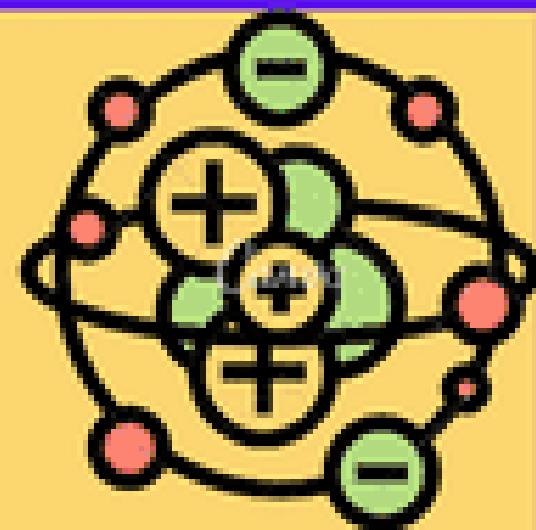
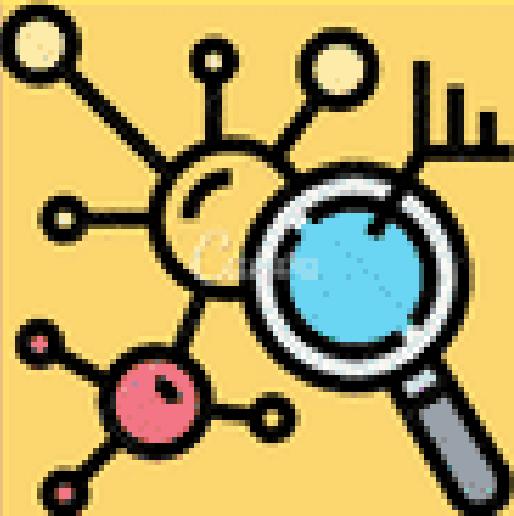
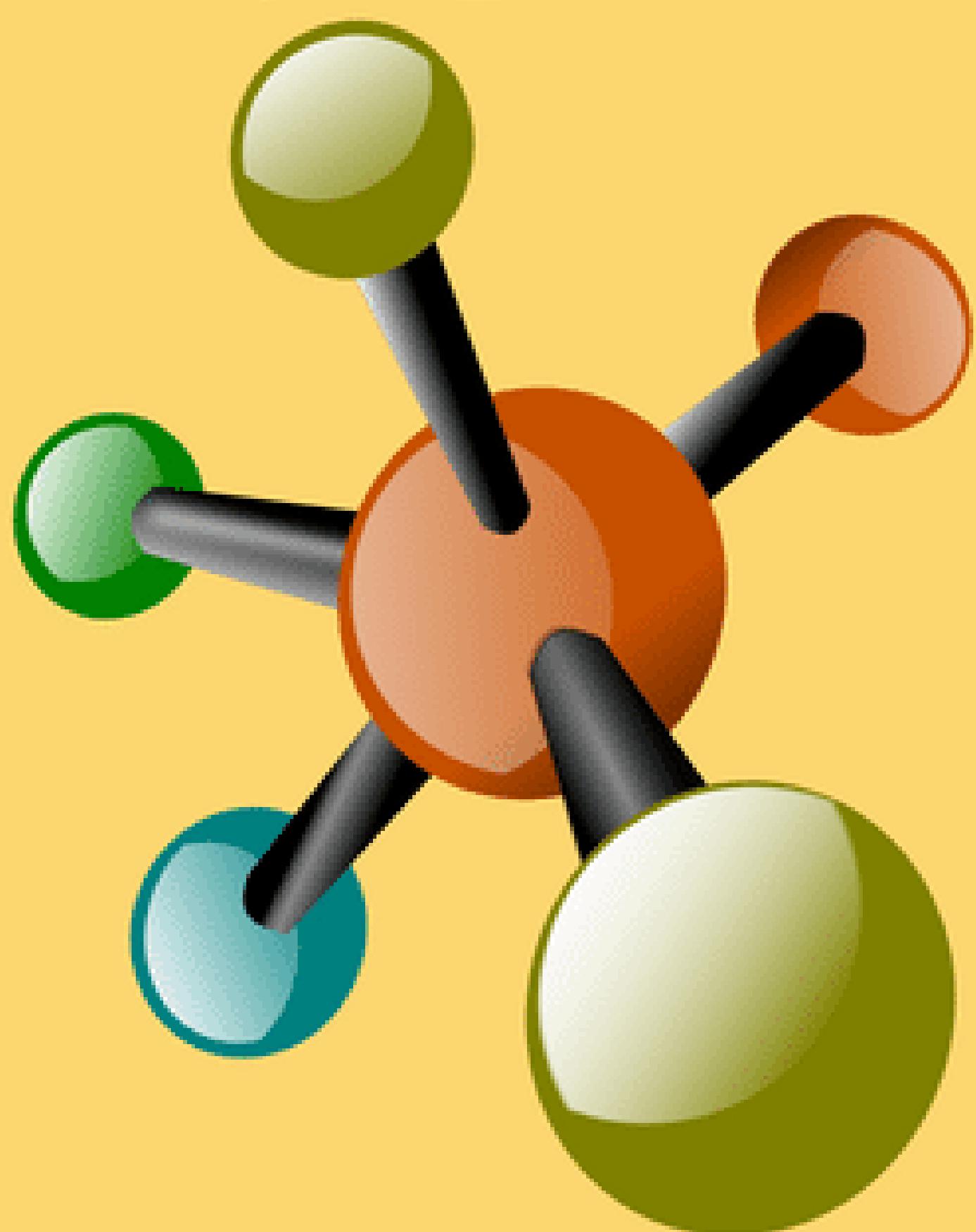


