H_2SO_4 in order to make its normality 0.2 N.

(A) 672 mL (B) 707 mL (C) 537.6 mL (D) 326.7 mL

84. A regular copolymer of ethylene and vinyl chloride contains both monomers alternatively. Calculate percentage by mass of ethylene in this copolymer.

(A) 27.8 % (B) 28.2 % (C) 25 % (D) 30.93 %

85. Mole fraction of iodine (I_2) in benzene (C_6H_6) is 0.2. Calculate molality of iodine in benzene.

(A) 2.35 m (B) 3.20 m (C) 2.75 m (D) 3.6 m

86. 5 mL 8 N nitric acid, 4.8 mL 5 N HCl and a certain volume of 17 M H_2SO_4 were mixed and the volume of a mixture was made up to 2 L. 30 mL of this mixture neutralise 42.9 mL of solution of 1 gram sodium carbonate ($Na_2CO_3 \, . \, 10H_2O$) dissolved in 100 mL solution. Calculate the mass of sulphate ions in solution.

(A) 2.685 gram (B) 0.136 gram (C) 6.528 gram (D) 13.05 gram

87. How many mL of 0.1 M nitric acid solution will be required to react completely with 1 gram mixture containing equal number of moles of Na_2CO_3 and $NaHCO_3$?

(A) 158 mL (B) 65 mL (C) 42 mL (D) 110 mL

88. On heating 1 gram metal carbonate, 0.56 gram oxide is obtained. Calculate the equivalent weight of metal.

(A) 10 (B) 20 (C) 12 (D) 24

89. Combustion of 3 litre gaseous mixture of propane and butane at 25 °C temperature produce 10 litre CO_2 gas. Calculate the percentage proportion of butane in a gaseous mixture.

(A) 66.66 % (B) 44.44 % (C) 33.33 % (D) 48.55 %

90. A hydrocarbon contains 10.5 gram carbon per gram of hydrogen. The mass of 1 litre vapours of this hydrocarbon is 2.8 gram at 127 °C temperature and 1 atmospheric pressure. Find molecular formula of hydrocarbon.

(A) C_3H_8 (B) C_5H_8 (C) C_4H_{10} (D) C_7H_8

Answers : **73.** (B), **74.** (C), **75.** (B), **76.** (D), **77.** (A), **78.** (C), **79.** (A), **80.** (B), **81.** (A), **82.** (A), **83.** (C), **84.** (D), **85.** (B), **86.** (C), **87.** (A), **88.** (B), **89.** (C), **90.** (D)

- **Two statements are given below in each question. In that one is assertion (A) and another is reason (R). Study the statements carefully and select correct option as per instructions given below :**

  (A) If A and R both are correct and R is correct explanation of A.

  (B) If A and R both are correct but R is not correct explanation of A.

  (C) If A is correct but R is incorrect.

  (D) If A and R both are incorrect.

91. Assertion (A) : 1 amu is $\frac{1}{12^{th}}$ part of the mass of C^{12}.

Reason (R) : Carbon-12 is the most abundant isotope of carbon and is accepted as standard.

92. Assertion (A) : The combustion of 30 gram ethane yields 54 gram water.

Reason (R) : Water is one of the products obtained on combustion of ethane.

93. Assertion (A) : Pure water always contains hydrogen and oxygen in the ratio of 2:16 by mass irrespective of source.

Reason (R) : The law of conservation of mass is followed in chemical reactions.

94. Assertion (A) : For a reaction $NH_3 + HCl \rightarrow NH_4Cl$, Gay-Lussac's law does not follow.

Reason (R) : NH_4Cl is a solid substance.

95. Assertion (A) : Galena is chemical compound, whereas solution of salt in water is a mixture.

Reason (R) : There is always 6.5 times lead than the mass of sulphur in Galena, whereas solution of salt in water can be prepared by taking any amounts of salt and water.

96. Assertion (A) : Sulphuric acid is dibasic acid.

Reason (R) : The normality of 0.2 M H_2SO_4 is 0.1 N.

97. Assertion (A) : Atomic mass of sodium is 11.

Reason (R) : Sodium atom is 23 times heavier than atom of carbon-12.

98. Assertion (A) : The value of molarity does not vary with temperature.

Reason (R) : Molarity does not depend on temperature.

99. Assertion (A) : A substance is made up of three components A, B and C. If mole fractions of A and B are 0.2 and 0.3 respectively, then the mole fraction of C will be 0.5.

Reason (R) : The sum of mole fractions of all components is always 1.

100. Assertion (A) : Molecular weight and equivalent weight of sodium hydroxide are same.

Reason (R) : The basicity of sodium hydroxide is 1.

Answers : 91. (B), **92.** (B), **93.** (B), **94.** (A), **95.** (A), **96.** (C), **97.** (D), **98.** (D), **99.** (A), **100.** (C)

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