

**SOME BASIC CONCEPT OF CHEMISTRY**

**YEAR LONG REVISION EXERCISE**

Not To Be Discussed in Class

**SECTION - 1 : SINGLE CHOICE CORRECT QUESTIONS**

- The shape of Tobacco Mosaic Virus (TMC) is cylindrical, having length and diameter 3000 Å and 170 Å, respectively. The density of the virus is 0.08 gm/ml. The molecular weight of TMC is  
 (A) 3.28 (B)  $5.44 \times 10^{-24}$  (C)  $5.44 \times 10^{-18}$  (D)  $3.28 \times 10^6$
- What time, it would take to spend Avogadro's number of rupees at the rate of 10 lac rupees per second?  
 (A)  $6.023 \times 10^{17}$  sec (B)  $1.909 \times 10^{10}$  year (C)  $1.673 \times 10^{14}$  hour (D) all of these
- The sodium salt of methyl orange has 7% sodium. What is the minimum molecular weight of the compound?  
 (A) 420 (B) 375 (C) 329 (D) 295
- In the preceding problem, if the compound contains 12.8% nitrogen 9.8% sulphur how many nitrogen and sulphur atoms are present per atom of sodium :  
 (A) 2 and 1 (B) 1 and 3 (C) 1 and 2 (D) 3 and 1
- In the following final result is ... $0.1 \text{ mol CH}_4 + 3.01 \times 10^{23} \text{ molecules CH}_4 - 9.6 \text{ g CH}_4 = x \text{ mol H atoms}$  :  
 (A) 0 mol H atom (B) 0.2 mol H atom (C) 0.3 mol H atom (D) 0.4 mol H atom
- In a gaseous mixture an alkane ( $\text{C}_x\text{H}_{2x+2}$ ) and an alkene ( $\text{C}_y\text{H}_{2y}$ ) are taken in 2 : 1 mole ratios, the average molecular weight of mixture is observed to be 20. If the same alkane and alkene are taken in 1 : 2 mole ratios, the average molecular weight of mixture is observed to be 24. Then the value of 'x' and 'y' respectively are :  
 (A) 2, 1 (B) 1, 2 (C) 2, 3 (D) 3, 2
- 3.06 L of  $\text{H}_2\text{O}_{(\text{vap})}$  is taken at a pressure of 1 atm and 373 K. It is now condensed to  $\text{H}_2\text{O}_{(l)}$  at 373K. Calculate the volume occupied by  $\text{H}_2\text{O}_{(l)}$  (Density of liquid water = 1 g/ml)  
 (A) 3.06 L (B) 1.8 ml (C) 1.8 L (D) 3.06 ml
- Nylon is prepared using a compound having formula  $\text{HOOC}(\text{CH}_2)_4\text{COOH}$ . What is the total number of atoms present in 0.73 mg of the above compound :  
 (A)  $6.023 \times 10^{19}$  (B)  $6.023 \times 10^{22}$  (C)  $60.23 \times 10^{23}$  (D) 20
- A substance has 16% by mass of Sulphur and 4% by mass of Oxygen. Calculate minimum molar mass of the substance.  
 (A) 200 (B) 400 (C) 600 (D) 100
- In an experiment, it is found that **2.0769 gm** of pure X produces **3.6769 gm** of pure  $\text{X}_2\text{O}_5$ . Then number of moles of X is :  
 (A) 0.04 (B) 0.06 (C) 0.4 (D) 0.02
- Two elements A and B form two different sets of compounds  $\text{A}_2\text{B}_3$  and  $\text{A}_3\text{B}_4$ . 2.02 kg of  $\text{A}_2\text{B}_3$  has  $1.806 \times 10^{25}$  atoms of B and 1.44 kg of  $\text{A}_3\text{B}_4$  has  $9.03 \times 10^{24}$  atoms of A. What will be gram molecular mass (GMM) of another compound AB formed from combination of A and B.  
 (A) 75 (B) 86 (C) 94 (D) 97
- A solution of palmitic acid ( $M = 256$ ) in benzene contains 5 gm acid per litre. When this solution is dropped on surface,  $\text{C}_{16}\text{H}_{32}\text{O}_2$  gets evaporated and acid forms a unimolecular layer on the surface. If we wish to cover an area 6000  $\text{cm}^2$  with unimolecular film. What volume of solution in ml should be used? Area covered by one molecule of acid is 0.32  $\text{nm}^2$ . (Given :  $N_A = 6 \times 10^{23}$ )  
**Write your answer multiplying with 1000.**  
 (A) 120 ml (B) 140 ml (C) 160 ml (D) 180 ml
- An element exist in two isotopic forms  $\text{X}^{120}$  and  $\text{X}^{122}$ , in equal abundance. The average atomic mass of element is 121.44. If each atom of  $\text{X}^{120}$  are 10.04 times heavier than one  $\text{C}^{12}$  atom, then how many times each atom of  $\text{X}^{122}$  is heavier than one  $\text{C}^{12}$  atom ?  
 (A) 10.04 (B) 10.4 (C) 10.2 (D) 10.167

