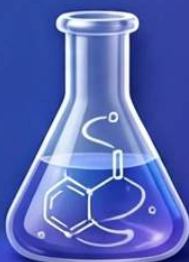
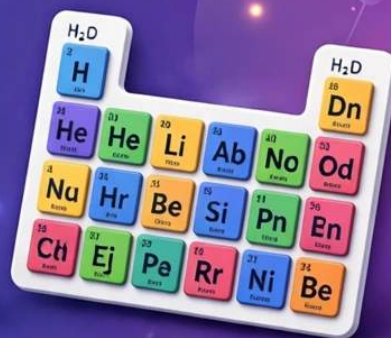
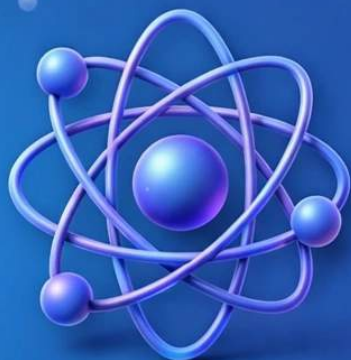


CLASS 11 CHEMISTRY

CHAPTER 1

Some Basic Concepts of Chemistry



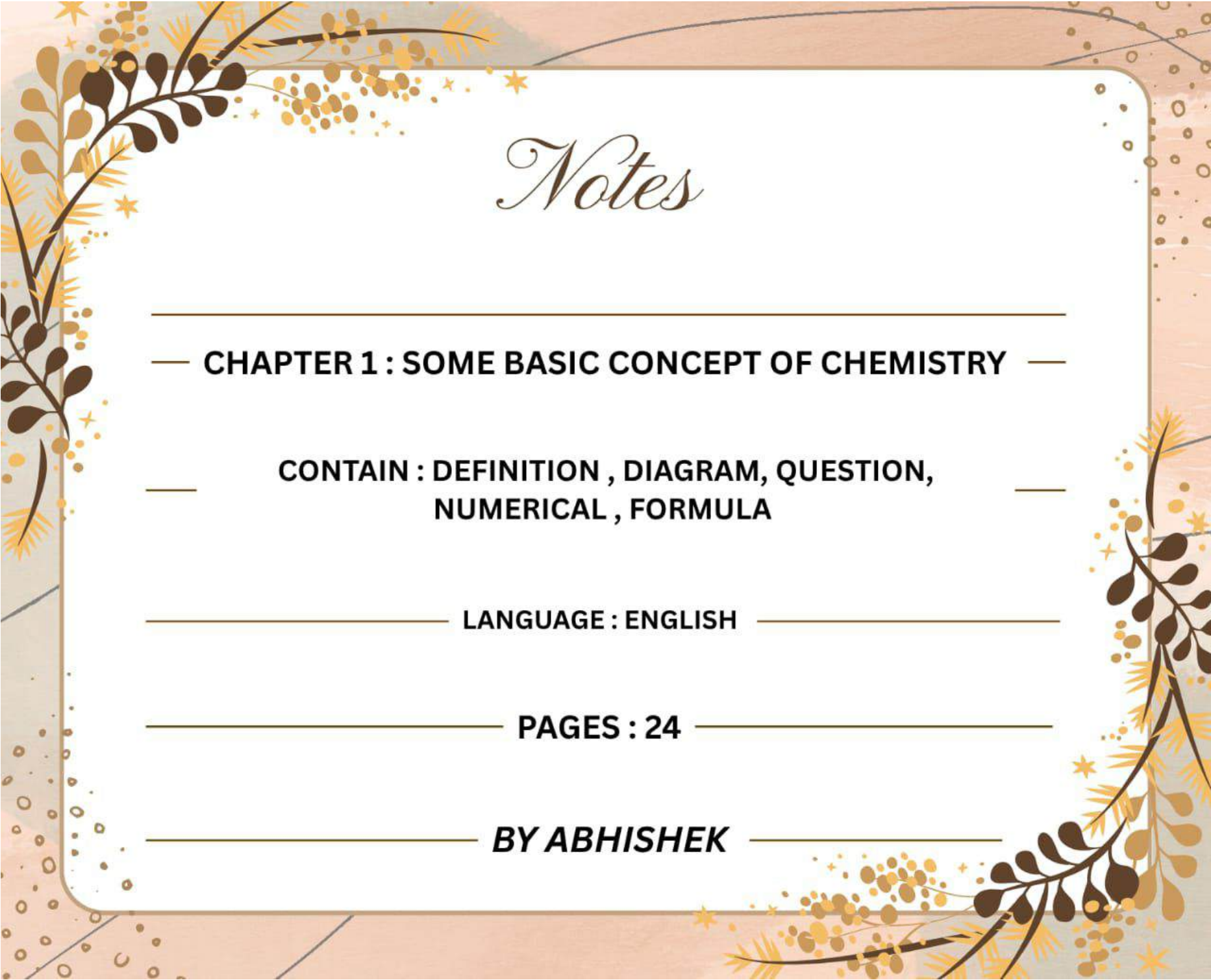
• Mole Concept

• Laws of Chemical Combination

• Stoichiometry Measurements

KEY CONCEPTS • NCERT SYLLABUS • STUDENT NOTES • EXAM READY





Notes

— **CHAPTER 1 : SOME BASIC CONCEPT OF CHEMISTRY** —

— **CONTAIN : DEFINITION , DIAGRAM, QUESTION,
NUMERICAL , FORMULA** —

— **LANGUAGE : ENGLISH** —

— **PAGES : 24** —

— **BY ABHISHEK** —

CHAPTER - 1

SOME BASIC CONCEPT OF CHEMISTRY

What is Chemistry?

⇒ Chemistry is the science of atom, molecules and their transformation.

• For eg - Charcoal $\xrightarrow[\text{or pressure } \uparrow]{\text{High (temperature) } \uparrow}$ Δ Diamond

Matter [on the basis of Physical properties]

⇒ Anything which has mass and occupies space is called Matter.

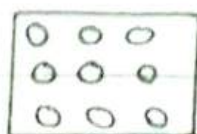
• For eg - Bottle, table.

