CHAPTER 01

SOME BASIC CONCEPTS OF CHEMISTRY

Consider Chemistry among the most useful of sciences, and big with future discoveries for the utility and safety of the human race

"THOMAS JEFFERSON"

INTRODUCTION

In this chapter we will study the basic concepts and techniques which will form the base of chemistry and will be useful in every chapter you are going to study. A you already know, chemistry is about the study of matter, so we will study the characteristics, classification and measurement of matter with international system of units and their inter conversions, and how to make precise and accurate scientific calculations. After this we will study about the laws of Chemical Combinations and Dalton's atomic theory and how to deal with calculations involving atoms, molecules, **moles and molar mass**. Also how to determine molecular formula and what is Emperical formula will be discussed in this chapter.

Classification of universe

The whole universe consists of matter and energy. In a chemical reaction niether any mass is destroyed nor any energy is lost. Energy can only be trnsformed from one form to another and that we will study in detail later in this chapter. So basically Universe is classified into 2 categoies as follows :

(I) Matter

(II) Energy

(I) Matter

The thing which occupy space and having mass which is feel by our five senses is called as **matter**. It is mainly subdivided on the basis of two kinds of classifications :

(I) Physical classification

(II) Chemical classification

Physical Classification :

We see different things around us having different shaped, sizes and colors, mass and occupy space, all these things are composed of matter. Depending upon physcial and chemical properties matter is classified into following three ctaegories

(a) Solid

(b) Liquid

(c) Gas

(a) Solid

A substance is said to be solid if it possesses a definite volume and a definite shape. Constituent particles are tightly packed and usually there is a regu;lar pattern among the particles and they do not have much freedom to move or not easily compressible.

Ex. sugar, iron, gold, wood, NaCl etc.

(b) Liquid

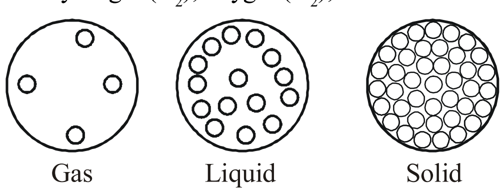
A substance is said to be liquid if it possesses a definite volume but not definite shape. They take up the shape of the vessel in which they are put. The intermolecular distance is high as compared to solids and thus they have the tendancy to flow but they are not much compressible due to little free space but can flow easily.

Ex. water, milk, oil, mercury, alcohol, Bromine etc.

(c) Gas

A substance is said to be gas if it neither possesses a definite volume nor a definite shape. This is because they fill up the whole vessel in which they are put. The intermolecular distance is highest in gases and are highly compressible.

Ex. hydrogen(H_2), oxygen(O_2), carbon dioxide(CO_2), etc.



Solid, Liquid and Gaseous states of matter are inter convertible by changing temperature and pressure.

$$\text{Solid} \underset{\text{Cool}}{\overset{\text{Heat}}{\rightleftharpoons}} \text{Liquid} \underset{\text{Cool}}{\overset{\text{Heat}}{\rightleftharpoons}} \text{Gas}$$

For example, water can be converted into ice and water vapour as follows :

$$\text{Ice} \underset{\text{Cool}}{\overset{\text{Heat}}{\rightleftharpoons}} \text{Water} \underset{\text{Cool}}{\overset{\text{Heat}}{\rightleftharpoons}} \text{Vapour}$$

ETOOS KEY POINTS

Direct conversion of solid to gaseous state is called as **sublimation**. Champhor undergoes sublimation. Also further on applying pressure at a particular temperature gases can be liquified, this principle is applied to compress natural gas and petroleum gas which are available for our uses as CNG and LPG.

Chemical Classification :

At the macroscopic level depending upon the composition, matter can also be divided into two broad categories :

(a) Pure Substance

(b) Mixture

(a) Pure Substance

A material containing only one type of substance. They have fixed composition and their properties also do not vary. Pure Substance can not be seperated into simpler substance by physical method.

Ex. Element = Na, Mg, Ca .... etc.

Compound = HCl, H_2O, CO_2, HNO_3 .... etc.

2 Types

(i) Element

(ii) Compound

(i) Element : The pure substance containing only one kind of atoms **.**

3 Types (depend on physical and chemical property)

- Metal
- Non-metal
- Metalloids

(ii) Compound

It is defined as pure substance containing more than one kind of atoms which are combined together in a fixed ratio by weight and which can be decomposed into simpler substance by the suitable chemical method. The properties of a compound are differnt from those of its components.

