

Worksheet

Class 9th (science)

Chapter 3rd ATOMS AND MOLECULES

Around 500 BC

- Indian philosopher Maharishi Kanad, postulated that if we go on dividing matter, we shall get smaller and smaller particles. Ultimately, a stage will come when we shall come across the smallest particles beyond which further division will not be possible .
He named these particle *Parmanu*.
- Another Indian philosopher, Pakudha Katyayama, said that these particles normally exist in a combined form which gives us various forms of matter.
- Greek philosopher- Democritus and Leucippus suggested that if we go on dividing matter, a stage will come when particles obtained cannot be divided further.
Democritus called these particles *atoms* (meaning indivisible).

- **Laws of chemical combination**

Antoine L. Lavoisier and Joseph L. Proust established two laws of chemical combination:

1. Law of conservation of mass
2. Law of constant proportions

1. Law of conservation of mass

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

2. Law of constant proportions

According to this law in a chemical substance the elements are always present in definite proportions by mass.

Dalton's Atomic Theory

In 1808, John Dalton gave an atomic theory based on laws of chemical combination. The postulates of this theory are as follows:

1. All matter is made of very tiny particles called atoms, which participate in chemical reactions.
2. Atoms are indivisible particle, which cannot be created or destroyed in a chemical reaction.
3. Atoms of a given element are identical in mass and chemical properties.
4. Atoms of different elements have different masses and chemical properties.
5. Atoms combine in the ratio of small whole numbers to form compounds.
6. The relative number and kinds of atoms are constant in a given compound.

Exercise

1. In a reaction, 5.3 g of sodium carbonate reacted with 6 g of acetic acid. The products were 2.2 g of carbon dioxide, 0.9 g of water and 8.2 g of sodium acetate. Show that these observations are in agreement with the law of conservation of mass.
Sodium carbonate + acetic acid $\rightarrow$ sodium acetate + carbon dioxide + water

Sol.

Sodium carbonate(5.3 g) + acetic acid(6 g) $\rightarrow$ sodium acetate(8.2 g) + carbon dioxide(2.2 g) + water(0.9 g)

Sum of mass before reaction = (5.3+ 6) g = 13.3 g

Sum of masa after reaction = (8.2 + 2.2 + 0.9) g = 13.3 g

Mass of the reactants before reaction = Mass of the reactants after reaction

Thus these observations are in agreement with the law of conservation of mass.

2. Hydrogen and oxygen combine in the ratio of 1:8 by mass to form water. What mass of oxygen gas would be required to react completely with 3 g of hydrogen gas?

Sol. Since, mass of oxygen combine with 1 g of hydrogen = 8 g

Then, mass of the oxygen combine with 3g of hydrogen = $3 \times 8 = 24$ g

3. Which postulate of Dolton's atomic theory can explain the law of conservation of mass?

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

4. Which postulate of Dolton's atomic theory can explain the law of definite proportions?

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