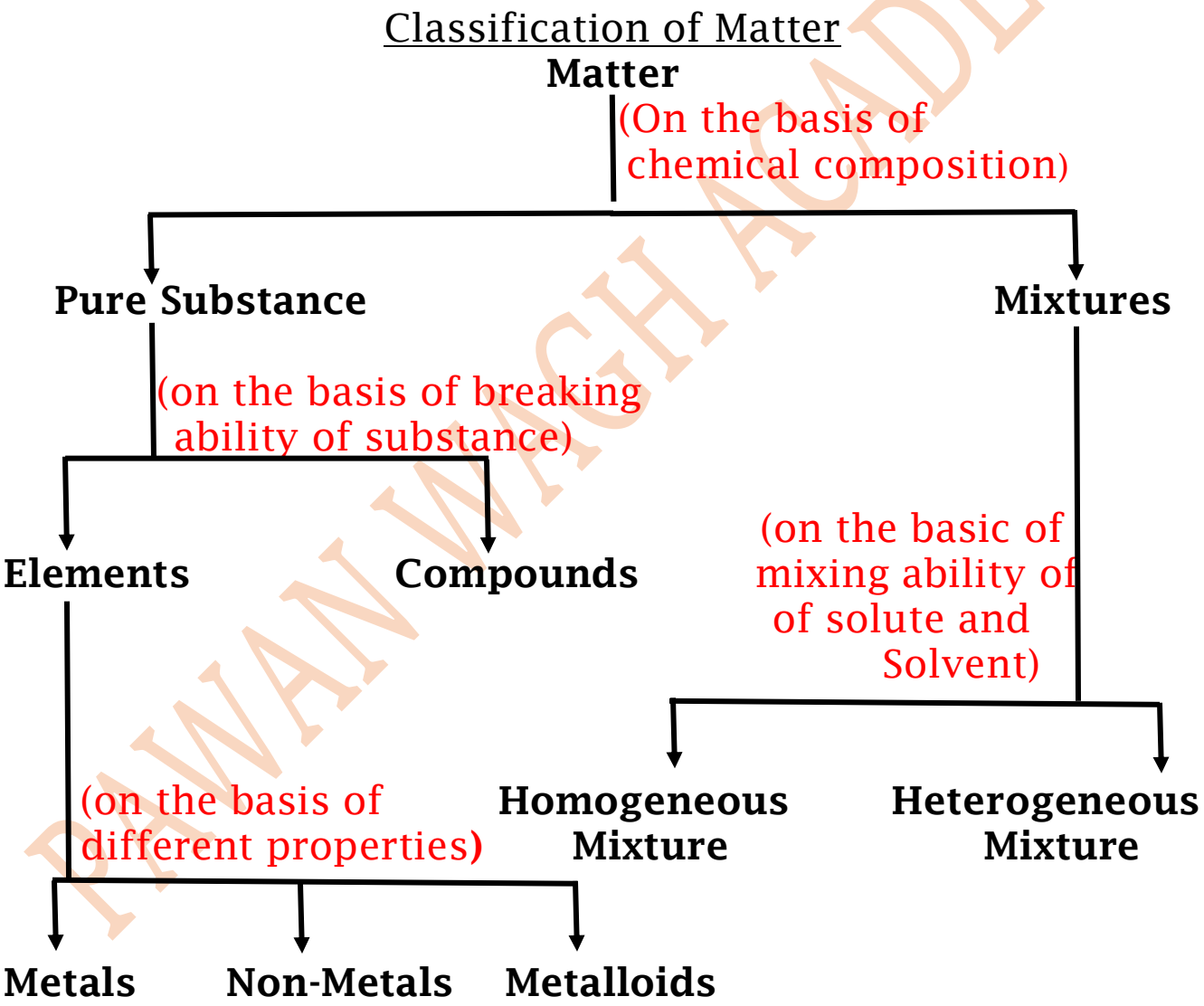
PAWAN WAGH ACADEMY

Notes-

Topic- Some Basic Concepts of Chemistry

- **Matter** – Any element or substance having mass and which occupies space is called as 'Matter'.



1. **Pure Substance** –
   The substance having definite (fixed) chemical composition is called as 'Pure Substance'.
   Ex – Pure Metal

2. **Mixture** –
   The substance having no definite (fixed) chemical compounds is called as 'Mixture'.
   Ex – Paint (mixture of oil and additive)

3. **Element** –
   The pure substance which cannot be broken down into simpler substance are called as 'Element'.
   Ex – Metals, Non-metals, Metalloids

4. **Compounds** –
   The pure substance which can be broken down into simpler substance are called as 'Compound'.
   Ex – Any chemical compound.