- 14.** How many moles of  $e^-$  weight one Kg :
- (A)  $6.023 \times 10^{23}$  (B)  $\frac{1}{9.108} \times 10^{31}$  (C)  $\frac{6.023}{9.108} \times 10^{54}$  (D)  $\frac{1}{9.108 \times 6.023} \times 10^8$
- 15.** Which has maximum number of atoms :
- (A) 24 g C(12) (B) 56 g Fe(56) (C) 27 g Al (27) (D) 108 g Ag(108)
- 16.** Which of the following set of compounds illustrate law of multiple proportion—
- (A)  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{H}_2\text{O}$  (B)  $\text{N}_2\text{O}$ ,  $\text{N}_2\text{O}_3$ ,  $\text{N}_2\text{O}_5$  (C)  $\text{H}_2\text{O}$ ,  $\text{D}_2\text{O}_3$ ,  $\text{HOD}$  (D) All of the above
- 17.** Among the following pairs of compounds, the one that illustrates the law of multiple proportions is—
- (A)  $\text{NH}_3$  and  $\text{NCl}_3$  (B)  $\text{H}_2\text{S}$  and  $\text{SO}_2$  (C)  $\text{CuO}$  and  $\text{Cu}_2\text{O}$  (D)  $\text{CS}_2$  and  $\text{FeSO}_4$
- 18.** Law of multiple proportions is illustrated by one of the following pairs—
- (A)  $\text{H}_2\text{S}$  and  $\text{SO}_2$  (B)  $\text{NO}$  and  $\text{N}_2\text{O}$  (C)  $\text{Na}_2\text{S}$  and  $\text{Na}_2\text{O}$  (D)  $\text{BeO}$  and  $\text{BeCl}_2$
- 19.** Which of the following contains greatest number of oxygen atoms :
- (A) 1 g of O (B) 1 g of  $\text{O}_2$   
 (C) 1 g of  $\text{O}_3$  (D) all have the same number of atoms
- 20.** A sample of ammonium phosphate,  $(\text{NH}_4)_3\text{PO}_4$ , contains 3.18 mol of hydrogen atoms. The number of moles of oxygen atoms in the sample is :
- (A) 0.265 (B) 0.795 (C) 1.06 (D) 3.1
- 21.** Four 1 litre flasks are separately filled with the gases  $\text{H}_2$ ,  $\text{He}$ ,  $\text{O}_2$  and  $\text{O}_3$  at the same temperature and pressure. The ratio of total number of atoms of these gases present in different flask would be :
- (A) 1 : 1 : 1 : 1 (B) 1 : 2 : 2 : 3 (C) 2 : 1 : 2 : 3 (D) 3 : 2 : 2 : 1
- 22.** Number of gm-atoms of sulphur present in  $\text{SO}_2$  gas which occupy 22.7 ml at S.T.P.
- (A) 0.001 (B) 0.01 (C) 1 (D) 10
- 23.** 50 g of  $\text{ZnS}$  are strongly heated in air to effect partial oxidation and the resultant mass weighed 44 g. What is the ratio of  $\text{ZnO}$  to  $\text{ZnS}$  in the resultant mixture :
- (A) 13.5 : 30.5 (B) 27 : 12.58 (C) 27 : 15.31 (D) 30.52 : 13.48
- 24.** Iodobenzene ( $\text{C}_6\text{H}_5\text{I}$ ) is prepared from aniline ( $\text{C}_6\text{H}_5\text{NH}_2$ ) in a two step process as shown below  
 $\text{C}_6\text{H}_5\text{NH}_2 + \text{HNO}_2 + \text{HCl} \rightarrow \text{C}_6\text{H}_5\text{N}_2^+\text{Cl}^- + 2\text{H}_2\text{O}$   
 $\text{C}_6\text{H}_5\text{N}_2^+\text{Cl}^- + \text{KI} \rightarrow \text{C}_6\text{H}_5\text{I} + \text{N}_2 + \text{KCl}$   
 In an actual preparation 9.30 g of aniline was converted to 16.32 g of iodobenzene. The percentage yield of iodobenzene is :
- (A) 8 % (B) 50 % (C) 75 % (D) 80 %
- 25.** A 15 mL sample of 0.20 M  $\text{MgCl}_2$  is added to 45 mL of 0.40 M  $\text{AlCl}_3$ . What is the molarity of  $\text{Cl}^-$  ions in the final solution:
- (A) 1.0 M (B) 0.60 M (C) 0.35 M (D) 0.30 M
- 26.** The molality of a 1 L solution with x %  $\text{H}_2\text{SO}_4$  is 9. The weight of solvent present in the solution is 910 grams. The value of x is :
- (A) 90 (B) 80.3 (C) 30.38 (D) 46.87
- 27.** 500 mL of a glucose solution contains  $6.02 \times 10^{22}$  molecules. The concentration of the solution is :
- (A) 0.1 M (B) 1.0 M (C) 0.2 M (D) 2.0 M
- 28.** A solution containing 12.0% sodium hydroxide by mass has a density of 1.131 g/mL. What volume of this solution contains 5.00 mol of  $\text{NaOH}$  :
- (A) 0.0240 L (B) 1.67 L (C) 1.47 L (D) 1.00 L