Ex. H_2O , HCl, HNO_3 .... etc.

2 : 16

1 : 8 **by wt.**

Compounds are further classified into two categories :

- Organic Compound
- Inorganic Compound

(b) Mixture

A material which contain more than one type of substances and which is mixed any ratio by wt. i.e the components of a mixture have variable composition. The property of the mixture is the property of its components. The mixture can be seperated by simple physical method. Depending upon the composition mixtures are of two types :

(i) Homogeneous mixture

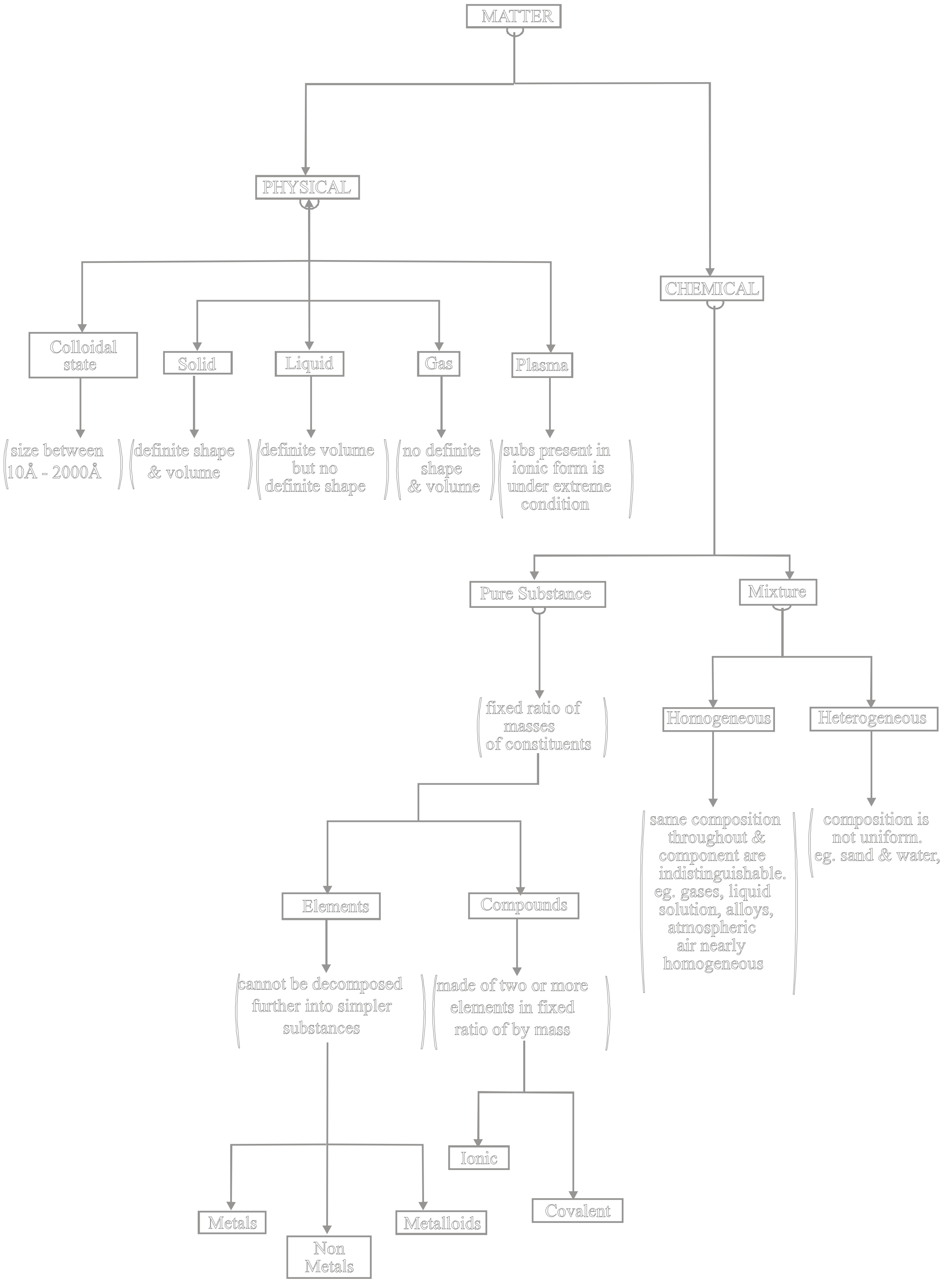
(ii) Hetrogeneous mixture

(i) Homogeneous Mixture

The mixture, in which all the components are present in **uniform** is called as homogeneous mixture.

