

16.07.20

CHAPTER-03

ATOMS AND MOLECULES

CLASS-IX

SUB-SCIENCE

❖ **Kanad was one of the first person to propose that matter is made up of very small particles called “parmanu”**

❖ John Daltons called these particles by the name of atom.

❖ The word atoms means indivisible.

❖ The combined form of atom is now called molecules.

❖ All the matter is made up of small particles called atoms and molecules.

Laws of chemical combinations

1. Law of conservation of mass

2. Law of constant proportion

3. Law of multiple proportion

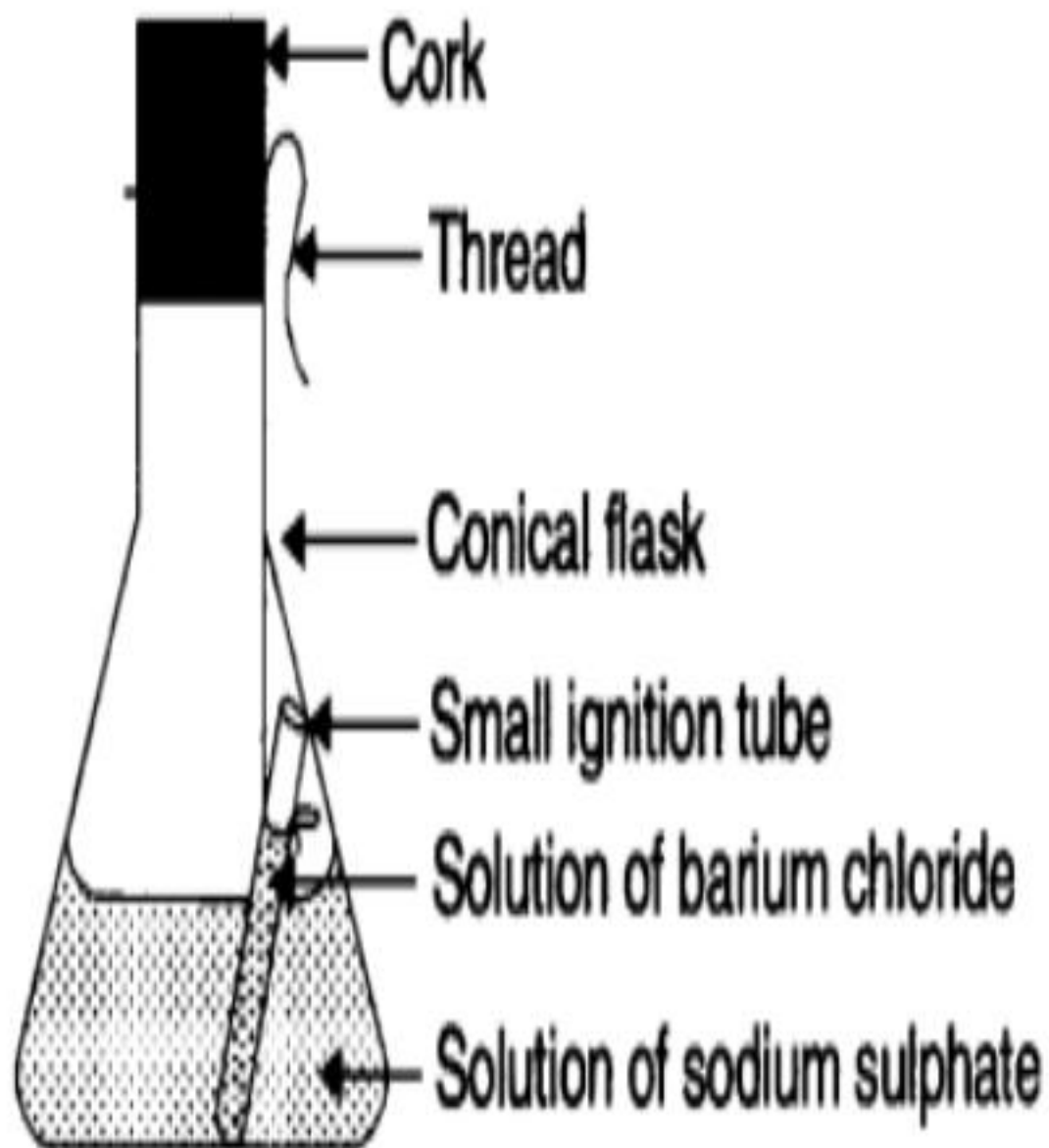
Law of conservation of mass :