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CLASS 9 ATOMS



HANDWRITTEN NOTES

[Based on NCERT & Includes
CBSE PYQ]



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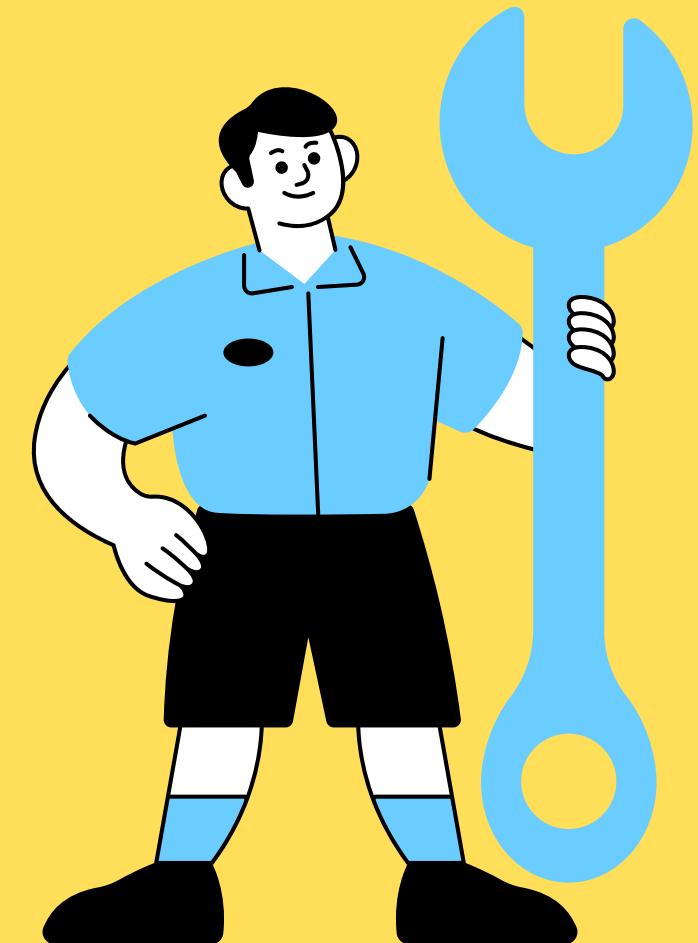
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 Iss baar 97% Phodna hai!