- 29.** A quantity of aluminium has a mass of 54.0 g. What is the mass of the same number of magnesium atoms ?  
(At. wt. Al = 27, Mg = 24)  
(A) 12.1 g (B) 23.3 g (C) 48 g (D) 97.2 g
- 30.** One atomic mass unit in kilogram is  
(A)  $1/N_A$  (B)  $12/N_A$  (C)  $1/1000 N_A$  (D)  $1000/N_A$
- 31.** The mass of 1 mole of protons ( $m_p = 1.672 \times 10^{-27}$  kg) is :  
(A)  $1.800 \times 10^{-3}$  kg (B)  $1.008 \times 10^{-4}$  kg  
(C)  $1.080 \times 10^{-3}$  kg (D)  $1.007 \times 10^{-3}$  kg
- 32.** A gaseous mixture contains  $\text{CO}_2$  (g) and  $\text{N}_2\text{O}$  (g) in a 2 : 5 ratio by mass. The ratio of the number of molecules of  $\text{CO}_2$  (g) and  $\text{N}_2\text{O}$  (g) is  
(A) 5 : 2 (B) 2 : 5 (C) 1 : 2 (D) 5 : 4
- 33.** 1.61 gm of  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  contains same number of oxygen atoms as present in  
(A) 0.98 gm  $\text{H}_2\text{SO}_4$  (B) 0.08 gm  $\text{SO}_3$  (C) 1.78 gm  $\text{H}_2\text{S}_2\text{O}_7$  (D) 0.05 gm  $\text{CaCO}_3$
- 34.** If the mass of proton is doubled and that of neutron is halved, the molecular weight of  $\text{CO}_2$ , consisting only  $\text{C}^{12}$  and  $\text{O}^{16}$  atoms, will  
(A) not change (B) increase by 25% (C) decrease by 25% (D) increase by 50%
- 35.** The number of g-molecules of oxygen in  $6.02 \times 10^{24}$  CO molecules is  
(A) 1 g-molecule (B) 0.5 g-molecule (C) 5 g-molecule (D) 10 g-molecule
- 36.** Which of the following will occupy greater volume under the similar conditions of pressure and temperature?  
(A) 6 gm oxygen (B) 0.98 gm hydrogen (C) 5.25 gm nitrogen (D) 1.32 gm helium
- 37.** X gm A atoms on combining with Y atoms of B form 5 molecules of a compound containing A & B. Find the molecular weight of compound formed. (Atomic weight of B = M)  
(A)  $\frac{XN_A + MY}{5}$  (B)  $\frac{X + M}{5}$  (C)  $\frac{X + MY}{5}$  (D)  $\left( \frac{X + MYN_A}{5} \right)$
- 38.** The weight of  $2.01 \times 10^{23}$  molecules of CO is  
(A) 9.3 g (B) 7.2 g (C) 1.2 g (D) 3 g
- 39.** In an organic compound of molar mass  $108 \text{ g mol}^{-1}$  C, H and N atoms are present in 9 : 1 : 3.5 by weight. Molecular formula can be :  
(A)  $\text{C}_6\text{H}_8\text{N}_2$  (B)  $\text{C}_7\text{H}_{10}\text{N}$  (C)  $\text{C}_5\text{H}_6\text{N}_3$  (D)  $\text{C}_4\text{H}_{18}\text{N}_3$
- 40.** How many moles of magnesium phosphate,  $\text{Mg}_3(\text{PO}_4)_2$  will contain 0.25 mole of oxygen atoms?  
(A)  $3.125 \times 10^{-2}$  (B)  $1.25 \times 10^{-2}$  (C)  $2.5 \times 10^{-2}$  (D) 0.02