Ex. Water + Salt, Water + Sugar, Water + alcohol, Air gasoline, brass etc.

Etoos Tips & Formulas



SOLVED EXAMPLE

Ex. 1 Show that in the reaction
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$, mass is conserved.

Sol. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

	N_2	H_2	NH_3
moles before reaction	1	3	0
moles after reaction	0	0	2

Mass before reaction = mass of 1 mole $N_2(g)$ + mass of 3 mole $H_2(g)$
= 14 x 2 + 3 x 2 = 34 g
mass after reaction = mass of 2 mole NH_3
= 2 x 17 = 34 g.

Ex. 2 Find the density of $CO_2(g)$ with respect to $N_2O(g)$.

Sol. $$\text{R.D.} = \frac{\text{M.wt.of } CO_2}{\text{M.wt.of } N_2O} = \frac{44}{44} = 1.$$

Ex. 3 Find the vapour density of N_2O_5

Sol. $$\text{V.D.} = \frac{\text{Mol. wt. of } N_2O_5}{2} = 54.$$

Ex. 4 Write a balance chemical equation for following reaction :

When ammonia (NH_3) decompose into nitrogen (N_2) gas & hydrogen (H_2) gas.

Sol. $NH_3 \rightarrow \frac{1}{2}N_2 + \frac{3}{2}H_2$ or $2NH_3 \rightarrow N_2 + 3H_2$.

Ex. 5 When 170 g NH_3 (M =17) decomposes how many grams of N_2 & H_2 is produced.

Sol. $NH_3 \rightarrow \frac{1}{2}N_2 + \frac{3}{2}H_2$

$$\frac{\text{moles of } NH_3}{1} = \frac{\text{moles of } N_2}{1/2} = \frac{\text{moles of } H_2}{3/2}.$$

So moles of $N_2 = \frac{1}{2} \times \frac{170}{17} = 5.$

So wt. of $N_2 = 5 \times 28 = 140$ g.

Similarly moles of $H_2 = \frac{3}{2} \times \frac{170}{17} = 15.$

So wt. of $H_2 = 15 \times 2 = 30$ g.

Ex. 6 When x gram of a certain metal brunt in 1.5 g oxygen to give 3.0 g of its oxide. 1.20 g of the same metal heated in a steam gave 2.40 g of its oxide. shows the these result illustrate the law of constant or definite proportion

Sol. Wt. of metal = 3.0 – 1.5 = 1.5 g

so wt. of metal : wt of oxygen = 1.5 : 1.5 = 1 : 1

similarly in second case ,

wt. of oxygen = 2.4 – 1.2 = 1.2 g

so wt. of metal : wt of oxygen = 1.2 : 1.2 = 1 : 1

so these results illustrate the law of constant proportion.

Ex. 7 Find out % of O & H in H_2O compound.

Sol. $$\% \text{ of O} = \frac{16}{18} \times 100 = 88.89\%$$

$$\% \text{ of H} = \frac{2}{18} \times 100 = 11.11\%$$

Ex. 8 Acetylene & butene have empirical formula CH & CH_2 respectively. The molecular mass of acetylene and butene are 26 & 56 respectively deduce their molecular formula.

Ans. C_2H_2 & C_4H_8

Sol. $$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

For Acetylene :

$$n = \frac{26}{13} = 2$$

∴ Molecular formula = C_2H_2

For Butene :

$$n = \frac{56}{14} = 4$$

∴ Molecular formula = C_4H_8.