Matter

1) Solid



2) Liquid



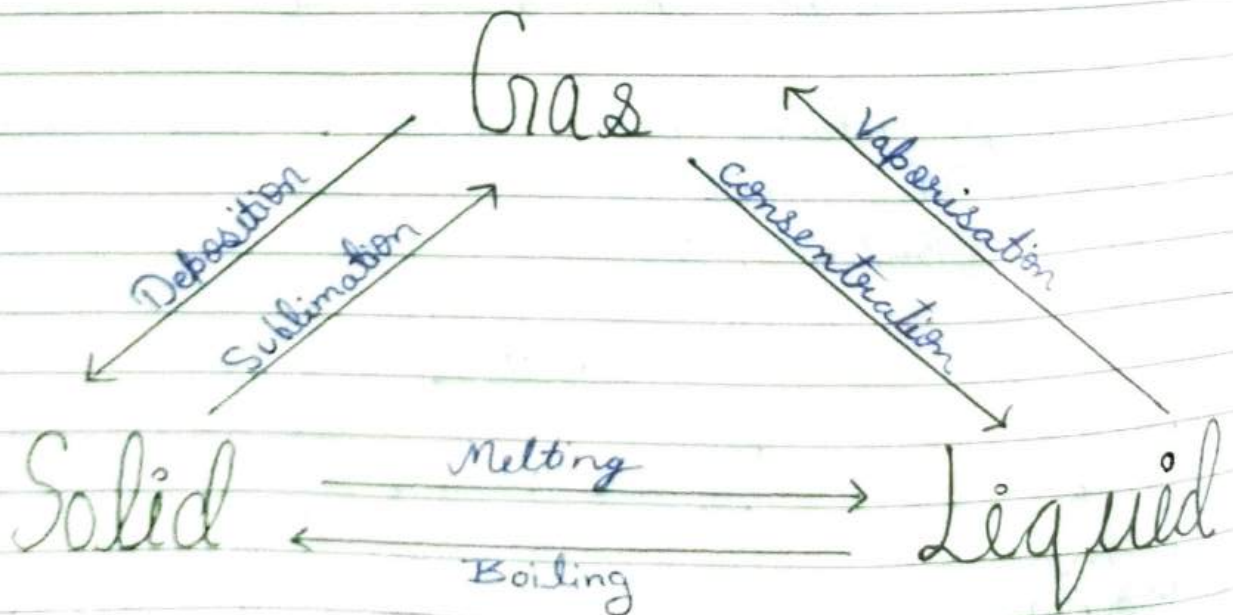
3) Gas

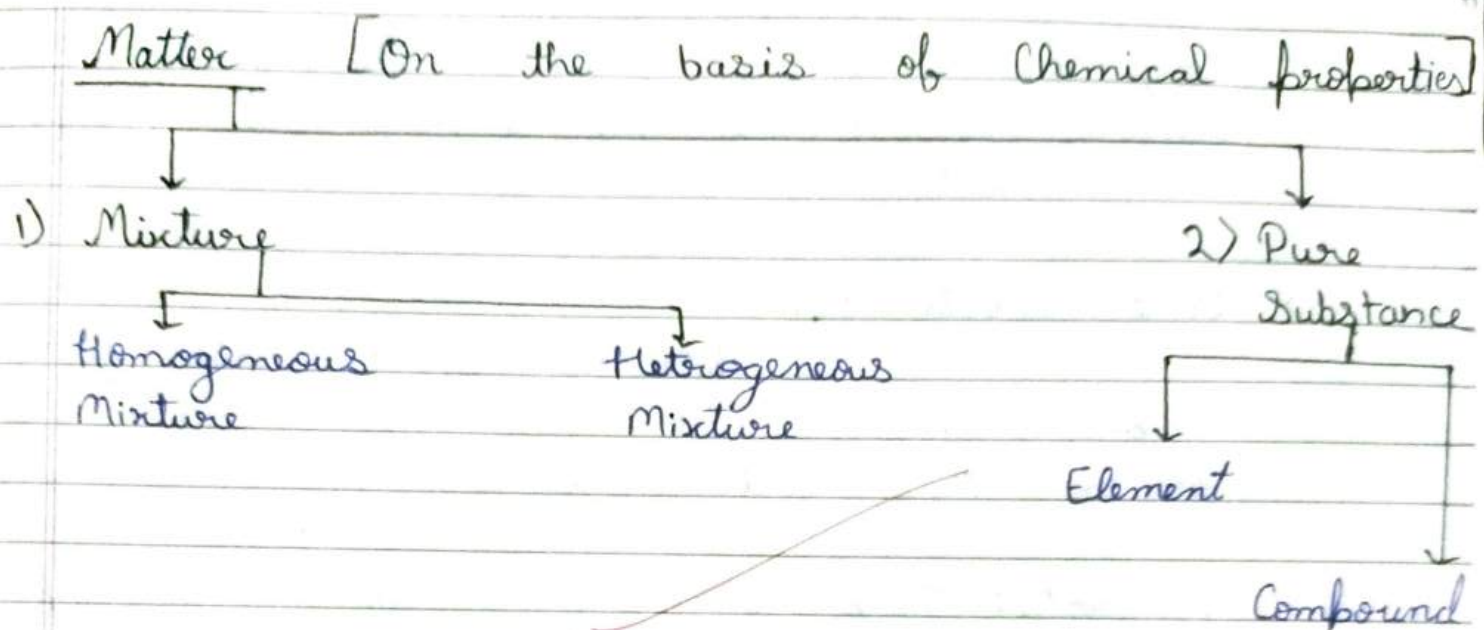


- | | | |
|--|--|---|
| <ul style="list-style-type: none"> Constituents particle are closely packed strong force of attraction. | <ul style="list-style-type: none"> The constituents particle are connect with moderate force of attraction. | <ul style="list-style-type: none"> Weak force of attraction. |
| <ul style="list-style-type: none"> fixed shape or volume. | <ul style="list-style-type: none"> Volume fixed but shape is not fixed. | <ul style="list-style-type: none"> Not fixed volume or shape |
| <ul style="list-style-type: none"> Solid have very high boiling and melting point. | <ul style="list-style-type: none"> Liquid have medium boiling and melting point | <ul style="list-style-type: none"> Gases have very low melting and boiling point |

eg - H_2 CO_2

→ All phases are interconvertible





◇ Mixture :-

Combination of two or more than one two chemical substance is known as mixture.

For eg:- Water + milk , water + salt etc.

① Homogeneous mixture :-

If the composition of compound is same throughout the mixture is known as homogeneous mixture.

Homogeneous mixture are uniformly mixed.
For eg - Water + Sugar.

② Heterogeneous mixture :-

If the composition of

components is not same throughout the mixture is known as heterogeneous mixture
for eg - Water + Sand

◇ Pure Substance :-

Pure substance has fixed composition.

- for eg - Pure gold.

① Element : Only one type of element present only one atom are called element.

- For eg. - H, N, O, etc.

② Compound : More than one atoms or elements together form compound.

- For eg :- $H_2 + \frac{1}{2} O_2 \rightarrow H_2O$

Solution :-

Homogeneous mixture of two or more than one component is called solution.

* Binary Solution :-

Only two component are present. One is solute another component is solvent.

- Solvent : Those component present in larger amount in a solution.
- Solute : Those component present in smaller amount in a solution.

Concentration terms :- Terms which are used to determine amount of solute and solvent are known as concentration terms.