## SECTION - 2 : MULTIPLE CHOICE CORRECT QUESTIONS

- 41.** A polymeric organic compound contains 0.07% iron and 0.035% nitrogen by mass. Which of the following statement(s) is/are correct for the compound ? (Fe = 56, N = 14)  
(A) The molecular mass of compound may be 40000.  
(B) The molecular mass of compound may be 160000.  
(C) In each molecule of this compound, there are 2 nitrogen atoms per iron atom.  
(D) In each molecule of this compound, there are 2 iron atoms per nitrogen atom.
- 42.** Which of the following have equal no. of atoms ?  
(A) 12 g  $\text{MgSO}_4$  (B) 0.2 mole  $\text{CO}_2$  (C) 5.6 L  $\text{SO}_2$  at STP (D) 24 g Ca

43. A mixture of two gases  $H_2$  and  $O_2$  has an average molecular mass 12 and is kept at a temperature of  $\frac{200}{3}$  K and pressure 0.821 atm. Select the correct options :
- (A) Mixture contains  $\frac{100}{9}$  % by mass of  $H_2$  gas. (B) Density of mixture is 1.8 gm/ml.  
 (C) Mixture contains  $\frac{100}{3}$  % by mol of  $O_2$  gas (D) Mole ratio of  $O_2$  and  $H_2$  gas in the mixture is  $\frac{1}{3}$
44. Which of the statements is / are **true** for a chemical reaction occurring in a closed container?  
 (A) Total mass of all reactants and products always remain constant.  
 (B) Average molecular mass of the mixture may change during chemical reaction.  
 (C) Total number of atoms of each element will remain constant in a chemical reaction.  
 (D) Total volume of all reactants and products always remain constant.
45. Which of the following contains the same number of molecules ?  
 (A) 1 g of  $O_2$ , 2 g of  $SO_2$   
 (B) 1 g of  $CO_2$ , 1 g of  $N_2O$   
 (C) 11.2 ml of  $O_2$  at STP, 224 ml of He at 0.5 atm and 273 K  
 (D) 1 g of oxygen, 1 g of ozone
46. Select the correct statement(s) for  $(NH_4)_3PO_4$ .  
 (A) Ratio of number of oxygen atom to number of hydrogen atom is 1 : 3.  
 (B) Ratio of number of cation to number of anion is 3 : 1.  
 (C) Ratio of number of nitrogen atom to number of oxygen atom is 3 : 4.  
 (D) Total number of atoms in one mole of  $(NH_4)_3PO_4$  is 20.
47. 1 mol of  $^{24}_{12}Mg^{2+}$  ions contains :  
 (A)  $12 \times 6.023 \times 10^{23}$  electrons (B)  $12 \times 6.023 \times 10^{23}$  protons  
 (C)  $12 \times 6.023 \times 10^{23}$  neutrons (D)  $14 \times 6.023 \times 10^{23}$  protons
48. 8g  $O_2$  has same number of molecules as that in :  
 (A) 14g CO (B) 7 g CO (C) 11 g  $CO_2$  (D) 22 g  $CO_2$
49. Which of the following statements(s) is/are correct for water ?  
 (A) H and O are in 2 : 1 atomic ratio (B) H and O are in 2 : 1 weight ratio  
 (C) H and O are in 1 : 8 weight ratio (D) H and O are in 1 : 16 weight ratio
50. Which of the following will have same mass of the substance ?  
 (A) 11.2 litre of  $O_2$  gas at NTP (B) 44.8 litre of  $H_2$  gas at NTP  
 (C) 22.4 litre of  $CH_4$  gas at NTP (D) 16 ml of  $H_2O$  at NTP (Density of water = 1 g/mL)
51. Which of the following options is/are incorrect.  
 (A) 10 gm of Boron is having 5 mole of nucleons.  
 (B) One atom of an element weight  $1.8 \times 10^{-22}$  gm, then its atomic mass is 108.36  
 (C) 10 gm of  $CaCO_3$  contains 1 gm atom of C.  
 (D) Number of atoms in 2 moles of  $S_8$  is greater than 5.5 moles of  $SO_2$
52. Which of the following have equal no. of atoms ?  
 (A) 12 g  $MgSO_4$  (B) 0.2 mole  $CO_2$  (C) 5.6 L  $SO_2$  at STP (D) 24 g Ca
53. If 27 g of Carbon is mixed with 88 g of Oxygen and is allowed to burn to produce  $CO_2$ , then :  
 (A) Oxygen is the limiting reagent.  
 (B) Volume of  $CO_2$  gas produced at NTP is 50.4 L.  
 (C) C and O combine in mass ratio 3 : 8.  
 (D) Volume of unreacted  $O_2$  at STP is 11.2 L.