Exercise # 1

SINGLE OBJECTIVE | NEET LEVEL

1. Which of the following pairs of substances illustrate the law of multiple proportions
(A) CO and CO_2 (B) H_2O and D_2O
(C) NaCl and NaBr (D) MgO and $Mg(OH)_2$

2. 1.0 g of an oxide of A contained 0.5 g of A. 4.0 g of another oxide of A contained 1.6 g of A. The data indicate the law of
(A) Reciprocal proportions
(B) Constant proportions
(C) Conservation of energy
(D) Multiple proportions

3. Among the following pairs of compounds, the one that illustrates the law of multiple proportions is
(A) NH_3 and NCl_3 (B) H_2S and SO_2
(C) CuO and Cu_2O (D) CS_2 and $FeSO_4$

4. The percentage of copper and oxygen in samples of CuO obtained by different methods were found to be the same. This illustrates the law of
(A) Constant proportions
(B) Conservation of mass
(C) Multiple proportions
(D) Reciprocal proportions

5. Two samples of lead oxide were separately reduced to metallic lead by heating in a current of hydrogen. The weight of lead from one oxide was half the weight of lead obtained from the other oxide. The data illustrates
(A) Law of reciprocal proportions
(B) Law of constant proportions
(C) Law of multiple proportions
(D) Law of equivalent proportions

6. Chemical equation is balanced according to the law of
(A) Multiple proportion
(B) Reciprocal proportion
(C) Conservation of mass
(D) Definite proportions

7. Avogadro number is
(A) Number of atoms in one gram of element
(B) Number of millilitres which one mole of a gaseous substances occupies at NTP
(C) Number of molecules present in one gram molecular mass of a substance
(D) All of these

8. Which property of an element is always a whole number
(A) Atomic weight (B) Equivalent weight
(C) Atomic number (D) Atomic volume

9. Which one of the following properties of an element is not variable
(A) Valency (B) Atomic weight
(C) Equivalent weight (D) All of these

10. The modern atomic weight scale is based on
(A) C^{12} (B) O^{16}
(C) H^1 (D) C^{13}

11. 1 amu is equal to
(A) $\frac{1}{12}$ of C – 12 (B) $\frac{1}{14}$ of O-16
(C) 1g of H_2 (D) 1.66×10^{-23} kg

12. Sulphur forms the chlorides S_2Cl_2 and SCl_2. The equivalent mass of sulphur in SCl_2 is
(A) 8 g/mole (B) 16 g/mole
(C) 64.8 g/mole (D) 32 g/mole

13. The sulphate of a metal M contains 9.87% of M. This sulphate is isomorphous with $ZnSO_4.7H_2O$. The atomic weight of M is
(A) 40.3 (B) 36.3
(C) 24.3 (D) 11.3

14. When 100 ml of 1 M NaOH solution and 10 ml of 10 N H_2SO_4 solution are mixed together, the resulting solution will be
(A) Alkaline (B) Acidic
(C) Strongly acidic (D) Neutral

15. In chemical scale, the relative mass of the isotopic mixture of oxygen atoms (O^{16}, O^{17}, O^{18}) is assumed to be equal to
(A) 16.002 (B) 16.00
(C) 17.00 (D) 11.00

16. For preparing 0.1 N solution of a compound from its impure sample of which the percentage purity is known, the weight of the substance required will be
(A) More than the theoretical weight
(B) Less than the theoretical weight
(C) Same as the theoretical weight
(D) None of these

17. 1 mol of CH_4 contains
(A) 6.02×10^{23} atoms of H
(B) 4 g atom of Hydrogen
(C) 1.81×10^{23} molecules of CH_4
(D) 3.0 g of carbon

Exercise # 2

SINGLE OBJECTIVE | AIIMS LEVEL

1. Calculate the amount of Ni needed in the Mond's process given below

$Ni + 4CO \longrightarrow Ni(CO)_4$

If CO used in this process is obtained through a process, in which 6 g of carbon is mixed with 44 g CO_2.

(A) 14.675 g (B) 29 g
(C) 58 g (D) 28 g

2. The mass of 70% H_2SO_4 required for neutralisation of 1 mol of NaOH.

(A) 49 gm (B) 98 gm
(C) 70 gm (D) 34.3 gm

3. In a certain operation 358 g of $TiCl_4$ is reacted with 96 g of Mg. Calculate % yield of Ti if 32 g of Ti is actually obtained [At. wt. Ti = 48, Mg = 24]

[Hint : $\frac{358}{190} = 1.88$]

(A) 35.38 % (B) 66.6 %
(C) 100 % (D) 60 %

4. 0.5 mole of H_2SO_4 is mixed with 0.2 mole of Ca $(OH)_2$. The maximum number of moles of $CaSO_4$ formed is

(A) 0.2 (B) 0.5
(C) 0.4 (D) 1.5

5. Equal weight of 'X' (At. wt. = 36) and 'Y' (At. wt. = 24) are reacted to form the compound X_2Y_3. Then :

(A) X is the limiting reagent
(B) Y is the limiting reagent
(C) No reactant is left over and mass of X_2Y_3 formed is double the mass of 'X' taken
(D) none of these

6. 25.4 g of iodine and 14.2g of chlorine are made to react completely to yield a mixture of ICl and ICl_3. Calculate the number of moles of ICl and ICl_3 formed.