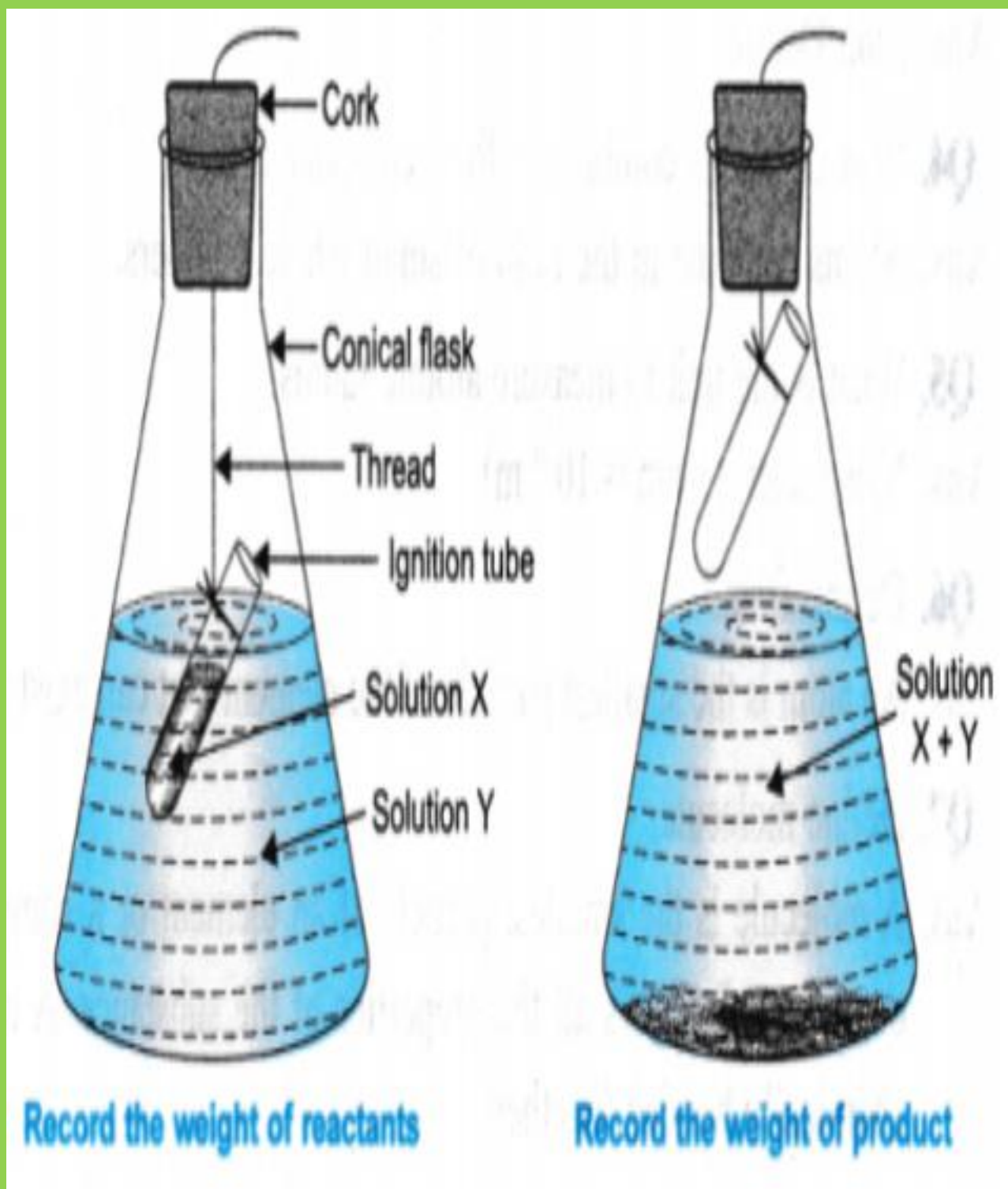
- The law of conservation of mass means that in a

chemical reaction, the total mass of the product is equal to the total mass of the reactant.