54. Which of the following option(s) is/are correct.  
 [Take  $H_2O$  be solvent in every case & solute is completely soluble]  
 (A) If mass fraction of  $CaBr_2$  and  $H_2O$  are same then molality of  $CaBr_2$  is 5 m.  
 (B) If equal moles of  $NaCl$  and  $H_2O$  are taken then molality of  $NaCl$  is 55.55 m.  
 (C) If in place of  $NaCl$  we use  $NaBr$  as solute in option (B) then molality of  $NaBr$  changes.  
 (D) If mole fraction of  $NaCl$  is same as that of  $H_2O$  then molality of  $NaCl$  will be 55.55 m.
55. Solution(s) containing 40 gm  $NaOH$  is/are  
 (A) 50 gm of 80% (w/w)  $NaOH$   
 (B) 50 gm of 80% (w/v)  $NaOH$  [ $d_{soln.} = 1.2$  gm/ml]  
 (C) 50 gm of 20 M  $NaOH$  [ $d_{soln.} = 1$  gm/ml]  
 (D) 50 gm of 5m  $NaOH$

### SECTION - 3 : COMPREHENSION BASED QUESTIONS

#### Paragraph for Q.56 to Q.58

The first concept of atomic weight was given by Dalton. He defined that the absolute mass of an atom cannot be determined but we may compare the masses of atoms of different elements, perfectly, by knowing the chemical formula and percentage composition, by mass, of the compound formed by the elements concerned. The chemical or molecular formula can be determined with the help of Avogadro's hypothesis that is, under similar conditions of pressure and temperature, equal volume of all the gases have equal number of molecules. Dalton defined the atomic weight of an element as the number of times by which one atom of the element is heavier than one atom of hydrogen. In order to determine the atomic weight of nitrogen, the following data are observed by experiments, for a compound containing only nitrogen and hydrogen atoms :

**Data I :** The compound contains 88% nitrogen and 12% hydrogen, by mass.

**Data II :** 10 ml of this gaseous compound exactly gives 10 ml nitrogen and 20 ml hydrogen, on complete decomposition. (All volumes are at the same temperature and pressure)

56. What is the molecular formula of the compound if nitrogen and hydrogen, both are diatomic ?  
 (A)  $NH_3$  (B)  $N_2H_4$  (C)  $N_4H_2$  (D)  $N_2H_2$
57. What is the atomic weight of nitrogen on this hydrogen scale ?  
 (A) 14 (B) 14.67 (C) 14.33 (D) 13.67
58. What would be the molecular formula of the compound if nitrogen were triatomic and hydrogen were diatomic?  
 (A)  $NH_3$  (B)  $N_3H_4$  (C)  $N_4H_3$  (D)  $N_3H_2$

#### Paragraph for Q.59 to Q.61

$9 \times 10^{22}$  atoms of Ar and n moles of  $O_2$  are kept in a vessel of capacity 5 L at 1 atm and  $27^\circ C$ .  
 (Consider  $N_A = 6 \times 10^{23}$ ) :

59. Find the mass of  $O_2$  in vessel -  
 (A) 16 gm (B) 3.2 gm (C) 1.6 gm (D) 32 gm
60. If all the  $O_2$  is converted to  $O_3$  in vessel -  
 (A) moles of gas remain same (B) molecules in vessel remain same  
 (C) pressure in vessel remain same (D) total atoms in vessel remain same
61. If  $3 \times 10^{22}$  molecules of  $O_2$  are added in vessel. Find the new pressure in vessel at same temperature in vessel-  
 (A) 1.23 atm (B) 2.23 atm (C) 0.23 atm (D) None of the above