(A) 0.1 mole, 0.1 mole (B) 0.1 mole, 0.2 mole
(C) 0.5 mole, 0.5 mole (D) 0.2 mole, 0.2 mole

7. What weights of P_4O_6 and P_4O_{10} will be produced by the combustion of 31g of P_4 in 32g of oxygen leaving no P_4 and O_2.

(A) 2.75g, 219.5g (B) 27.5g, 35.5g
(C) 55g, 71g (D) 17.5g, 190.5g

8. What weight of $CaCO_3$ must be decomposed to produce the sufficient quantity of carbon dioxide to convert 21.2 kg of Na_2CO_3 completely in to $NaHCO_3$. [Atomic mass Na = 23, Ca = 40]

$CaCO_3 \longrightarrow CaO + CO_2$

$Na_2CO_3 + CO_2 + H_2O \longrightarrow 2NaHCO_3$

(A) 100 Kg (B) 20 Kg
(C) 120 Kg (D) 30 Kg

9. NX is produced by the following step of reactions

$M + X_2 \longrightarrow MX_2$; $3MX_2 + X_2 \longrightarrow M_3X_8$; $M_3X_8 + N_2CO_3 \longrightarrow NX + CO_2 + M_3O_4$

How much M (metal) is consumed to produce 206 gm of NX. (Take at wt of M = 56, N=23, X = 80)

(A) 42 gm (B) 56 gm
(C) $\frac{14}{3}$ gm (D) $\frac{7}{4}$ gm

10. 0.05 mole of $LiAlH_4$ in ether solution was placed in a flask containing 74g (1 mole) of t-butyl alcohol. The product $LiAlHC_{12}H_{27}O_3$ weighed 12.7 g. If Li atoms are conserved, the percentage yield is :
(Li = 7, Al = 27, H = 1, C = 12, O = 16).

(A) 25% (B) 75%
(C) 100% (D) 15%

11. A sample of a mixture of $CaCl_2$ and NaCl weighing 4.44 gm was treated to precipitate all the Ca as $CaCO_3$, which was then heated and quantitatively converted to 1.12g of CaO. (At . wt. Ca = 40, Na = 23, Cl = 35.5)

(A) Mixture contains 25% NaCl
(B) Mixture contains 60% $CaCl_2$
(C) Mass of $CaCl_2$ is 2.22 g
(D) Mass of $CaCl_2$ 1.11 g

12. The oxidation states of Sulphur in the anions SO_3^{2-}, $S_2O_4^{2-}$ and $S_2O_6^{2-}$ follow the order :

(A) $S_2O_6^{2-} < S_2O_4^{2} < SO_3^{2-}$
(B) $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$
(C) $SO_3^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$
(D) $S_2O_4^{2} < S_2O_6^{2-} < SO_3^{2-}$

13. The oxidation number of Phosphorus in $Mg_2P_2O_7$ is :

(A) + 3 (B) + 2
(C) + 5 (D) – 3

Exercise # 3 | PART - 1 | MATRIX MATCH COLUMN

1.

Column I	Column II
(A) $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(s) + H_2(g)$ above reaction is carried out by taking 2 moles each of Zn and HCl	(p) 50% of excess reagent left
(B) $AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(g)$ above reaction is carried out by taking 170 g $AgNO_3$ and 18.25 g HCl (Ag = 108)	(q) 22.4 L of gas at STP is liberated
(C) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ 100 g $CaCO_3$ is decomposed]	(r) 1 moles of solid (product) obtained.
(D) $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$ 2/3 moles of $KClO_3$ decomposed	(s) HCl is the limiting reagent

2.