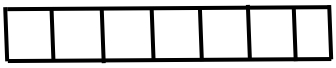
5. **Homogeneous Mixture** – (एक जैसा Mixture)
   The mixture in which the molecules of solute and solvent are uniformly mixed is called as 'Homogeneous mixture'.
   Ex – Soluble solid in a liquid.

6. **Heterogeneous Mixture** –
   The mixture in which the molecules of solute and solvent are not uniformly mixed is called as 'Heterogeneous mixture'.
   Ex – Insoluble solid in liquid

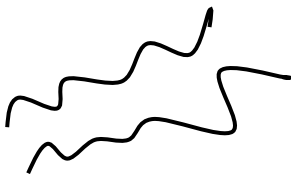
Properties of Metals, Non-Metals and Metalloids.

Properties	Metals	Non-Metals	Metalloids
Luster (shinning)	Have luster (shinning)	Do not have Luster (shinning)	They show Intermediate properties of both metals and non-metals
Conducting Property	Good conductor of heat and electricity	Poor conduct or of heat and electricity	Same as Above
Malleability	Metals are malleable, so they can be hammered into sheets	Non-Metals are not malleable	Same as Above
Ductility	Metals are ductile, so they can be drawn into wires	Non-metals are not ductile	Same as Above
Ex	Iron, Copper	Gases, Nitrogen, Oxygen	Silicon, Germanium

- Malleability –

Metals $\xrightarrow{Hammered}$ Sheet (thin) 

- Ductility -

Metals $\xrightarrow[Into]{Drawn}$ Wire (thin) 

Properties of Matter

Physical Properties
The properties which Can be measured without Changing chemical com-Position are called as 'Physical Properties'.

Ex – Melting Point, Boiling Point

Chemical Properties
The properties which can be measured by changing chemical composition or which involves changes in chemical composition are called as 'Chemical Properties'.

Ex – Coal $\xrightarrow{Burns}$ $CO_{2\,(g)}$ (Carbon dioxide Gas)

Measurement of Properties

Properties can be measured using various Units.

- **Units –**
  The arbitrarily decided and universally accepted standards are called 'Units'.