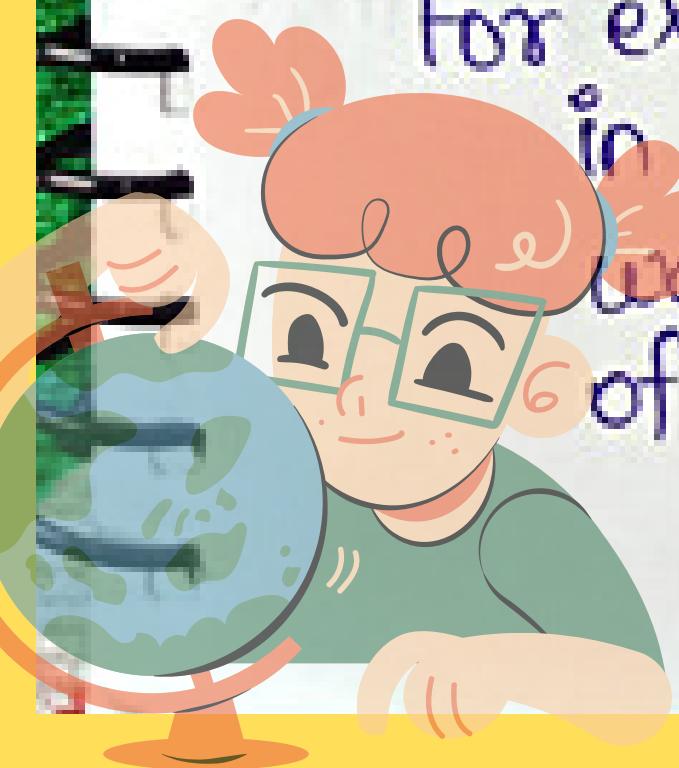
● Idea of divisibility :

- Maharishi Kanad - He postulated that if we keep on dividing the matter we will get smaller and smaller particles. Ultimately we will achieve the smallest particles (Parmanu) which may not divide further.
- Pakudha Katyayama - He postulated that there are various forms of matter because the particles of matter exist together in Combinations.
- Democritus and Leucippus - They suggested that when we keep on dividing the matter there comes a time when no more division of particles can take place. they called these particles atoms (meaning indivisible).

● Laws of chemical Combination :

- ① Law of Conservation of mass - Mass can neither be Created nor destroyed in a chemical reaction.
- ② Law of Constant Proportion - Elements are always Present in definite proportions by mass in a chemical substance.

For example : Hydrogen and oxygen are present in water in a ratio of 1:8. Thus, if 9g of water is decomposed, 1g of hydrogen and 8g of oxygen are always obtained.





Q1 Dalton Atomic Theory :

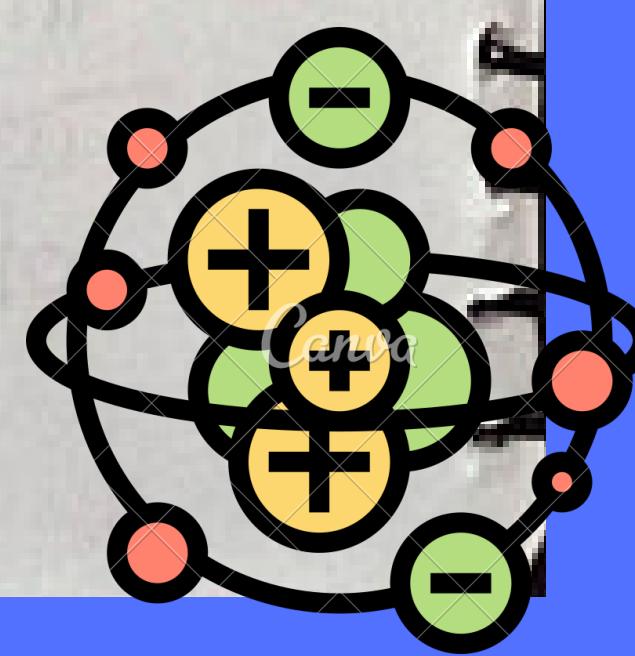
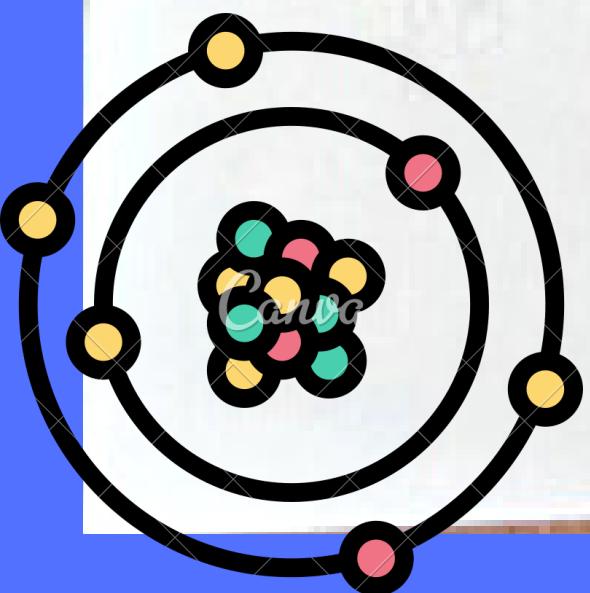
John Dalton ने यह theory propose की in which he said, all matter whether it is an element, a compound or a mixture consist of tiny invisible particles called 'atoms'.