(1) Mass by mass % ($w/w\%$) $\rightarrow$ The amount of compound in 100 gm of solution is known as mass percent.

$$1) \text{ Mass\% of solute} = \frac{\text{mass of solute}}{\text{total mass of solution}} \times 100$$

$$2) \text{ Mass\% of solvent} = \frac{\text{mass of solvent}}{\text{total mass of solution}} \times 100$$

Ques-1 28 g of ethyl alcohol is dissolved in 76 g of water. Calculate the mass percentage of each component.

Sol- Given $\rightarrow$ Ethyl Alcohol = 28g
Water (H_2O) = 76g

Mass

$$\text{Mass \% of ethyl alcohol} = \frac{\text{mass of solute}}{\text{total mass of solution}} \times 100$$

$$\Rightarrow \frac{28}{104} \times 100$$

$$\Rightarrow \frac{352}{13} \Rightarrow 26.9\%$$

$$\text{Mass \% of water} = \frac{76}{104} \times 100$$

$$= \frac{950}{13} \Rightarrow 73.07\%$$

Que. 2- 35 g of CHCl_3 dissolved in 85 g of benzene
Calculate the mass% of each component.

Sol. Given $\rightarrow \text{CHCl}_3$ (Solute) = 35g

Benzene (Solvent) = 85g

Mass of solution = 120g

$$\begin{aligned} \text{Mass \% of solute} &= \frac{\text{mass of solute}}{\text{total mass of solution}} \times 100 \\ &= \frac{35\text{g}}{120\text{g}} \times 100\% \end{aligned}$$

$$= \frac{175}{6} = 29.16\%$$

$$\text{Mass \% of solvent} = \frac{\text{mass of solvent}}{\text{total mass of solution}} \times 100$$

$$= \frac{85}{120} \times 100\% = \frac{425}{6} \Rightarrow 70.83\%$$

Ques-3 20g of NaCl in 100 ml of water ($d=1\text{g/ml}$)
Calculate the mass % of each component.

Sol. Mass of solute = 20g
Volume of solvent = 100 ml

$$\left[d = \frac{\text{mass}}{\text{volume}} \right] \quad d = \frac{1\text{g}}{\text{ml}}$$

$$g = d \times \text{ml}$$

$$\text{Mass of water} = 1\text{g} \times 100 = 100\text{g}$$

$$\begin{aligned} \text{Mass of solution} &= 20\text{g} + 100\text{g} \\ &= 120\text{g} \end{aligned}$$

$$\text{Mass \% of solute} = \frac{\text{mass of solute}}{\text{total mass of solution}} \times 100$$

$$= \frac{20}{120} \times 100\%$$

$$= \frac{50}{3} = 16.67\%$$

$$\text{Mass \% of solvent} = \frac{\text{mass of solvent}}{\text{mass of solution}} \times 100$$

$$= \frac{100}{120} \times 100$$

$$= \frac{200}{3} \Rightarrow 66.67\%$$

$$= \frac{100}{120} \times 100\%$$

$$= \frac{250}{3} = 83.3\%$$

Que - 4 20g of NaOH is dissolved in 40g of H₂O.
 Calculate the mass % of each component.

Sol - NaOH (Solute) = 20g
 H₂O (Solvent) = 40g
 Mass of solution = 20 + 40 = 60g

$$\begin{aligned} \text{Mass \% of solute} &= \frac{\text{mass of solute}}{\text{mass of solution}} \times 100 \\ &= \frac{20}{60} \times 100 \\ &= \frac{100}{3} = 33.3\% \end{aligned}$$

$$\begin{aligned} \text{Mass \% of solvent} &= \frac{\text{mass of solvent}}{\text{mass of solution}} \times 100 \\ &= \frac{40}{60} \times 100 \\ &= \frac{200}{3} = 66.67\% \end{aligned}$$

(2) Volume by Volume % (v/v %)

The amount of component in ml dissolve in 100 ml of solution is known as volume percentage.

$$1) \text{ Volume \% of solute} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$

$$2) \text{ Volume \% of solvent} = \frac{\text{Volume of solvent}}{\text{Volume of solution}} \times 100$$

Que-1 Calculate the Volume Percentage -

1) 46 ml of ethyl alcohol dissolve in 92 ml of water.

