

2. STOICHIOMETRY

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2.1 Dalton's Atomic Theory

 **Learning outcomes:** After the lesson,
The students should be able to: Explain Dalton's atomic theory and its postulates.

Greek philosophers used to get puzzled about the nature of matter. For the first time, Democritus conceived the idea that every matter must be made up of extremely small indivisible particles to be called atoms.

[*How Did the Ancient Greeks Predict The Atom?*](#)

Only in 1808 did John Dalton give a comprehensive theory regarding atoms based on the findings until that time.

The basic postulates of Dalton's atomic theory are:

- 1) Every **matter** is **made up of** extremely **small indivisible particles** called **atoms**.
- 2) Atoms **cannot be created, destroyed, or changed** into atoms of **different kinds**.
- 3) All **atoms of the same element are alike**, especially in shape, size, and mass.
- 4) **Atoms of different elements are entirely different**, especially in shape, size, and mass.
- 5) **Atoms combine in a simple whole-number ratio** to form compound atoms (now called molecules).

In light of modern experimental findings, we know these postulates are not precisely true in their original form. However, modern chemistry was founded on this atomic theory.

Dalton's atomic theory has the following limitations:

1. *An atom can be subdivided. It is a complex structure consisting of electrons, protons, and neutrons.*
2. *Atoms of the same element may not be alike. Atoms can have isotopes with the same atomic number but different atomic masses. For example, the chlorine element has two isomers, Cl_{35} and Cl_{37} .*
3. *The ratio in which atoms combine may not be simple. There are several compounds in which the atoms combine far more than a simple ratio.*

For example, Soap ($\text{C}_{18}\text{H}_{35}\text{O}_2\text{Na}$; 18:35:2:1)

Cane sugar ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$; 1.09:2:1)

4. *Instead of compound atoms, the term molecules is used. The molecules are the smallest particles with independent existence. The molecules of elements consist of the same type of atoms, but those of a compound consist of dissimilar atoms.*

For example, the molecule O_2 consists of the same type of atoms, whereas the calcium carbonate (CaCO_3) molecule consists of different atoms.

5. *Atoms can be altered. Certain radioactive elements occurring in nature change to the atoms of another element by the emission of radiation.*

For example, a uranium atom changes into a thorium atom by emitting alpha particles.



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***** This is not a complete note. It is to guide you. It is recommended to study the prescribed textbooks along with this material. *****