#### Paragraph for Q.62 to Q.64

Azurite is a copper containing mineral that is a mixture of Copper (II) carbonate and copper (II) hydroxide,  $[CuCO_3]_x [Cu(OH)_2]_y$ . If the mineral is 55.31% Cu, 0.58% H and 6.97% C, with the remainder oxygen, what are x and y in the general formula ? [**Cu = 63.5**]

62. What is the value of 'x' in general empirical formula ?  
 (A) 7 (B) 2 (C) 3 (D) 4
63. What is the value of 'y' in the general empirical formula b?  
 (A) 1 (B) 2 (C) 3 (D) 4
64. If the value of x and y be 1 and 2 respectively. Calculate the % composition of Cu ?  
 (A) 50 % (B) 59.8% (C) 51.2% (D) 60%

**SECTION - 4 : MATRIX - MATCH QUESTIONS**

65. Match the following column :

**Column - I**

- (A) 19.0 g  $\text{N}_2\text{O}_3$   
 (B) 15.0 g NO  
 (C) 22.0 g  $\text{N}_2\text{O}$   
 (D) 23.0 g  $\text{NO}_2$

**Column - II**

- (P) Number of N atoms in the sample =  $3.01 \times 10^{23}$   
 (Q) Number of O atoms in the sample =  $6.02 \times 10^{23}$   
 (R) Number of O atoms in the sample =  $3.01 \times 10^{23}$   
 (S) Number of O atoms in the sample =  $4.52 \times 10^{23}$   
 (T) Number of total atoms in the sample =  $9.03 \times 10^{23}$

**SECTION - 5 : NUMERICAL ANSWER BASED QUESTIONS**

66. 20% surface sites have adsorbed  $\text{N}_2$ . On heating  $\text{N}_2$  gas evolved from sites and were collected at 0.001 atm and 298 K in a container of volume is  $2.46 \text{ cm}^3$ . Density of surface sites is  $6.023 \times 10^{14}/\text{cm}^2$  and surface area is  $1000 \text{ cm}^2$ , find out the no. of surface sites occupied per molecule of  $\text{N}_2$  :
67.  $\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}$  has 50%  $\text{H}_2\text{O}$ . Hence, x is :
68. An element exist in three isotopic form  $^{40}\text{X}$ ,  $^{41}\text{X}$  and  $^{42}\text{X}$ .  
 Percentage abundance of  $^{40}\text{X}$  = 30% by mole.  
 If average atomic mass of 'X' is 41.25. Find out percentage abundance of  $^{41}\text{X}$ .  
**[Divide your answer by 3 and fill OMR sheet]**
69. Two isotopes of an element ( atomic mass =  $x + 2.35$ ) have mass ( $x + 2$ ) and ( $x + 7$ ) respectively. Calculate natural abundance of heavier isotope in percentage.
70. Ratio of number of protons to neutrons in  $3.011 \times 10^{22}$  molecules of  $\text{D}_3\text{O}^+$  is "\_\_\_\_\_"
71. Consider the following statements  
 (i) If all the reactants are not taken in their stoichiometric ratio, then at least one reactant will be left behind.  
 (ii) 2 moles of  $\text{H}_2(\text{g})$  and 3 moles of  $\text{O}_2(\text{g})$  produce 2 moles of water.  
 (iii) Equal wt. of carbon and oxygen are taken to produce  $\text{CO}_2$  then  $\text{O}_2$  is limiting reagent.  
 (iv) The percentage of nitrogen will be more in  $\text{NH}_3$  than  $\text{NH}_4\text{OH}$ .  
 (v) The Density of oxygen gas will be more than that of nitrogen under similar conditions of pressure and temperature.  
 The number of true statements are:
72. If for the reaction  $2\text{NH}_3 \rightarrow \text{N}_2 + 3\text{H}_2$ , the reaction is started with 2ml of  $\text{NH}_3$ , the total volume of the gases in ml when the reaction is 50 % complete will be :
73. Calculate the % by mass of 'H' in 1 ml of  $\text{H}_2\text{O}^{18}$  at 1 atm and  $27^\circ\text{C}$ .  
**(Express your answer as sum of all digits.)**
74. Calculate the mass of urea ( $\text{NH}_2\text{CONH}_2$ ) containing 1gm-atom H.  
**(Express your answer as sum of all digits.)**
75. 0.36 gm of a triatomic gas,  $\text{X}_3$ , occupies 168 ml at 1 atm & 273 K. The atomic weight of X is