Sol- Given:- Ethyl alcohol = 46 ml
Water = 92 ml

$$\text{Volume \% of solution} = \frac{46 + 92}{138} = 138$$

$$\begin{aligned} \text{Volume \% of solute} &= \frac{\text{volume of solute}}{\text{Volume of solution}} \times 100 \\ &= \frac{46}{138} \times 100 \end{aligned}$$

$$= \frac{2300}{69} \Rightarrow 33.3\%$$

$$\text{Volume \% of solvent} = \frac{\text{volume of solvent}}{\text{volume of solution}} \times 100$$

$$= \frac{92}{138} \times 100 \Rightarrow \frac{4600}{69}$$

$$= 66.6\%$$

(2) 10 ml of ethanol is mixed with 50 ml of water.

Ans: Given $\rightarrow$ Ethanol = 10 ml
Water = 50 ml

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$$\text{Volume \% of solution} = 50 + 10 = 60 \text{ ml}$$

$$\begin{aligned} \text{Volume \% of solute} &= \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100 \\ &= \frac{10}{60} \times 100 \Rightarrow 16.6\% \end{aligned}$$

$$\begin{aligned} \text{Volume \% of solvent} &= \frac{\text{Volume of solvent}}{\text{Volume of solution}} \times 100 \\ &= \frac{50}{60} \times 100 = 83.3\% \end{aligned}$$

3) If 20ml of benzene, 40g methane
 $d = 4.5 \text{ g/ml}$
 Sol- $d = \frac{\text{mass}}{\text{volume}} \quad \left[d = \frac{m}{V} \right]$

$$V = \frac{m}{d}$$

$$V = \frac{400}{4.5} \Rightarrow V = 8.8 \text{ ml}$$

$$\text{Volume of solution} = 20 + 8.8 = 28.8 \text{ ml}$$

$$\begin{aligned} \text{Volume \% of solvent} &= \frac{\text{volume of solvent}}{\text{Volume of solution}} \times 100 \\ &= \frac{20}{28.8} \times 100 \\ &= \frac{625}{9} \\ &= 69.44 \end{aligned}$$

$$\begin{aligned}\text{Volume \% of solute} &= \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100 \\ &= \frac{8.80}{28.80} \times 100 \\ &= 30.55 \%\end{aligned}$$

* Atomic Mass :-

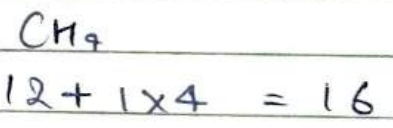
Individual mass of atoms

- Eg $\rightarrow$ $H=1$, $O=16$, $C=12$

* Molecular Mass :-

The sum of atomic mass

- Eg $\rightarrow$ H_2O
 $1 \times 2 + 16 = 18$



(3) Mole Fraction :- The ratio of number of moles of solute or solvent to the total no. of moles in solution is known as mole fraction.

i) Mole fraction of solute (X_B) = $\frac{\text{No. of moles of solute}}{\text{Mole of solution}}$

ii) Mole fraction of solvent = $\frac{\text{No. of mole of solvent}}{\text{mole of solution}}$

- $\left[\begin{matrix} \text{Mole} \\ (n) \end{matrix} = \frac{\text{Given mass (w)}}{\text{Molecular mass (m)}} \right]$

Que. 1- 64 g of oxygen dissolve in 90 g of H_2O
Find out the mole fraction of solute and solvent.

Sol - Given $\rightarrow$ Oxygen = 64g
Water = 90g

$$\text{Mole of solute} = \frac{\text{Given mass}}{\text{Molecular mass}}$$

$$= \frac{64}{32} \Rightarrow 2$$

$$\text{Mole of solvent} = \frac{\text{Given mass}}{\text{Molecular mass}}$$

$$= \frac{90}{18} \Rightarrow 5$$

$$\text{Total mole} = 5 + 2 = 7$$

$$\text{Mole fraction of Solute } (X_{O_2}) = \frac{\text{No. of mole of solute}}{\text{Mole of solution}}$$

$$= \frac{2}{7} = 0.28$$

$$\text{Mole of fraction of solvent } (X_{H_2O}) = \frac{\text{No. of mole of solvent}}{\text{mole of solution}}$$

$$= \frac{5}{7} = 0.71$$

Que-2 6g of ethyl alcohol dissolve in 40 g of water. Calculate the mole fraction of

each component?