Q2 Postulates of dalton atomic theory :

- (1.) The matter is made up of tiny particles called atoms that cannot be divided.
- (2.) Atoms are never formed or destroyed during a chemical reaction.
- (3.) Atoms of an element have same nature. They have same size, mass and character.
- (4.) Atoms of different elements exhibit variant nature . They do not have same characteristics.
- (5.) Atoms form compounds by combining in a ratio of whole numbers.
- (6.) A Compound Contains constant number and kinds of atoms .

Q3 What is an Atom ?

Atoms are the building blocks of matter. just like bricks are the building blocks of a building.



● What is the size of an atom?

Atoms are extremely small. More than millions of atoms when stacked would make a layer as thick as sheet of paper.

Atomic radius is measured in nanometres

$$\frac{1}{10^9} \text{ m} = 1 \text{ nm}$$

$$1 \text{ m} = 10^9 \text{ nm}$$

● Symbols for Atoms

Here are some examples of the symbols that are used to represent different atoms.

	Hydrogen		Carbon		Oxygen
	Phosphorus		Sulphur		Iron
	Copper		Lead		Silver
	Gold		Platina		Mercury

Fig. 3.3: Symbols for some elements as proposed by Dalton

The symbols for representing an atom are generated from the first two letters of the element's name.

The first letter is always in uppercase (capital) while the second letter is written in lowercase (small)

for example - hydrogen H

Aluminium, Al not AL

Cobalt, Co not CO



Now-a-days, IUPAC [International Union of Pure and Applied Chemistry] approves names of elements.

■ The Atomic Mass :

Dalton's Atomic theory suggested that each element has a distinguish atomic mass.

पर क्योंकि Atom का size बहुत small है तो उसकी mass calculate करना difficult है।

Therefore scientists started evaluating the mass of an atom by comparing it with mass of a standard atom.

- Earlier $\frac{1}{16}$ of mass of an oxygen atom was used as standard for calculating mass of other elements.

However in 1961 Carbon-12 is considered a standard atom for calculating the mass.

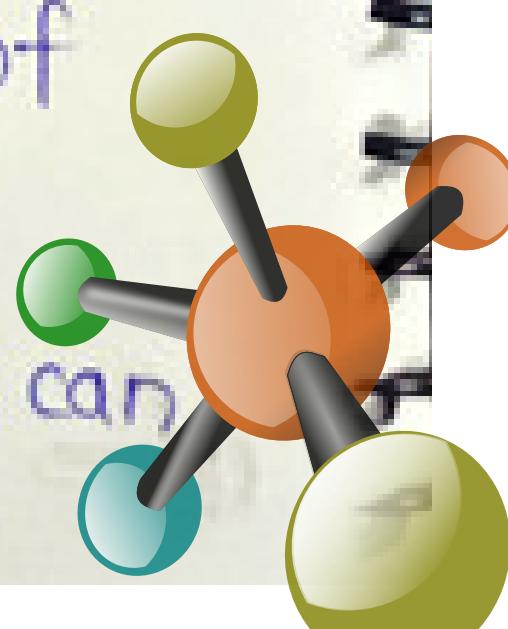
“ One atomic mass unit is the mass of $\frac{1}{12}$ the mass of a Carbon-12 atom.”

● How do Atoms exist?

Atoms cannot survive independently. So, atoms join together and form molecules or ions.

■ What is a Molecule ?

- A Molecule is a collection of various atoms that combine chemically with each other.
- Atoms are bound together by certain force of attraction.
- Atoms of same elements or different elements can bind together to form molecules.