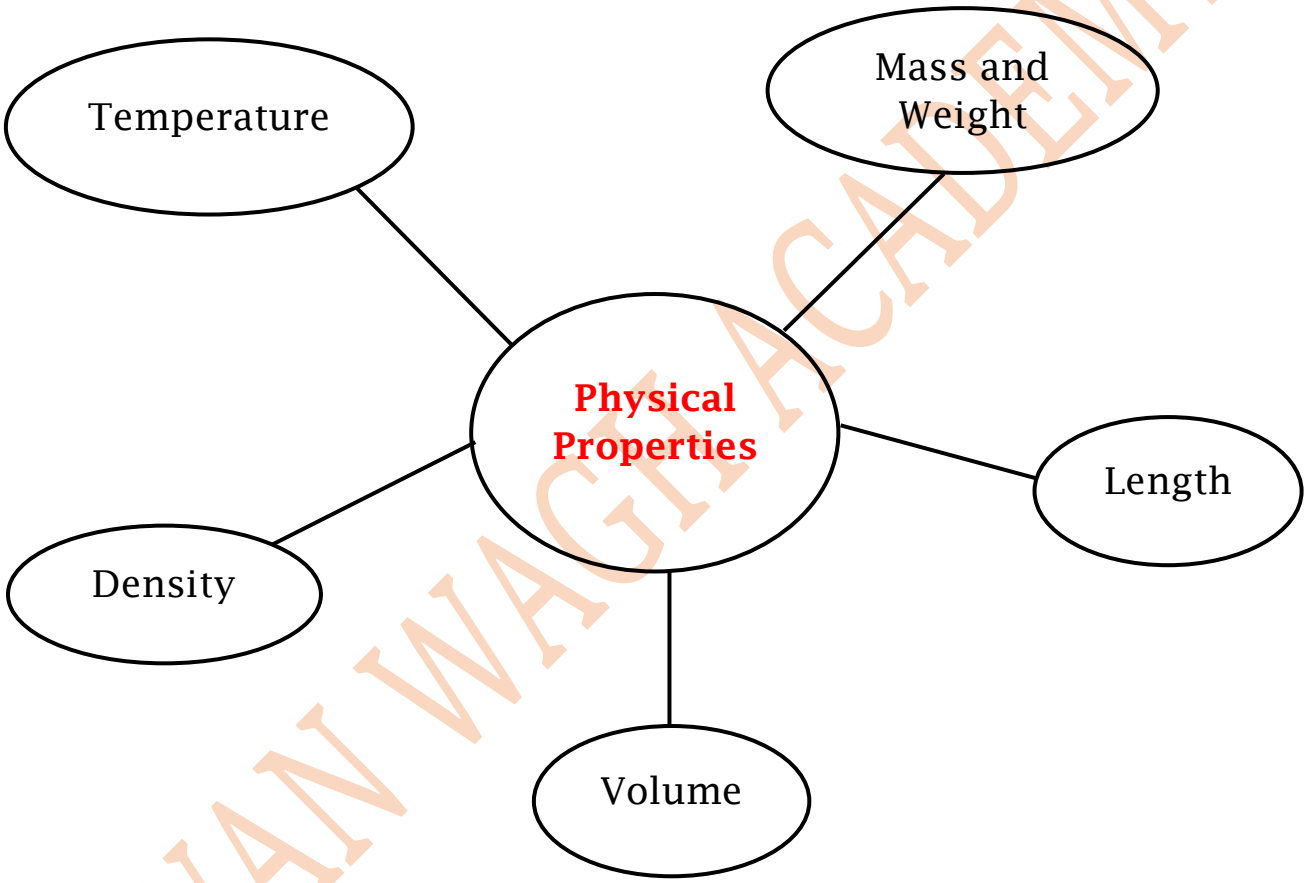
Unit can be expressed as

S.I Unit
(International system of Units)

C.G.S Unit
(Centimeter for length, mass,...)

- S.I unit for physical quantities

Length ⟶ Meter (m)
Mass ⟶ Kilogram (kg)
Time ⟶ Second
Current ⟶ Ampere
Temperature ⟶ Kelvin
Amount of substance ⟶ Mole



1. Mass and Weight –

Mass → The mass of body does not vary with changes in position. (places)

Weight → The Weight of the body vary with changes in the position.

 # So mass is more fundamental (major) property.

2. Length –

Length can be → Length → Atomic Radius
Length → Bond Length
Length → Wavelength of Radiation

3. Volume –

Amount of space occupies by any object.

Ex – एक ऊची, एक लंबी, एक चौडी पाणी की टंकी = 1 ml

1 x 1 x 1 = 1 ml

So, 1 cm^3 = 1 ml and

1 dm^3 = 1 litre

4. Density –

It is the ratio of mass per unit length volume.

$$\text{Density} = \frac{Mass}{Volume} \rightarrow \frac{kg}{m^3} \rightarrow \text{S.I Units}$$

5. Temperature –

It is measure of hotness or coldness of an object.