Ans - Given - Ethyl alcohol = 6g
water = 40g

$$\text{Molecular mass of } C_2H_5OH = 12 \times 2 + 5 \times 16 + 1 = 46$$

$$\text{Molecular mass of } H_2O = 2 + 16 = 18$$

$$\text{Mole of } C_2H_5OH = \frac{\text{given mass}}{\text{molecular mass}} = \frac{6}{46}$$

$$= 0.13$$

$$\text{Mole of } H_2O = \frac{\text{given mass}}{\text{molecular mass}} = \frac{40}{18}$$

$$= 2.2$$

$$\text{Total mole} = 0.13 + 2.2$$

$$= 2.33$$

$$\text{Mole fraction of } C_2H_5OH = \frac{\text{No. of mole of solute}}{\text{mole of solution}}$$

$$= \frac{0.13}{2.33}$$

$$= 0.055$$

$$\text{Mole fraction of } H_2O = \frac{\text{No. of mole of solvent}}{\text{mole of solution}}$$

$$= \frac{2.2}{2.33} = 0.94$$

Ques 3 - Calculate the mole fraction of ethylene glycol ($C_2H_6O_2$) in a solution containing 20% (w/w) of ethylene glycol.

Sol - Given:- Ethylene glycol = $C_2H_6O_2$
 (w/w%) of $C_2H_6O_2$ = 20%

$$\text{Molecular mass} = 12 \times 2 + 6 + 16 \times 2$$

$$= 62$$

$$C_2H_6O_2 \Rightarrow 20\% \text{ (w/w)} = 20 \text{ gm}$$

$$H_2O \Rightarrow 80\% \text{ (w/w)} = 80 \text{ gm}$$

$$\text{Mole of } (C_2H_6O_2) = \frac{\text{Given mass}}{\text{molecular mass}}$$

$$= \frac{20}{62} = 0.3$$

$$\text{Mole of } (H_2O) = \frac{\text{Given mass}}{\text{molecular mass}}$$

$$= \frac{80}{18} \Rightarrow 4.44$$

$$\text{Mole fraction of solute} = \frac{\text{No. of mole of solute}}{\text{mole of solution}}$$

$$= \frac{0.3}{4.7} \Rightarrow 0.06$$

$$\text{Mole fraction of solvent} = \frac{\text{No. of mole of solvent}}{\text{mole of solution}}$$

$$= \frac{4.4}{4.7} \Rightarrow 0.92$$

4) Molarity :-

The no. of mole of solute present in 1 litre of solution is known as molarity.

It is denoted by capital M.

$$\bullet \text{ Molarity (M)} = \frac{\text{No. of mole of solute (n}_s\text{)}}{\text{Volume of soln in (L)}}$$

$$\left[\text{mole (n}_s\text{)} = \frac{\text{given mass (W}_s\text{)}}{\text{molecular mass}} \right]$$

$$\bullet \text{ Molarity (M)} = \frac{W_s}{M_s \times \text{Volume of a solution in L}}$$

$$\bullet \text{ Unit of molarity} = \text{mole / Litre (ML}^{-1}\text{)}$$

Ques-1 5g of NaOH dissolve in 250 ml of water (Solution). Calculate the molarity.

Sol- Given $\rightarrow$ NaOH = 5gm
H₂O = 250 ml

$$\text{Molecular mass (NaOH)} = 23 + 16 + 1 = 40$$

$$\text{Molecular mass (H}_2\text{O)} = 18$$

$$\text{Mole of NaOH} = \frac{\text{given mass}}{\text{molecular mass}}$$

$$= \frac{5}{40} = \frac{1}{8}$$

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$$\text{Molarity} = \frac{100}{8 \times 0.25} \rightarrow 0.5 \text{ mole / litre}$$

Ques - Calculate the molarity -
Solution containing 30 gm of $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ in 4.3 l of solution.

Sol - Given:- $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O} = 30 \text{ gm}$
Solution = 4.3 l

$$\begin{aligned} &\text{Molecular mass } \text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O} \\ &= 58.9 + 2 [14 + 16 \times 3] + 6 \times 18 \\ &= 58.9 + 2 \times 62 + 108 \\ &= 58.9 + 124 + 108 \\ &= 291 \end{aligned}$$

$$\begin{aligned} \text{Molarity} &= \frac{W_2}{M_2 \times \text{Volume of solution in (l)}} \\ &= \frac{30}{291 \times 4.3} \\ &= 0.49 \text{ mole/l} \end{aligned}$$

5) Molality :-

The no. of solute present in 1 kg of solvent is known as molality.