“Matter is neither created nor destroyed in a chemical reaction”

(a) Diagram :





It has been found by experiment that if 100 g of calcium carbonate are

decomposed completely then
56 g of calcium oxide and 44 g
of carbon dioxide are
formed. Example:-



Sodium carbonate + ethanoic acid \longrightarrow Sodium ethanoate + carbon dioxide + water

(5.3 g)

(6 g)

(8.2 g)

(2.2 g)

(0.9 g)

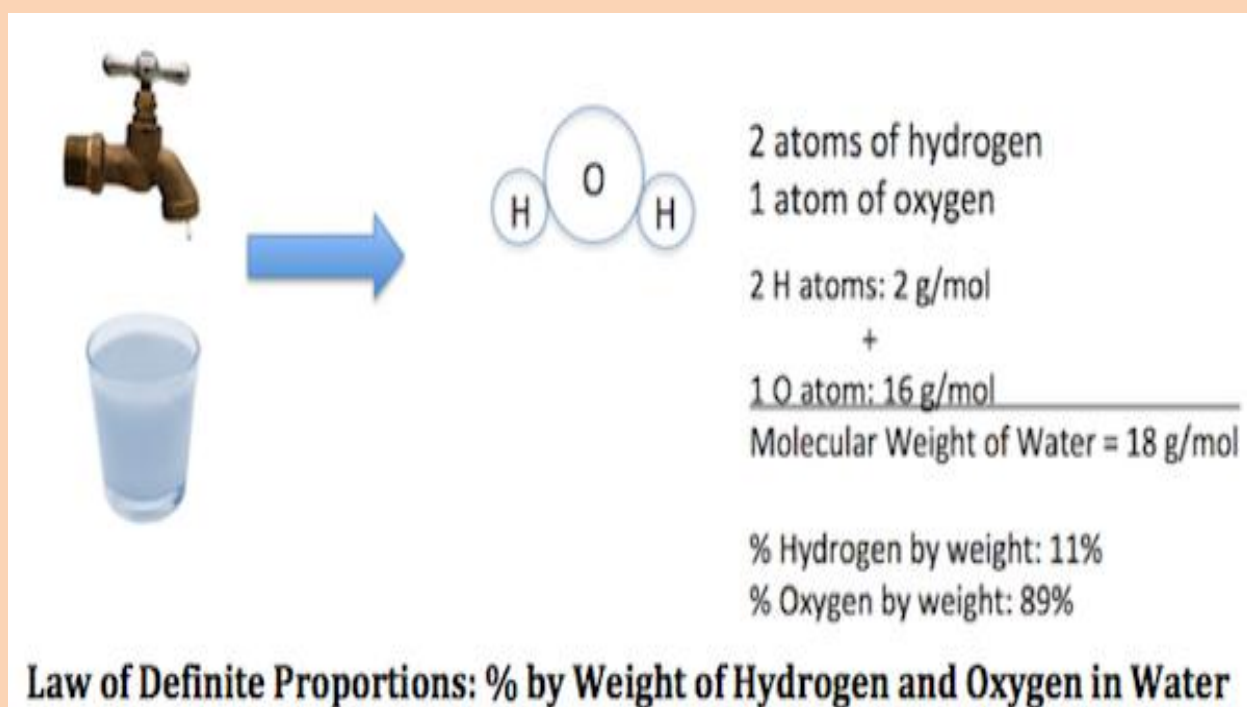
$$5.3 \text{ g} + 6 \text{ g} \rightarrow 8.2 \text{ g} + 2.2 \text{ g} + 0.9 \text{ g}$$

$$\text{L.H.S} = \text{R.H.S}$$

$$11.3 \text{ g} = 11.3 \text{ g}$$

- **Law of constant proportion:** This law was given by “Proust” in 1779. According to this law a chemical compound always consists of the same

elements combined together in the same proportion by mass. Example : water consists of the same two elements hydrogen and oxygen, combined together in the same constant proportion of 11:89 or 1:8 by mass .