**SECTION - 6 : SUBJECTIVE QUESTIONS**

76. The average mass of one gold atom in a sample of naturally occurring gold is  $3.2707 \times 10^{-22} \text{ g}$ . Use this to calculate the molar mass of gold.
77. A plant virus is found to consist of uniform symmetrical particles of  $150 \text{ \AA}$  in diameter and  $5000 \text{ \AA}$  long. The specific volume of the virus is  $0.75 \text{ cm}^3/\text{g}$ . If the virus is considered to be a single particle, find its molecular weight.

78. A chemical commonly called "dioxin" has been very much in the news in the past few years. (It is the by product of herbicide manufacture and is thought to be quite toxic.) Its formula is  $C_{12}H_4Cl_4O_2$ . If you have a sample of dirt (28.3 g) that contains  $1.0 \times 10^{-4} \%$  dioxin, how many moles of dioxin are in the dirt sample?
79. The action of bacteria on meat and fish produces a poisonous compound called cadaverine. As its name and origin imply, it stinks ! It is 58.77% C, 13.81 % H, and 27.42 % N. Its molar mass is 102 g/mol. Determine the molecular formula of cadaverine.
80. Given the following empirical formulae and molecular weight, compute the true molecular formulae :
- |     | Empirical formula | Molecular weight |
|-----|-------------------|------------------|
| (a) | $CH_2$            | 84               |
| (b) | $CH_2O$           | 150              |
| (c) | $HO$              | 34               |
| (d) | $HgCl$            | 472              |
| (e) | $HF$              | 80               |
81. 1 mole of diatomic gas  $A_2$  contain 32 and 36 moles of electrons and neutrons respectively. The representation of the element.
82. A sample of nitrogen contains 90%  $N^{14}$  and 10%  $N^{15}$  isotopes. The average number of neutron per atom is
83. If molecular weight of glucose-1-phosphate is 260 and its density is 1.5 g/ml. What is the average volume occupied by 1 molecule of this compound?
84. A crystalline hydrated salt on being rendered anhydrous, loses 45.6% of its weight. The percentage composition of anhydrous salt is : Al = 10.5%, K = 15.1%, S = 24.8% and O = 49.6%. Find the empirical formula of the anhydrous and crystalline salt :
85. A compound containing Ca, C, N and S was subjected to quantitative analysis and formula mass determination. A 0.25 g of this compound was mixed with  $Na_2CO_3$  to convert all Ca into 0.16 g  $CaCO_3$ . A 0.115 g sample of compound was carried through a series of reactions until all its S was changed into  $SO_4^{2-}$  and precipitated as 0.344 g of  $BaSO_4$ . A 0.712 g sample was processed to liberate all of its N as  $NH_3$  and 0.155 g  $NH_3$  was obtained. The formula mass was found to be 156. Determine the empirical and molecular formula of the compound :
86. One mole of a mixture of  $N_2$ ,  $NO_2$  and  $N_2O_4$  has a mean molar mass of 55.4. On heating to a temperature at which  $N_2O_4$  may be dissociated :  $N_2O_4 \longrightarrow 2NO_2$ , the mean molar mass tends to the lower value of 39.6. What is the mole ratio of  $N_2 : NO_2 : N_2O_4$  in the original mixture?
87. Two elements C and D combine to form two compounds  $C_xD_y$  &  $C_yD_x$ . 0.5 mole of  $C_yD_x$  weigh 40 gm & 1 molecule of  $C_xD_y$  weigh  $1.66 \times 10^{-25}$  kg. The atomic weight of C and D are 20 & 40 respectively. 'x' & 'y' are respectively.
88. On a reference scale of C, at. weight of Al is 26.98 of Titanium is 47.48. What would be at. weight of Al on a new reference scale where Titanium has a value of 48.
89. Three isotopes of an element have mass numbers M, (M+1) and (M+2). If the mean mass number is (M + 0.5), then the ratio of number of the three isotopes (if the two heavier isotopes are same in number).

### SECTION - 7 : ASSERTION-REASON QUESTIONS

These questions contains, Statement I (assertion) and Statement II (reason).

