

<b>Class: IX</b>	<b>Chapter-3</b> <b>Topic: Atom and Molecule</b>
<b>Subject: Chemistry</b>	<b>Date -27/10/2021</b>

### Define the Law of conservation of mass

It was given by **A.Lavoisier**

According to this law - Mass can neither be created nor destroyed in a chemical reaction. e.g.,  $A + B \rightarrow C + D$

Sum of masses of reactant = Sum of masses of products

**Define the law of constant proportion:** It was given by **Joseph L.**

**Proust** :In a chemical substance the elements are always present in definite proportions by mass.

E.g., in water, the ratio of the mass of hydrogen to the mass of oxygen is always 1 : 8 respectively.

### Write the postulates of Dalton's Atomic Theory

Every matter is made up of very small or tiny particles called atoms. Atoms are not divisible and cannot be created or destroyed in a chemical reaction.

All atoms of a given element are same in size, mass and chemical properties.

Atoms of different elements are different in size, mass and chemical properties.

Atoms combine in the ratio of a small whole number to form compounds.

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

### Define Atom

Atoms are the smallest particles of an element which can take part in a chemical reaction.

Size of an atom: Atomic radius is measured in nanometres.

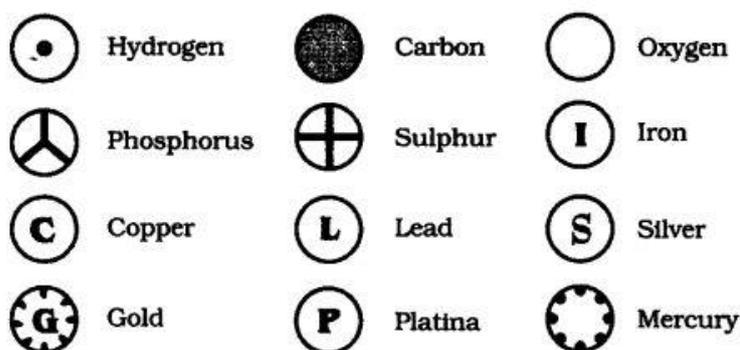
$$1 \text{ nm} = \frac{1}{10^9} \text{ m}$$

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

$$\text{Atomic radii of hydrogen atom} = 1 \times 10^{-10} \text{ m.}$$

Symbols of atoms:

(a) Symbols for some elements as proposed by Dalton:



**(b) Symbols of some common elements:**

Name of the element	Latin name	Symbol
Hydrogen	-	H
Helium	-	He
Carbon	-	C
Copper	Cuprum	Cu
Cobalt		Co
Chlorine		Cl
Cadmium		Cd
Boron		B
Barium		Ba
Bromine		Br
Bismuth		Bi
Sodium	Natrium	Na
Potassium	Kalium	K
Iron	Ferrum	Fe
Gold	Aurum	Au
Silver	Argentum	Ag
Mercury	Hydragyrum	Hg

**Write three points of difference between an atom and a molecule.**

**Or**

**What is the difference between an atom and a molecule ?**

Atom	Molecule
(i) Atom is the smallest particle of an element that takes part in a chemical reaction.	(i) Molecule is the smallest particle of an element or a compound that is capable of an independent existence.
(ii) An atom is usually not stable by itself.	(ii) A molecule is usually stable by itself.
(iii) When similar atoms combine together in varying numbers, molecules of different properties can be formed e.g., O <sub>2</sub> , O <sub>3</sub> .	(iii) When similar molecules combine together in any numbers, a simple similar product is formed.

**When 3.0 g of magnesium is burnt in 2.00 g of oxygen, 5.00 g of magnesium oxide is produced. What mass of magnesium oxide will be formed when 3.00 g magnesium is burnt in 5.00 g of oxygen ? Which law of chemical combination will govern your answer ? State the law.**

When 3.0 g of magnesium is burnt in 2.00 g of oxygen, 5.00 g of magnesium oxide is produced. It means magnesium and oxygen are combined in the ratio of 3 : 2 to form magnesium oxide.

Thus, when 3.00 g of magnesium is burnt in 5.00 g of oxygen, 5.00 g of magnesium oxide will be formed and the remaining oxygen will be left unused.