17.07.20 (Lecture-02)

Chapter -02

Atoms and molecules

Class –IX

Sub –Science

Dalton's atomic theory :-

1. Atoms can neither be created or nor destroyed .

2. Atoms of a given element are identical in mass and chemical properties.

3. Atoms combine in the ratio of small

**whole numbers to
form compounds.**

**4. The relative
number and kinds of
atoms are constant in
a given compound.**

**Draw backs of
Dalton's atomic
theory**

One of the major drawbacks of Daltons atomic theory of matter is that atoms are thought to be indivisible. We now know that under special circumstances atoms can be further divided still into still

**smaller particles
called electrons,
protons ,neutrons.**

What is an atom?

**An atoms is the
smallest particles of
an element that can
take part in chemical**

reaction.

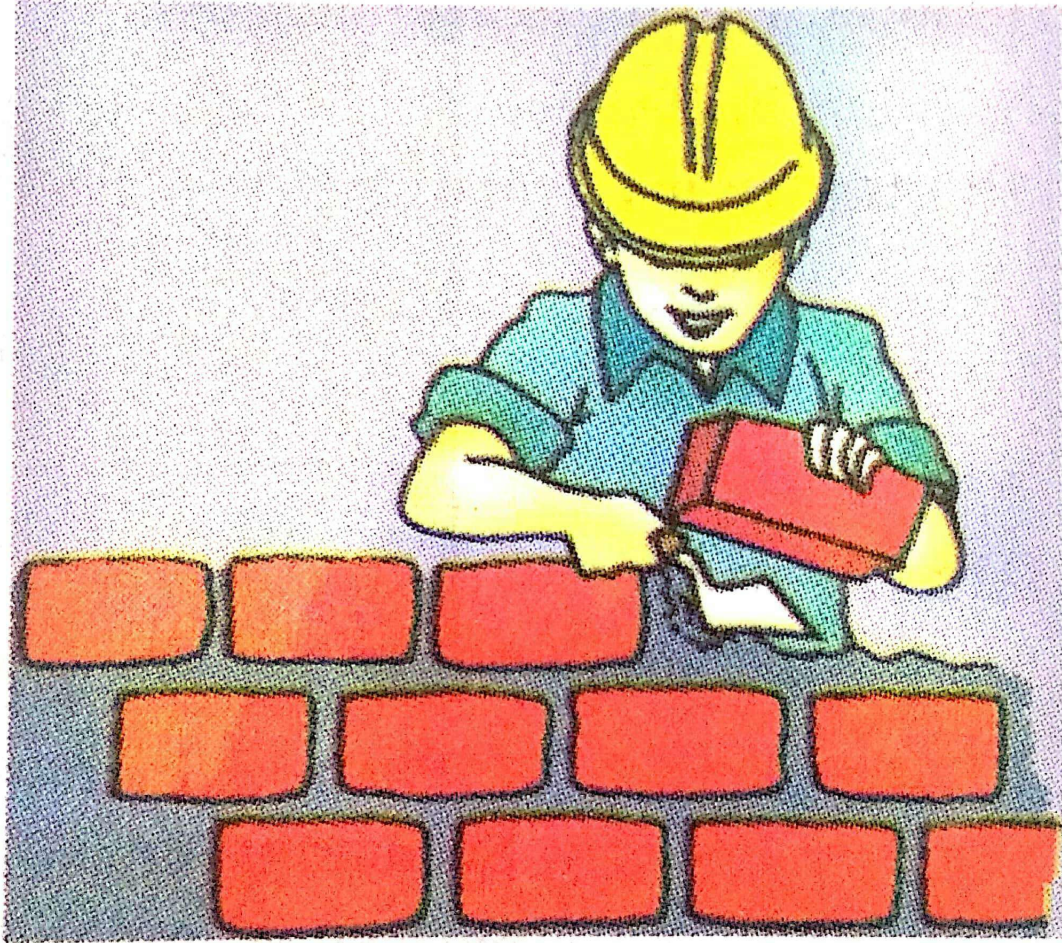
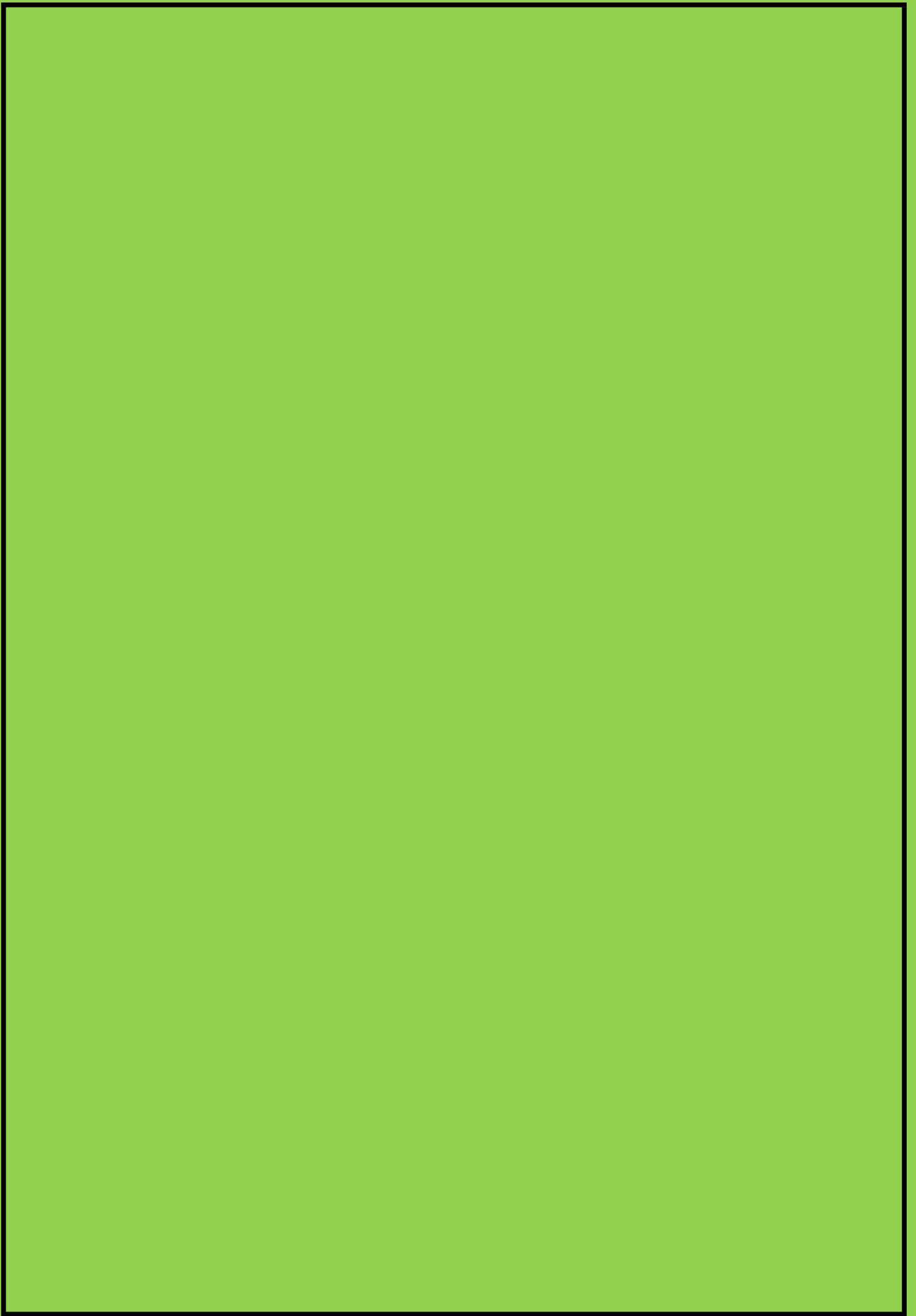


Figure 11. Just as bricks are the building blocks of all the houses, atoms are the building blocks of all matter.