$$T(K) = T\,(^0c) + 273.15$$

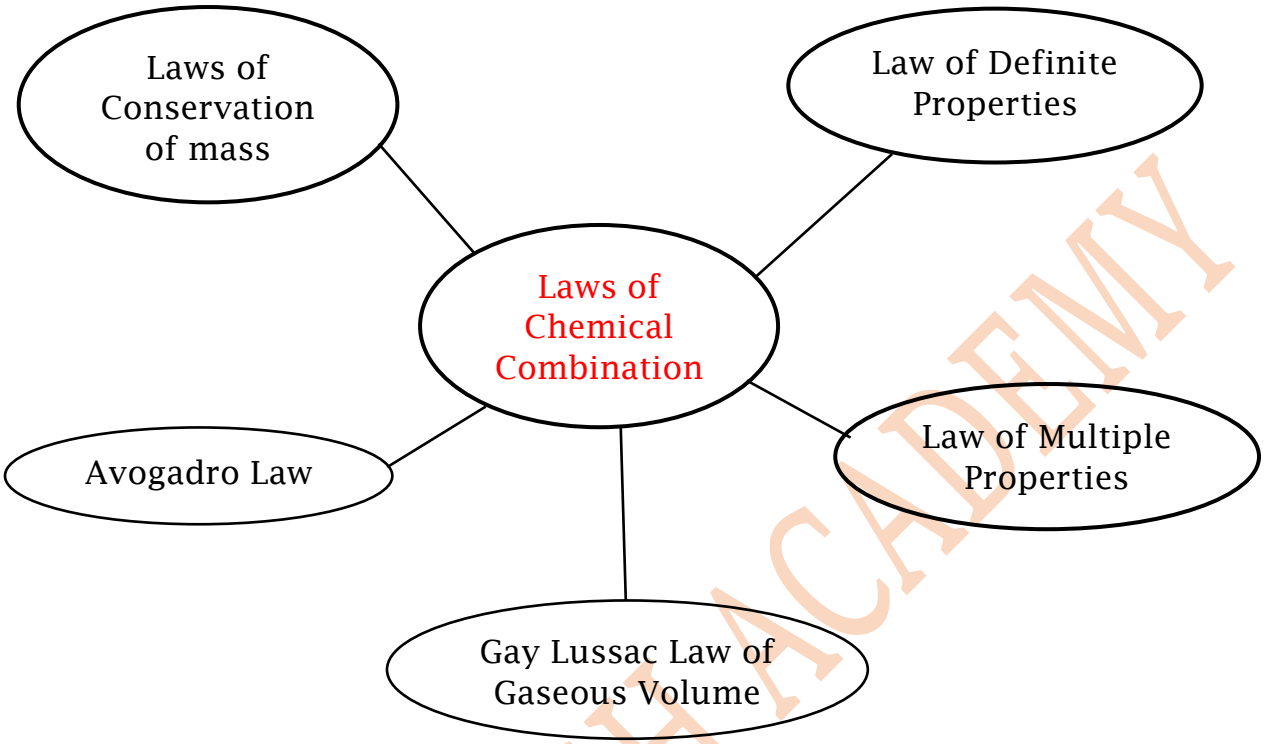
And $T(^0F) = \frac{9}{5}\,(T\,^0c) + 32$

∴ T^0c = Temperature in degree Celsius

∴ T(K) = Temperature in Kelvin

∴ T^0F = Temperature in degree Fahrenheit

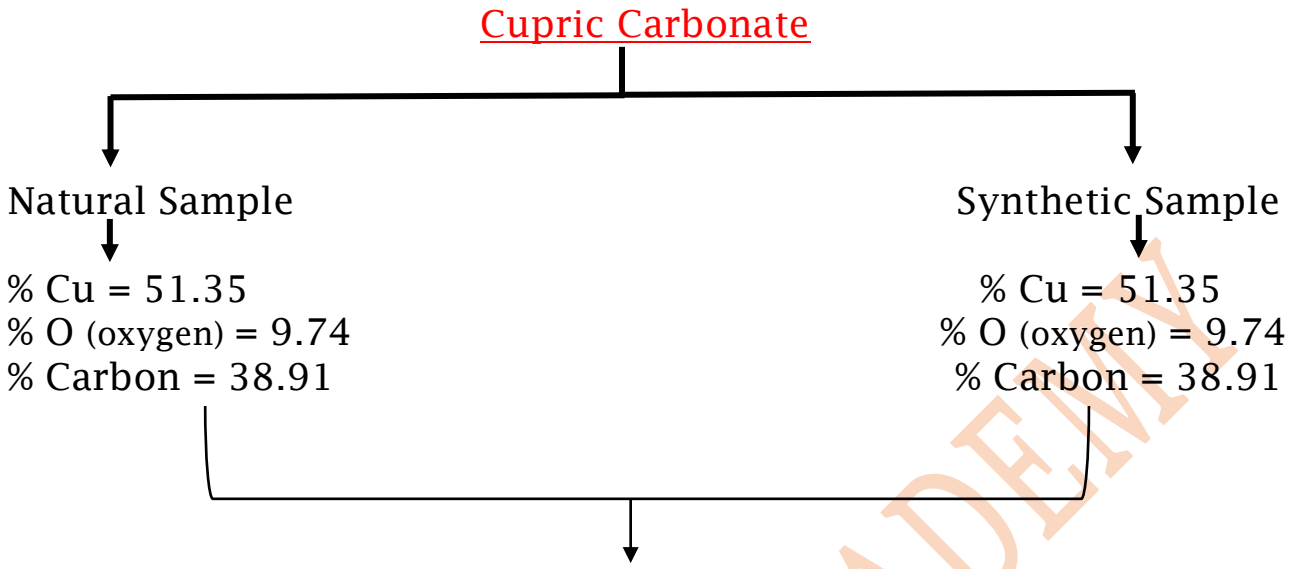
- **Laws**



1. **Law of Conservation of Mass** –
   Mass can be neither be created nor be destroyed.