- It is denoted by small m

$$\bullet \text{ Molality} = \frac{\text{No. of mole of solute}}{\text{Mass of a solvent in Kg}}$$

• Unit of molality is mole / Kg.

$$\bullet \quad m = \frac{W_B}{M_B \times \text{mass of a solvent in Kg}}$$

Ques 1- Calculate the molality of 25 g of ethanoic acid (CH_3COOH) in 75 g of benzene.

sol- Given:- ethanoic acid = 25 g
 CH_3COOH

$$\text{Benzene} = \frac{75\text{g}}{1000} = 0.075 \text{ Kg}$$

Molecular mass CH_3COOH

$$= 12 + 3 + 12 + 16 + 16 + 1$$

$$= 27 + 32 + 1$$

$$= 60$$

$$\text{Molality} = \frac{W_B}{M_B \times \text{Volume of solution in (Kg)}}$$

$$= \frac{25}{60 \times 0.075}$$

$$= 0.312 \text{ mole/Kg}$$

Que - 2 5g of NaOH dissolve in solution find the molality of 23g of sodium dissolved in 2000g of water (sodium 23)

Sol- Given:- Sodium = 23g
water = 2000g = 2kg

$$\text{Mole of solute} = \frac{\text{given mass}}{\text{molecular mass}}$$

$$= \frac{23}{23} = 1$$

$$\text{Molality} = \frac{\text{No. of mole of solute}}{\text{mass of a solvent in kg}}$$

$$= \frac{1}{2} = 0.5 \text{ mole/kg}$$

The Law of chemical combination

There are five laws:-

- 1) Law of conservation of mass
- 2) Law of definite proportion
- 3) Law of multiple proportion
- 4) Gay Lussac's law of Gaseous Volume
- 5) Avogadro's law

1) Law of conservation of mass:-

According to this law mass (matter) can neither be created nor be destroyed in a chemical reaction.

2) Law of definite proportion:- This law states that a chemical compound always contain same element combined together in same proportion in same mass

Ex	Sea water	tap water	Rain water
	H_2O	H_2O	H_2O
	2:1	2:1	2:1
	2:16	2:16	2:16

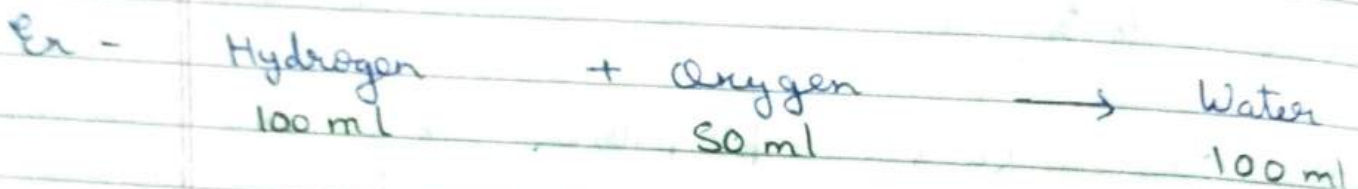
3) Law of multiple proportion:-

This law states that if two element can combine to form more than one compound. The mass of one element that combined with a fixed mass of the other element in the ratio of small whole number.

4) Gay Lussac's law of gaseous volume:-

When gaseous combined or are produce in a chemical reaction they do so in a

simple ratio by volume provided all gaseous are at the same temperature and pressure



5) Avogadro's law :- Equal volume of gas at the same temperature and pressure should contain equal no. of molecules

• $[6.022 \times 10^{23} \text{ atom/molecules}]$

Difference between mass and weight :-

Mass	Weight
• The amount of matter present in it	• Force exerted by gravity on an object.
• Mass of a substance is constant.	• Weight may be vary from one place to another place due to change in gravity
• SI unit is Kg.	• SI unit is Newton

10/5/26

Significant numbers :-

Rule 1 → All non-zero are significant.

Ex → 3498 - 4

321 - 3

2840 - 3

0.01 - 1

0.0314 - 3

Rule 2 → (0) zeros preceding to first non-zero digits are not significant.

Ex → 0.334 - 3

0.033 - 2

Rule 3 → Zero between two non-zero digits are significant.

Ex → 20002 - 5

0.202 - 3

2.203 - 4

Rule 4 → Zeros at the end or right of a number are significant, provided they are on the right side of the decimal point.

Ex → 0.200 → 3

234.000 → 3

Rule 5 → Indefinite significant numbers

263.60000000

= ∞

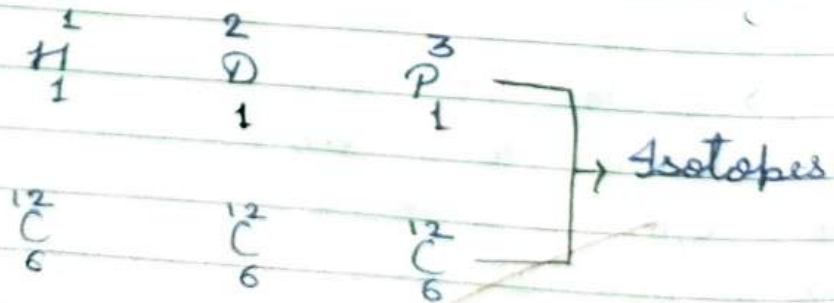
Dalton's atomic theory:-

- 1) Matter consists of individual atoms.
- 2) All the atoms of a given element have identical properties, including identical mass. ~~Atoms~~ Atoms of different elements differ in mass.
- 3) Compounds are formed when atoms of different element combine in a fixed ratio.
- 4) Chemical reaction involve reorganisation of atoms. They are neither created nor destroyed in a chemical reaction.