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**Atoms donot
exist in free state”.
They are very ,very
small in size. The size
of the atoms is
indicated by its radius
which is called atomic
radius. Atomic radius
is measured Is in
‘nanometer’ .**

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

Atomic radius is measured in nanometres.

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

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

Relative Sizes

Radii (in m)	Example
10^{-10}	Atom of hydrogen
10^{-9}	Molecule of water
10^{-8}	Molecule of haemoglobin
10^{-4}	Grain of sand
10^{-3}	Ant
10^{-1}	Apple





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ATOMS AND MOLECULES

**Atoms are so small
that we cannot see
them under the most
powerful optical
microscope.**

**STM- Scanning
tunneling microscope**
Daltons symbols of

 Hydrogen  Carbon  Oxygen

 Phosphorus  Sulphur  Iron

 Copper  Lead  Silver

 Gold  Platina  Mercury

Symbols proposed by Dalton

Dalton's symbols for elements were difficult to draw and inconvenient to use.so, Dalton's symbols are only of historical importance.They are not used at all. It was

**Sweden who
proposed that the first
letter and another
letter (or the first
letter and another
letter) of the name of
an element used at its
symbol.**

Symbol and Name of some elements

Element	Symbol	Element	Symbol	Element	Symbol
Hydrogen	H	Sodium	Na	Cromium	Cr
Helium	He	Magnesium	Mg	Mangese	Mn
Lithium	Li	Aluminium	Al	Iron	Fe
Beryllium	Be	Silicon	Si	Cobalt	Co
Boron	B	Phosphorous	P	Nickel	Ni
Carbon	C	Sulphur	S	Copper	Cu
Nitrogen	N	Chlorine	Cl	Zinc	Zn
Oxygen	O	Argon	Ar	Silver	Ag
Fluorine	F	Potassium	K	Gold	Au
Neon	Ne	Calcium	Ca	Mercury	Hg

18.07.20

CHAPTER-03

ATOMS AND MOLECULES

CLASS-IX SUB-SCIENCE

Lecture-03

**Atomic mass unit (1u):-
The**

**atomic mass unit is
defined as exactly
one –twelfth the mass
of an atom of carbon-
12 .**

**Atomic mass unit =
1/12 the mass of a
carbon -12 atom**

relative atomic mass

relative atomic mass of an element

Relative atomic masses of common elements:

Elements	Relative Atomic Mass	Symbol
hydrogen	1	H
helium	4	He
carbon	12	C
nitrogen	14	N
oxygen	16	O
sodium	23	Na
magnesium	24	Mg
aluminium	27	Al
silicon	28	Si
phosphorus	31	P
sulphur	32	S