- Therefore, a molecule is the smallest particle of a substance that can exist independently and shows all the property of that substance.

● Molecules of Elements :

The molecules of an element are formed by combinations of similar types of atoms. जैसे Helium (He) is made up one atom while oxygen is made up of two atoms.

- Atomicity - The number of atoms in a molecule of an element is called its atomicity. जैसे Helium is monoatomic क्योंकि दो एक atom की molecule, oxygen is diatomic because of two atoms.

● Molecules of Compounds &

Molecules of compounds constitute atoms of different elements that combine together in a fixed proportion. for example -

Water made Up of 2 hydrogen and 1 oxygen

■ What is an ION ?

- Compounds contains metals and non metals. These elements include charged species which are known as ions.
- Ion is a particle that has positive or negative charge.

Anion - negatively charged Cation - Positively charged



- When a group of atoms carries a charge in a compound it is called **Polyatomic ion**.

Ion बनते कैसे हैं? → will study in chapter 4.

■ Chemical Formula :

The chemical formula of a compound is a symbolic representation of its composition.

To write a chemical formula, we must know two things-

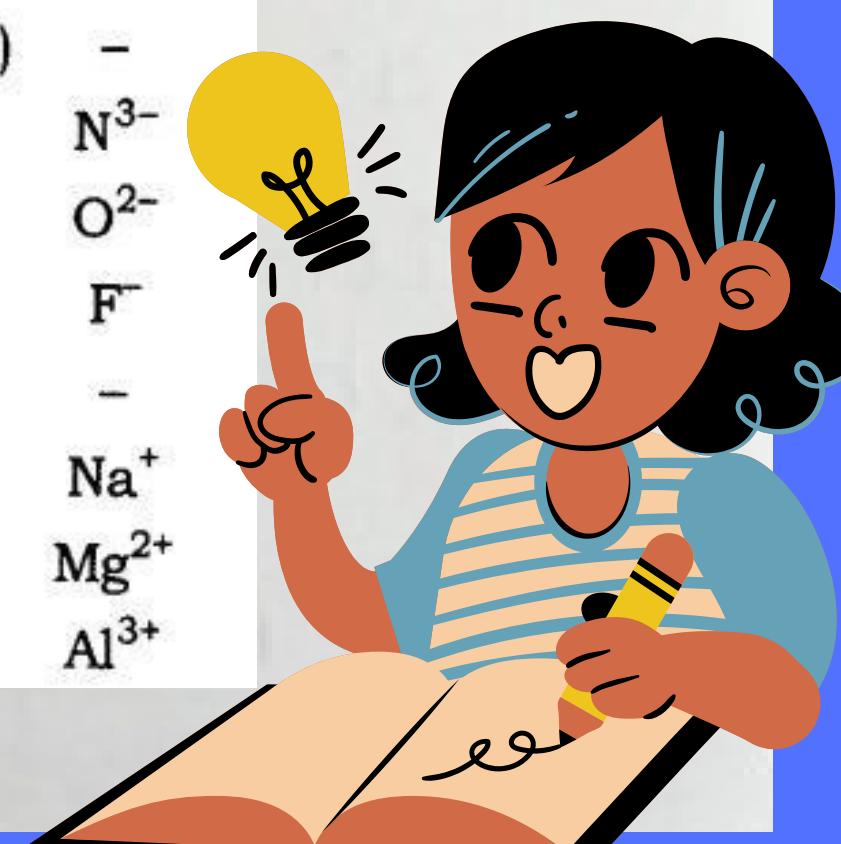
- ① Symbols of elements (ये तो हम जानते हैं)
- ② Valency

- Valency :** It is known as the combining capacity of an element. In simple words how atoms of one element will mix with atoms of another element.

For example - Hydrogen ion is represented as H^+ which means its valency is 1.