Column-I	Column-II
(A) 100 ml of 0.2 M $AlCl_3$ solution + 400 ml of 0.1 M HCl solution	(p) Total concentration of cation(s) = 0.12 M
(B) 50 ml of 0.4 M KCl + 50 ml H_2O	(q) $[SO_4^{2-}] = 0.06$ M
(C) 30 ml of 0.2 M K_2SO_4 + 70 ml H_2O	(r) $[SO_4^{2-}] = 2.5$ M
(D) 200 ml 24.5% (w/v) H_2SO_4	(s) $[Cl^-] = 0.2$ M

3.

Column-I	Column-II
(A) Molarity	(p) Dependent on temperature
(B) Molality	(q) $\frac{M_A \times n_A}{n_A M_A + n_B M_B}$ x 100
(C) Mole fraction	(r) Independent of temperature
(D) Mass %	(s) $\frac{X_A}{X_B M_B} \times 1000$

Where M_A , M_B are molar masses, n_A , n_B are no of moles & X_A , X_B are mole fractions of solute and solvent respectively.

4.

Column-I	Column-II
(A) Law of conservation of mass	(p) CH_4 has carbon and hydrogen in 3 : 1 mass ratio.
(B) Law of multiple proportion	(q) 10 mL N_2 combines with 30 mL of H_2 to form 20 mL of NH_3
(C) Law of definite proportion	(r) S and O_2 combine to form SO_2 and SO_3
(D) Law of reciprocal proportion	(s) In H_2S and SO_2 mass ratio of H and O w.r.t. sulphur is 1 : 16, hence in H_2O, mass ratio of H and O is 1 : 8.
(E) Gay Lussac's Law	(t) 4.2 g $MgCO_3$ gives 2.0 g residue on heating.

5.

Column-I	Column-II (mass of product)
(A) $2H_2 + O_2 \longrightarrow 2H_2O$ (1g, 1g)	(p) 1.028 g
(B) $3H_2 + N_2 \longrightarrow 2NH_3$ (1g, 1g)	(q) 1.333 g
(C) $H_2 + Cl_2 \longrightarrow 2HCl$ (1g, 1g)	(r) 1.125 g
(D) $2H_2 + C \longrightarrow CH_4$ (1g, 1g)	(s) 1.214 g

Exercise # 4 PART - 1 PREVIOUS YEAR (NEET/AIPMT)

1. Assuming fully decomposed, the volume of CO_2 released at STP on heating 9.85 g of $BaCO_3$ (at. mass of Ba = 137) will be **[CBSE AIPMT 2000]**
(A) 1.12 L (B) 0.84 L
(C) 2.24 L (D) 4.96 L

2. percentage of Se in peroxidase anhydrase enzyme is 0.5% by weight (at. weight = 78.4), then minimum molecular weight of peroxidase anhydrase enzyme is **[CBSE AIPMT 2001]**
(A) 1.568×10^3 (B) 15.68
(C) 2.168×10^4 (D) 1.568×10^4

3. Specific volume of cylindrical virus particle is 6.02 × 10–2 cc/g, whose radius and length are 7Å and 10Å respectively. If $N_A = 6.023 \times 10^{23}$, find molecular weight of virus. **[CBSE AIPMT 2001]**
(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

4. Which has maximum number of molecules ? **[CBSE AIPMT 2002]**
(A) 7 g N_2 (B) 2 g H_2
(C) 16 g NO_2 (D) 16 g O_2

5. In Haber process 30 L of dihydrogen and 30L of dinitrogen were taken for reaction which yielded only 50% of the expected product. What will be the composition of gaseous mixture under the aforesaid condition in the end ? **[CBSE AIPMT 2003]**
(A) 20 L ammonia, 10 L nitrogen, 30 L hydrogen
(B) 20 L ammonia, 25 L nitrogen, 15 L hydrogen
(C) 20 L ammonia, 20 L nitrogen, 20 L hydrogen
(D) 10 L ammonia, 25 L nitrogen, 15 L hydrogen

6. The maximum number of molecules are present in **[CBSE AIPMT 2004]**
(A) 15 L of H_2 gas at STP (B) 5 L of N_2 gas at STP
(C) 0.5 g of H_2 gas (D) 10 g of O_2 gas

7. The mass of carbon anode consumed (giving only carbon dioxide) in the production of 270 kg of aluminium metal from bausite by the Hall process is (at. mass of Al = 27) **[CBSE AIPMT 2005]**
(A) 180 kg (B) 270 kg
(C) 540 kg (D) 90 kg