Significance of the symbol of an element

5. Symbol represents name of the element.

6. Symbol represents one atom of the element.

7. Symbol also represents one mole of atoms of the element.

8. Symbol represents a definite mass of the element.

How do atoms exist:-

1. in the form of

molecules 2. in the

form of ions

In the form of

molecules : A

molecule is an

**electrically neutral
group of atoms
chemically bonded
together**

**“A molecule is the
smallest particle of a
substance which has
the properties of that**

**substance and can exist
in free
state.”**

**Molecule can be
formed by
combination of
atoms of the same
element or of
different element.
Depending on this**

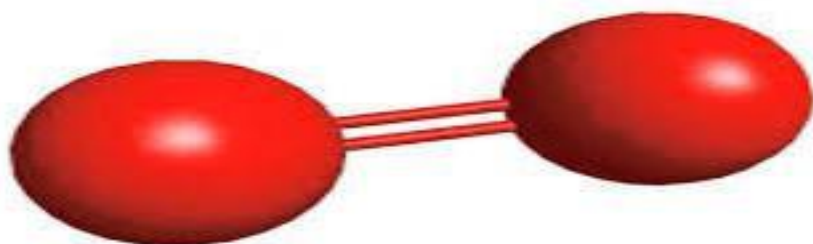
**there are two types
of molecules.**

**Molecules of
elements and
molecules of
compound.**

1.Molecules of element:- the molecules of an element contains of two or more similar atoms chemically combined together .example

H_2, Cl_2, O_2, N_2, I_2

1642.88 cm⁻¹





Hydrogen
(H₂)



Nitrogen
(N₂)



Oxygen
(O₂)



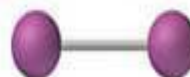
Fluorine
(F₂)



Chlorine
(Cl₂)



Bromine
(Br₂)



Iodine
(I₂)

Atomicity :- The number of atoms present in one molecules of an element is called its atomicity.

a. The atomicity of noble gases is 1

b. The atomicity of metal elements like sodium (Na) ,magnesium(Mg), iron (Fe) etc is also

**taken to be 1. thus
metal are to be
considered to be
monoatomic.**

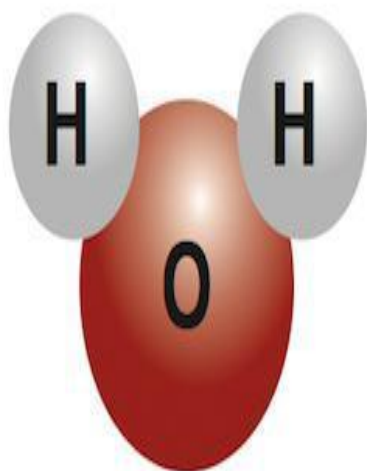
c. The atomicity of hydrogen, nitrogen, oxygen, chlorine, bromine, and iodine is 2 each.

d. Solid sulphur has 8 atoms in its molecules, so the atomicity of sulphur is 8.

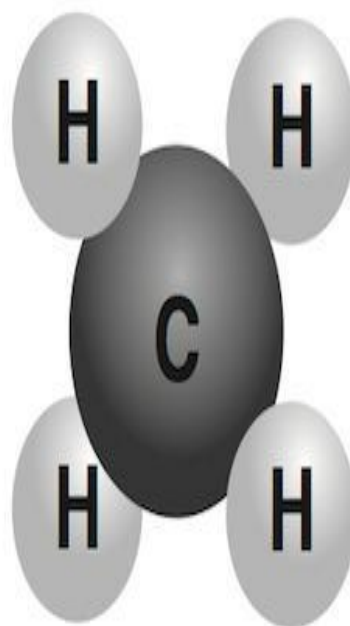
2. Molecules of compound : the molecules of compound contains two different types of atoms chemically combined

together .example:

H₂O,CO₂,CH₄,NH₃,SO₂



Water
 H_2O

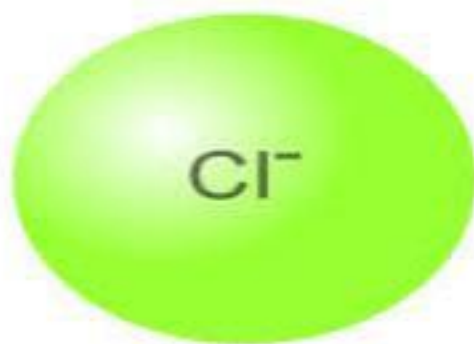


Methane
 CH_4

**In the form of ions : an
atom or
group of atoms p
having positive or
negative charge.**

Example Cl^{-1} , Na^{+} , PO_4^{3-} , NH_4^{+}

chloride ion



0.181 nm

potassium ion



0.133 nm



Phosphate Ion

