

CHEMISTRY STUDY MATERIALS FOR CLASS 9

(BASED ON CHAPTER 3: ATOMS AND MOLECULES)

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DALTON'S ATOMIC THEORY

John Dalton, a British school teacher, published his theory about atoms in 1808. His findings were based on experiments and the laws of chemical combination.

Dalton's theory is the basic theory about the nature of matter. According to his theory, all matter, whether a solid, liquid or gas or an element, compound or mixture, is composed of small particles called atoms.

The Postulates of Dalton's Atomic Theory

- All matter is made up of very tiny particles called atoms.
- Atoms are indivisible particles, which can neither be created nor destroyed in a chemical reaction.
- The atoms of a given element are identical in mass and chemical properties.
- Atoms of different elements have different masses and chemical properties.
- Atoms combine in the ratio of small whole numbers to form compounds.
- The relative number and types of atoms are constant in a given compound.

Drawbacks of Dalton's Atomic Theory

- The indivisibility of an atom was proved wrong: an atom can be further subdivided into protons, neutrons and electrons. However an atom is the smallest particle that takes part in chemical reactions.

- According to Dalton, the atoms of same element are similar in all respects. However, atoms of some elements vary in their masses and densities. These atoms of different masses are called isotopes. For example, chlorine has two isotopes with mass numbers 35 and 37.
- Dalton also claimed that atoms of different elements are different in all respects. This has been proven wrong in certain cases: argon and calcium atoms each have an atomic mass of 40 amu. These atoms are known as isobars.
- According to Dalton, atoms of different elements combine in simple whole number ratios to form compounds. This is not observed in complex organic compounds like sugar ($C_{12}H_{22}O_{11}$).
- The theory fails to explain the existence of allotropes; it does not account for differences in properties of charcoal, graphite, diamond.

The Atom: Its Size, Mass and Symbol

- An atom is very small in size and consists of subatomic particles protons, neutrons and electrons.
- About one million atoms stacked up one over the other would roughly equal the thickness of a sheet of a paper.

Atomic radius is measured in nanometers. 10^{-9} m = 1 nm, 1 m = 10^9 nm

Modern Day Symbols of Atoms of Different Elements

- Dalton was the first scientist to use symbols for elements. He used circles to represent elements.
- Berzelius suggested that the symbols of the elements can be made from one to two letters of the name of the element.
- Now, we use names and symbols as stated by IUPAC i.e. the International Union of Pure and Applied Chemistry.
- Many symbols are the first letter or the first two letters of the name of the element.

MISTROMS AND Name	Symbol
Carbon	C
Nitrogen	N
Calcium	Ca
Aluminium	Al

- The symbols of some elements are formed from the first letter of the name and a letter appearing later in the name.

Name	Symbol
Chlorine	Cl
Magnesium	Mg

- The symbols for some elements were derived from their Latin, German or Greek names.

English name of the element	Latin name of the element	Symbol
Sodium	Natrium	Na
Potassium	Kalium	K
Iron	Ferrum	Fe
Copper	Cuprum	Cu
Silver	Argentum	Ag
Gold	Aurum	Au
Mercury	Hydrargyrum	Hg
Lead	Plumbum	Pb
Tin	Stannum	Sn