8. The number of moles of $KMnO_4$ reduced by one mole of KI in alkaline medium is **[CBSE AIMPT 2005]**
(A) one fifth (B) five
(C) one (D) two

9. An element, X has the following isotopic composition :
^{200}X : 90%, ^{199}X : 8.0 %, ^{202}X : 2.0%
The weighted average atomic mass of the naturally occurring element X is closest to **[CBSE AIMPT 2007]**
(A) 201 u (B) 202 u
(C) 199 u (D) 200 u

10. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphite ion in acidic solution is **[CBSE AIPMT 2007]**
(A) 4/5 (B) 2/5
(C) 1 (D) 3/5

11. Number of moles of MnO_4^- required to oxidise one mole of ferrous oxalate completely in acidic medium will be **[CBSE AIPMT 2008]**
(A) 0.6 mole (B) 0.4 mole
(C) 7.5 moles (D) 0.2 mole

12. How many moles of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl? **[CBSE AIPMT 2008]**
(A) 0.044 (B) 0.333
(C) 0.011 (D) 0.029

13. What volume of oxygen gas (O_2) measured at 0°C and 1 atm, is needed to burn completely 1L of propane gas (C_3H_8) measured under the same conditions ? **[CBSE AIPMT 2008]**
(A) 7 L (B) 6 L
(C) 5 L (D) 10 L

14. Volume occupied by one molecule of water (density = 1 g cm^{-3}) is **[CBSE AIPMT 2008]**
(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

15. 10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be **[CBSE AIMPT 2009]**
(A) 2 moles (B) 3 moles
(C) 4 moles (D) 1 mol

16. The number of atoms in 0.1 mole of a triatomic gas is (NA = 6.023×10^{23} mol^{-1}) **[CBSE AIPMT 2010]**
(A) 6.026×10^{22} (B) 1.806×10^{23}
(C) 3.600×10^{23} (D) 1.800×10^{22}

MOCK TEST

1. The charge on 1 gram ions of Al^{3+} is : (N_A = Avogadro number, e = charge on one electron)

(A) $\frac{1}{27} N_A e$ coulomb (B) $\frac{1}{3} \times N_A e$ coulomb (C) $\frac{1}{9} \times N_A e$ coulomb (D) $3 \times N_A e$ coulomb

2. The weight of a molecule of the compound $C_{60}H_{22}$ is :
(A) 1.09×10^{-21} g (B) 1.24×10^{-21} g (C) 5.025×10^{-23} g (D) 16.023×10^{-23} g

3. 16 g of an ideal gas SO_x occupies 5.6 L. at STP. The value of x is
(A) x = 3 (B) x = 2 (C) x = 4 (D) none

4. Calculate the molecular formula of compound which contains 20% Ca and 80% Br (by wt.) if molecular weight of compound is 200. (Atomic wt. Ca = 40, Br = 80)
(A) $Ca_{1/2}Br$ (B) $CaBr_2$ (C) CaBr (D) Ca_2Br

5. A compound possess 8% sulphur by mass. The least molecular mass is :
(A) 200 (B) 400 (C) 155 (D) 355

6. Equal weight of 'X' (At. wt. = 36) and 'Y' (At. wt. = 24) are reacted to form the compound X_2Y_3. Then :
(A) X is the limiting reagent
(B) Y is the limiting reagent
(C) No reactant is left over and mass of X_2Y_3 formed is double the mass of 'X' taken
(D) none of these

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9. NX is produced by the following step of reactions

$M + X_2 \longrightarrow MX_2$; $3MX_2 + X_2 \longrightarrow M_3X_8$; $M_3X_8 + N_2CO_3 \longrightarrow NX + CO_2 + M_3O_4$
How much M (metal) is consumed to produce 206 gm of NX. (Take at wt of M = 56, N=23, X = 80)

(A) 42 gm (B) 56 gm (C) $\frac{14}{3}$ gm (D) $\frac{7}{4}$ gm

10. In $FeCr_2O_4$, the oxidation numbers of Fe and Cr are :
(A) + 2 and + 3 (B) 0 and + 2 (C) + 2 and + 6 (D) + 3 and + 6