Similarly oxygen ion is represented as O^{2-} which means इसकी Valency 2 है।

Name of the Element	Symbol	Valency	Ion.
Hydrogen	H	1	H^+
Helium	He	0	-
Lithium	Li	1	Li^+
Beryllium	Be	2	Be^{2+}
Boron	B	3	B^{3+}
Carbon	C	4 (Shares electrons)	-
Nitrogen	N	3	N^{3-}
Oxygen	O	2	O^{2-}
Fluorine	F	1	F^-
Neon	Ne	0	-
Sodium	Na	1	Na^+
Magnesium	Mg	2	Mg^{2+}
Aluminium	Al	3	Al^{3+}



■ Rules of writing a chemical Formula :

- Valencies of all the ions must balance.
 - अमर ऐसी compound में Metal and non metal होने पर्याप्त हैं, तो name of metal is always written first in the chemical formula.
- For example - Sodium chloride is written as NaCl.
होता है कि Sodium एक metal है, & chlorine non metal.
- In case of Polyatomic ions, the ion is written in brackets before writing the number of ions associated to it. अगर Single ion है, then there is no need of brackets.

Example- NaOH

■ Formula of Simple Compounds :

- Step-① Write the symbols of corresponding elements of the compounds as explained above.
- Step-② Write the valencies of the elements of compound.
- Step-③ Crossover the valencies of elements.

For example Formula of Sodium Oxide

Symbol → Na O
charge → +1 -2

Formula → Na_2O

For valency
visit page - 6

We know valency of Sodium (Na) is +1
and Oxygen (O) is -2, जैसे ही नीचे की
valency को cross-multiply कर दिया।





(i) Formula of Sodium Oxide	Symbol → Na O Charge → +1 -2 Formula → Na_2O	(ii) Formula of aluminium chloride Symbol → Al Cl Charge → +3 -1 Formula → AlCl_3
(iii) Formula of Sodium Sulfide	Symbol → Na S Charge → +1 -2 Formula → Na_2S	(iv) Formula of magnesium hydroxide Symbol → Mg OH Charge → +2 1 Formula → $\text{Mg}(\text{OH})_2$

(8)

Molecular Mass

The sum of the atomic masses of all the atoms in a molecule of the substance.

Molecular mass is expressed in atomic mass unit (amu)

Iupac changes amu to u.

unified mass (u)

For example : molecular mass of HNO_3 can be calculated as :

Atomic mass of H = 1u

Atomic mass of N = 14u

Atomic mass of O = 16u

For atomic mass visit page -④

Now, molecular mass of HNO_3 = $1 + 14 + 16 \times 3 = 63\text{u}$

Formula Unit Mass :

The Sum of atomic masses of all atoms in a formula unit of a compound is called formula unit mass.

ये same molecular mass जैसे ही calculate करते हैं !

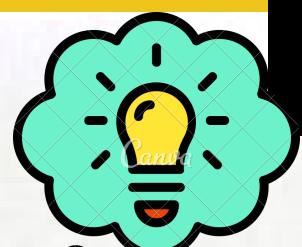
Example : Formula unit mass of Na_2O

$$= 2 \times \text{atomic mass of Na} + 1 \times \text{atomic mass of O}$$

$$= 2 \times 23\text{u} + 1 \times 16\text{u} = 62\text{u}$$



Mole Concept



- **Mole** - Mole is a quantity that has a mass equal to the atomic or molecular mass of species.
- The word "mole" was introduced in 1896 by Wilhelm Ostwald.

1 mole of any substance = 6.022×10^{23} particles

This is called Avogadro number or Avogadro Constant which is represented as N_A .

Mole basically एक quantity है, जिसकी fixed value 6.022×10^{23} है।

The mass of 1 mole of a substance is the same as that its atomic mass or molecular mass in grams.

- **Gram atomic mass** - The atomic mass of a substance when expressed in grams is called gram atomic mass.
- **Gram molecular mass** - The molecular mass of a substance when expressed in grams is known as gram molecular mass.

For example if atomic mass of Sulphur is 32 u

then Gram atomic mass of sulphur is 32 g

Simply, atomic mass की gram में लिख दो!

■ Important Formulae :

(i) Number of moles (n) = $\frac{\text{Given mass}}{\text{Molar mass}} = \frac{m}{M}$

(ii) Number of moles (n) = $\frac{\text{Given number of Particles}}{\text{Avogadro's number}} = \frac{N}{N_A}$

(iii) $\frac{m}{M} = \frac{N}{N_A} \Rightarrow m = \frac{M \times N}{N_A}$

पितने जी Question Exam में आएगी इन 3 formulae से ही Solve होंगी !

**Now Practice Previous
Year Questions!**