It is governed by law of definite proportion.

It states that in a chemical substance, the elements are always present in definite proportions by mass.

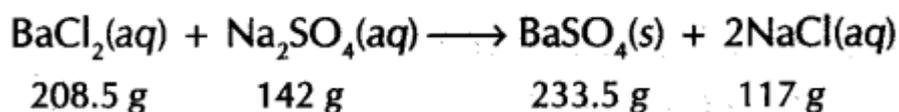
**State the law of conservation of mass. Is this law applicable to the chemical reactions ? Elaborate your answer with the help of an example.**

Law of conservation of mass states that mass can neither be created nor destroyed in a chemical reaction.

Yes, this law is applicable to the chemical reactions.

In all chemical reactions, there is only exchange of reactants taking place when products are formed. There is no loss or gain of mass.

For example, in the following reaction, the total mass of the reactants is equal to the total mass of the products formed.



**0.24 g sample of compound of oxygen and boron was found by analysis to contain 0.096 g of boron and 0.144 g of oxygen. Calculate the percentage composition of the compound by weight.**

**Answer.**

$$\begin{aligned} \% \text{ age of oxygen} &= \frac{\text{wt. of oxygen}}{\text{wt. of sample}} \times 100 \\ &= \frac{0.144}{0.24} \times 100 = 60\% \end{aligned}$$

$$\begin{aligned} \% \text{ age of boron} &= \frac{\text{wt. of boron}}{\text{wt. of sample}} \times 100 \\ &= \frac{0.096}{0.24} \times 100 = 40\% \end{aligned}$$

**In a reaction, 5.3 g of sodium carbonate reacted with 6 g of ethanoic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium ethanoate. Show that these observations are in agreement with the law of conservation of mass, sodium carbonate + ethanoic acid → sodium ethanoate + carbon dioxide + water.**

**Answer.** Mass of reactants before experiment

= Mass of sodium carbonate + Mass of ethanoic acid

= 5.3 g + 6g = 11.3 g

Mass of products after experiment

= Mass of sodium ethanoate + Mass of carbon dioxide + Mass of water

= 8.2 g + 2.2 g + 0.9 g = 11.3 g

The mass of reactants is equal to the mass of products, therefore, it proves law of conservation of mass.

**What is meant by a molecule ? Give examples.**

**Answer.** A molecule is the smallest particle of an element or a compound capable of independent existence under ordinary conditions. It shows all the properties of the substance. e.g., molecule of oxygen is O<sub>2</sub>, ozone is O<sub>3</sub>, phosphorus is P<sub>4</sub>, sulphur is S<sub>8</sub>, etc.

**How would you differentiate between a molecule of element and a molecule of compound ? Write one example of each type. [SA II-2012]**

**Answer.** Molecule of an element is made-up of only one kind of atoms, e.g., O<sub>2</sub>, N<sub>2</sub>, F<sub>2</sub>, O<sub>3</sub>, P<sub>4</sub>, S<sub>8</sub> etc. Molecule of a compound is made-up of two or more different kinds of atoms in a fixed ratio, e.g., H<sub>2</sub>O, CS<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, CH<sub>4</sub>.

**. Give two drawbacks of Dalton's atomic theory.**

**Answer.** Drawbacks of Dalton's Atomic Theory :

(i) According to modern theory, atom is not the ultimate indivisible particle of matter. Today, we know that atoms are divisible, i.e., they are themselves made-up of particles (protons, electrons, neutrons, etc.).

(ii) In case of isotopes of an element, the assumption that the atoms of the same element have same mass does not hold good.

**Which postulate of Dalton's atomic theory is the result of the law of conservation of mass ?**

**Answer.** Atoms are indivisible particles, which cannot be created or destroyed in a chemical reaction.

**'Atoms of most elements are not able to exist independently'. Name two atoms which exist as independent atoms.**

**Answer.** Noble gases such as argon (Ar), helium (He) exist as independent atoms.

**Which postulate of Dalton's atomic theory can explain the law of definite proportions ?**

**Answer.** Atoms combine in the ratio of small numbers to form compounds. In a compound, the relative number and kinds of atoms are constant.

**Note-** **The above content has been absolutely prepared from home**