11. The average oxidation state of Fe in Fe_3O_4 is :
(A) 2 and 3 (B) 8/3 (C) 2 (D) 3

12. A solution of $FeCl_3$ is $\frac{M}{30}$ its molarity for Cl^- ion will be :

(A) $\frac{M}{90}$ (B) $\frac{M}{30}$ (C) $\frac{M}{10}$ (D) $\frac{M}{5}$

13. The molarity of Cl^- in an aqueous solution which was (w/V) 2% NaCl, 4% $CaCl_2$ and 6% NH_4Cl will be
(A) 0.342 (B) 0.721 (C) 1.12 (D) 2.18

11th Class Modules Chapter Details

Physics
5
Modules

Chemistry
5
Modules

Mathematics
5
Modules

PHYSICS

Module-1

1. Physical World & Measurements
2. Basic Maths & Vector
3. Kinematics

Module-2

1. Law of Motion & Friction
2. Work, Energy & Power

Module-3

1. Motion of system of particles & Rigid Body
2. Gravitation

Module-4

1. Mechanical Properties of Matter
2. Thermal Properties of Matter

Module-5

1. Oscillations
2. Waves

CHEMISTRY

Module-1(PC)

1. Some Basic Conceps of Chemistry
2. Atomic Structure
3. Chemical Equilibrium
4. Ionic Equilibrium

Module-2(PC)

1. Thermodynamics & Thermochemistry
2. Redox Reaction
3. States Of Matter (Gaseous & Liquid)

Module-3(IC)

1. Periodic Table
2. Chemical Bonding
3. Hydrogen & Its Compounds
4. S-Block

Module-4(OC)

1. Nomenclature of Organic Compounds
2. Isomerism
3. General Organic Chemistry

Module-5(OC)

1. Reaction Mechanism
2. Hydrocarbon
3. Aromatic Hydrocarbon
4. Environmental Chemistry & Analysis Of Organic Compounds

BIOLOGY

Module-1

1. Diversity in the Living World
2. Plant Kingdom
3. Animal Kingdom

Module-2

1. Morphology in Flowering Plants
2. Anatomy of Flowering Plants
3. Structural Organization in Animals

Module-3

1. Cell: The Unit of Life
2. Biomolecules
3. Cell Cycle & Cell Division
4. Transport in Plants
5. Mineral Nutrition

Module-4

1. Photosynthesis in Higher Plants
2. Respiration in Plants
3. Plant Growth and Development
4. Digestion & Absorption
5. Breathing & Exchange of Gases

Module-5

1. Body Fluids & Its Circulation
2. Excretory Products & Their Elimination
3. Locomotion & Its Movement
4. Neural Control & Coordination
5. Chemical Coordination and Integration

12th Class Modules Chapter Details

Physics
5
Modules

Chemistry
5
Modules

Mathematics
5
Modules

PHYSICS

Module-1

1. Electrostatics
2. Capacitance

Module-2

1. Current Electricity
2. Magnetic Effect of Current and Magnetism

Module-3

1. Electromagnetic Induction
2. Alternating Current

Module-4

1. Geometrical Optics
2. Wave Optics

Module-5

1. Modern Physics
2. Nuclear Physics
3. Solids & Semiconductor Devices
4. Electromagnetic Waves

CHEMISTRY

Module-1(PC)

1. Solid State
2. Chemical Kinetics
3. Solutions and Colligative Properties

Module-2(PC)

1. Electrochemistry
2. Surface Chemistry

Module-3(IC)

1. P-Block Elements
2. Transition Elements (d & f block)
3. Co-ordination Compound
4. Metallurgy

Module-4(OC)

1. HaloAlkanes & HaloArenes
2. Alcohol, Phenol & Ether
3. Aldehyde, Ketone & Carboxylic Acid

Module-5(OC)

1. Nitrogen & Its Derivatives
2. Biomolecules & Polymers
3. Chemistry in Everyday Life

BIOLOGY

Module-1

1. Reproduction in Organisms
2. Sexual Reproduction in Flowering Plants
3. Human Reproduction
4. Reproductive Health

Module-2

1. Principles of Inheritance and Variation
2. Molecular Basis of Inheritance
3. Evolution

Module-3

1. Human Health and Disease
2. Strategies for Enhancement in Food Production
3. Microbes in Human Welfare

Module-4

1. Biotechnology: Principles and Processes
2. Biotechnology and Its Applications
3. Organisms and Populations

Module-5

1. Ecosystem
2. Biodiversity and Conservation
3. Environmental Issues