- (A) Statement-I is true, Statement-II is true ; Statement-II is correct explanation for Statement-I.  
 (B) Statement-I is true, Statement-II is true ; Statement-II is NOT a correct explanation for statement-I  
 (C) Statement-I is true, Statement-II is false  
 (D) Statement-I is false, Statement-II is true

90. **Statement-I** : 16 g each  $O_2$  and  $O_3$  contains  $\frac{N_A}{2}$  and  $\frac{N_A}{3}$  atoms respectively.

**Because**

**Statement-II** : 16 g  $O_2$  and  $O_3$  contains same no. of atoms.

91. **Statement-I** : The average mass of one Mg atom is 24.305 amu, which is not the actual mass of one Mg atom.

**Because**

**Statement-II** : Three isotopes,  $^{24}\text{Mg}$ ,  $^{25}\text{Mg}$  and  $^{26}\text{Mg}$ , of Mg are found in nature.

92. **Statement-I** : A molecule of butane,  $\text{C}_4\text{H}_{10}$  has a mass of 58.12 amu.

**Because**

**Statement-II** : One mole of butane contains  $6.022 \times 10^{23}$  molecules and has a mass of 58.12 g.

93. **Statement-I** : Both 12 g. of carbon and 27 g. of aluminium will have  $6.02 \times 10^{23}$  atoms.

**Because**

**Statement-II** : Gram atomic mass of an element contains Avogadro's number of atoms.



## ANSWERS

• **SINGLE CHOICE CORRECT QUESTIONS**

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 1. (D)  | 2. (D)  | 3. (C)  | 4. (D)  | 5. (A)  |
| 6. (B)  | 7. (B)  | 8. (A)  | 9. (B)  | 10. (A) |
| 11. (B) | 12. (C) | 13. (C) | 14. (D) | 15. (A) |
| 16. (B) | 17. (C) | 18. (B) | 19. (D) | 20. (C) |
| 21. (C) | 22. (A) | 23. (D) | 24. (D) | 25. (A) |
| 26. (D) | 27. (C) | 28. (C) | 29. (C) | 30. (C) |
| 31. (D) | 32. (B) | 33. (C) | 34. (B) | 35. (C) |
| 36. (B) | 37. (A) | 38. (A) | 39. (A) | 40. (A) |

• **MULTIPLE CHOICE CORRECT QUESTIONS**

- |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|
| 41. (BC)  | 42. (ABD) | 43. (AC)  | 44. (ABC) | 45. (ABC) |
| 46. (ABC) | 47. (BC)  | 48. (BC)  | 49. (AC)  | 50. (ACD) |
| 51. (ACD) | 52. (ABD) | 53. (BCD) | 54. (ABD) | 55. (AC)  |

• **COMPREHENSION BASED QUESTIONS**

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 56. (B) | 57. (B) | 58. (B) | 59. (C) | 60. (D) |
| 61. (A) | 62. (B) | 63. (A) | 64. (B) |         |

• **MATRIX MATCH QUESTIONS**

65. (A) PS, (B) PR, (C) RT, (D) PQT

• **NUMERICAL ANSWER BASED QUESTIONS**

- |         |         |         |         |          |
|---------|---------|---------|---------|----------|
| 66. (2) | 67. (4) | 68. (5) | 69. (7) | 70. (1)  |
| 71. (5) | 72. (3) | 73. (1) | 74. (6) | 75. (16) |

• **SUBJECTIVE QUESTIONS**

- |   |                                   |
|---|-----------------------------------|
| 76. (196.9)   | 77. $7.09 \times 10^7$            |
| 78. $8.8 \times 10^{-8}$ mol  | 79. $C_5H_{14}N_2$                |
| 80. (a) $C_6H_{12}$ (b) $C_5H_{10}O_5$ (c) $H_2O_2$ (d) $Hg_2Cl_2$ (e) $H_4F_4$ | 81. ${}_{16}A^{34}$               |
| 82. 7.10  | 83. $29 \times 10^{-23}$ ml       |
| 84. $KAlS_2O_8$ , $KAlS_2O_8 \cdot 12 H_2O$                                     | 85. $CaC_2N_2S_2$ , $CaC_2N_2S_2$ |
| 86. 0.5 : 0.1 : 0.4   | 87. $x = 1$ $y = 2$               |
| 88. 27.04   | 89. 4 : 1 : 1                     |

• **ASSERTION-REASON QUESTIONS**

- |         |         |         |         |
|---------|---------|---------|---------|
| 90. (D) | 91. (A) | 92. (A) | 93. (A) |
|---------|---------|---------|---------|