Modern atomic Theory:-

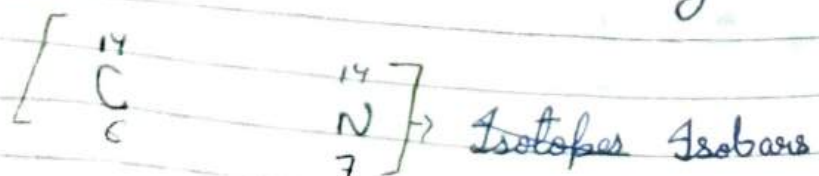
- * Atoms (matter) is no longer considered to be individual
- * Atoms of same elements may not be similar in the all respect.

Ex →



- * Atoms of different elements may be similar some concepts.

Ex →



- * Atoms is the smallest unit participating in chemical reaction.
- * Ratio in which atoms unit may be fixed integer value, but they are not simple always.
- * Atoms of one element can be changed into atoms of another elements.
Ex $\rightarrow$ Nuclear fusion.
- * Mass of atoms can be changed into energy
Ex $\rightarrow E = mc^2$

Molecular formula $\rightarrow$ Total number of atom of each element in a given molecule.

Example :-

Molecular formula of methane is CH_4 .
It is one molecule of methane. present 1 carbon atom attached with 4 hydrogen atom.

Empirical formula :-

It shows the simple whole no. ratio of various present in a compound.

Compound	Molecular formula	Empirical formula
Water	H_2O	H_2O
Hydrogen peroxide	H_2O_2	HO
Methane	CH_4	CH_4
Ethane	C_2H_6	CH_3
Benzene	C_6H_6	CH
Sugar	$C_{12}H_{22}O_{11}$	$C_{12}H_{22}O_{11}$
Nitrogen dioxide	N_2O_4	NO_2

Ques → In an organic compound carbon is present in 75% rest is hydrogen if its molecular mass is 16 amu. What will its empirical formula and molecular formula.

Ans → Given:- Carbon = 75%
Hydrogen = 25%

Element	%	Atomic mass	Relative mass	Simple formula
C	75	12	$\frac{75}{12} = 6.25$	$\frac{6.25}{6.25} = 1$
H	25	1	$\frac{25}{1} = 25$	$\frac{25}{6.25} = 4$

Empirical formula :- $C = 1$
 $H = 4$ $\left[C.H_4 \right] = CH_4$

$$n = \frac{\text{molecular mass}}{\text{empirical mass}} = \frac{16}{12+4} = \frac{16}{16} = 1$$

Molecular formula :- Empirical formula $\times n$

$$= CH_4 \times 1$$

$$= CH_4$$

Ques → A hydrocarbon 92.3 contain 92.3 % carbon its molecular mass 78 amu. What will be the explained empirical formula and molecular formula.

Ans → Given :- Hydrocarbon - 92.3

Element	%	Atomic mass	Relative mass	Simple formula
C	92.3	12+1	$\frac{92.3}{12} = 7.66$	$\frac{7.66}{0.641} = 11$
H	7.7	1	$\frac{7.7}{1} = 0.641$	$\frac{0.641}{0.641} = 1$

Empirical formula:- $\left. \begin{array}{l} CH = 1.1 \\ H = 1 \end{array} \right\} CH_2$

$$n = \frac{18}{13} = 6$$

molecular formula :- $CH_2 \times 6$
 $= C_6H_{12}$

Q. In an organic compound carbon present in 70% H is 20% and rest of the O and what will be empirical formula.

Ans

Element	%	Atomic mass	Relative mass	Simple formula
C	70	12	$\frac{70}{12} = 5.8$	$\frac{5.8}{0.62} = 9$
H	20	1	$\frac{20}{1} = 20$	$\frac{20}{0.62} = 32$
O	10	16	$\frac{10}{16} = 0.62$	$\frac{0.62}{0.62} = 1$

Empirical formula :- $\begin{array}{l} C = 9 \\ H = 32 \\ O = 1 \end{array}$

$= C_9H_{32}O$