   A ⟶ B
   (Reactant) (Product)
   Total mass of Reactant = Total mass of Product

2. **Law of Definite Proportions** –
   A given compound always contains exactly same (definite) proportion of element by weight.



3. Law of Multiple Properties –

When two element forms more than one product, then masses of element are in ratio of small whole number.

Ex –

1. Hydrogen + Oxygen → Water or H_2O
   2g 16g 18g

   Hydrogen + Oxygen → H_2O_2
   or or or
   H_2 O_2 Peroxide

2. 2g + 32g → 34g

   So, $\frac{Oxyegen\ mass\ 1^{st}\ Reaction}{Oxygen\ Mass\ in\ 2^{nd}\ Reaction} = \frac{16}{32} = \frac{1}{2}$

So, the ratio (1/2) obtained in small whole number.

4. Gay Lussac Law of Gaseous Volume –

When gases combines in a chemical reaction, they combine in a simple ratio by volume 'At same Temperature and Pressure'.

Ex – H_2 + O → H_2O

H_2	O	H_2O
100 ml	50 ml	100 ml
↓	↓	↓
2	1	2

Assume
If 50 = 1
So,
100 = 2

So, Ratio is (2:1:2)

5. Avogadro's Law –

Equal volume of all gases contains equal number of molecules.
'At same Temperature and Pressure'.

Number of volume ≅ Number of Molecules

Ex - H_2 + O ⟶ H_2O

100 ml 50 ml 100 ml

Volume - 2 : 1 : 2

Molecules – 2 : 1 : 2

Also same

❖ Daltons Atomic Theory

1) Matter consist of tiny, indivisible particle called as atom.
2) All atoms of a particular or specific element have identical (same) mass.
3) When atoms of different elements combine in a fixed ratio, they forms compounds.
4) Chemical reaction involved reorganization of atoms.

❖ Atomic Mass Unit (A.M.U)

1 amu = $\frac{1}{12}$ x Mass of c – 12

1 amu = 1.66×10^{-24} g

❖ Average Atomic Mass

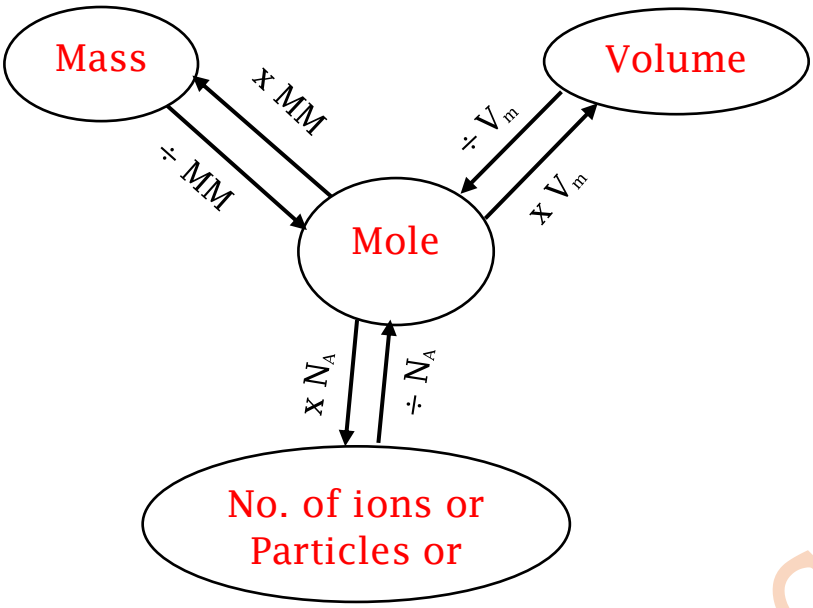
= Sum of % of all atomic masses

❖ Formula Mass

It is the sum of atomic masses of atoms.

❖ One Mole

1 mole = N_A = Avogadro's Number = 6.022×10^{23} Atoms of element



Where

→ V_m = Molar Volume = 22.4 $\frac{dm^3}{mol}$

→ N_A = Avogadro's Number = 6.022 x 10^{23} atom

→ MM = Molecular Mass

- 6 Formula that are derived from chart.

1) No of moles = $\frac{Mass}{Molecular\ Mass}$

2) Mass = No of Moles x Molecular mass

3) No of Moles = $\frac{Volume}{Molar\ Volume}$

4) Volume = No of moles x Molar Volume

5) No of moles = $\frac{No\ of\ ions}{N_A}$

6) No of ions = No of moles x N_A
= No of moles x 6.022 x 10^{23} atoms

Thank You !!!