



# Matter, Atoms and Molecules

## Unit 1: Some Basic Concepts of Chemistry

**Topics:** Matter and its nature; Dalton's atomic theory; Concept of atom, molecule, element, and compound

As we know, **anything which occupies space and has mass is called matter.**

- All matter is made up of atoms.

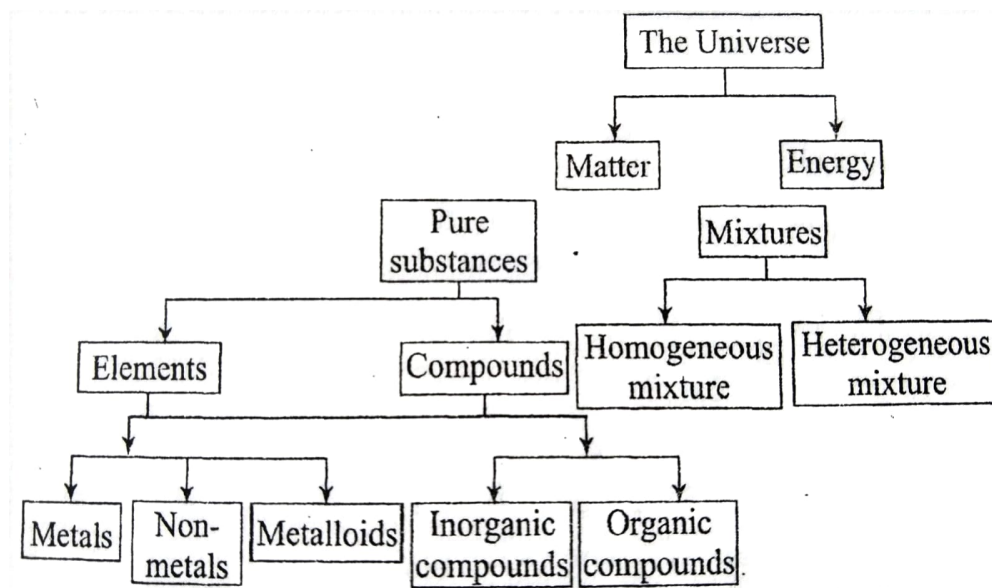
## States of Matter

State	Definite Volume	Definite Shape
Solid	Yes	Yes
Liquid	Yes	No
Gas	No	No





# Classification of Matter



## Element

An **Element** is a pure substance which is made up of only one type of atom. It cannot be decomposed or built from simpler substances.

*Eg: Gold, Hydrogen*

- Metals are further classified as Metals, Non Metals and Metalloids.

## Compound

A **Compound** is obtained by the reaction of two or more elements in a fixed mass ratio.

- The property of the compound does not depend on its constituent elements.
- Its constituent elements cannot be extracted by physical means.

*Eg: Water, Carbon Dioxide*

### Types of Compounds:

- **Organic Compounds:** These compounds are obtained from living sources such as plants and animals. All these compounds contain carbon.
- **Inorganic Compounds:** These compounds are obtained from non-living sources such as rocks and minerals.



## Mixture

A **Mixture** is the product obtained by mixing two or more substances.

- The proportion is not fixed and the properties of constituent substances are retained.
- Physical methods can be used to extract the constituents.
- Mixtures can be homogenous or heterogenous.

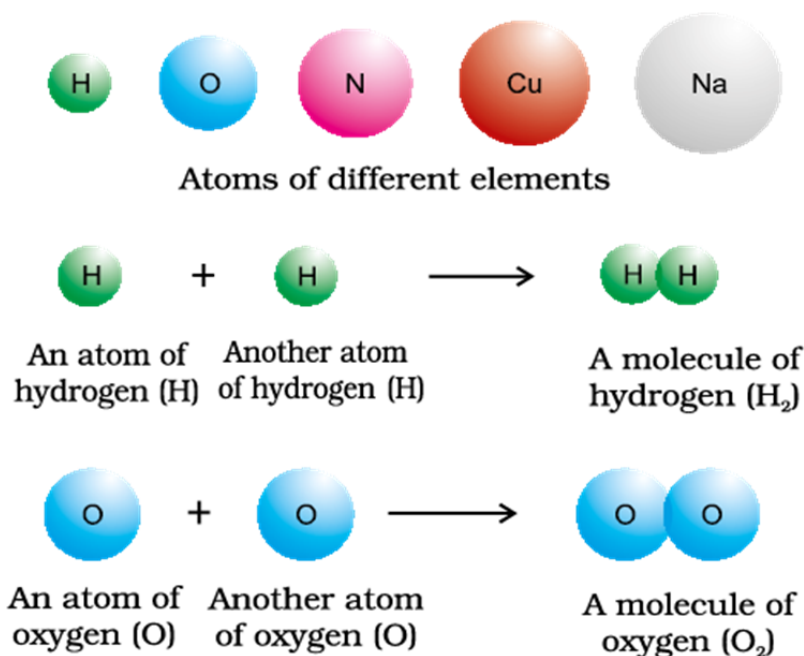
*Eg: Air, Tea, Sugar Solution*

### Types of Mixtures:

- A mixture is said to be **homogeneous** if it has an uniform composition throughout.  
(Air)
- A mixture is said to be **heterogeneous** if its composition is not unique throughout.  
(Mixture of Iron fillings and Sulphur)

## Atoms and Molecules

An atom is the smallest unit of matter. Molecules are made up of atoms.



- All substances are made up of molecules.  
*Eg: Hydrogen Molecule (H<sub>2</sub>), Water Molecule (H<sub>2</sub>O), etc.*



Compounds	Mixtures
1. In a compound, two or more elements are combined chemically.	1. In a mixture, two or more elements or compounds just mix together.
2. The compound contains two or more elements in a fixed ratio by mass. Its composition is always fixed.	2. The components of a mixture may be present in any ratio. Its composition is variable.
3. A compound has a definite formula.	3. A mixture does not have a definite formula.
4. A compound is always homogeneous i.e., has the same composition throughout.	4. A mixture may be homogeneous or heterogeneous.
5. A chemical reaction takes place and therefore, the formation of a compound takes place with absorption or evolution of energy.	5. No chemical reaction takes place and therefore, the formation of a mixture is not accompanied by any energy change.
6. The properties of a compound are entirely different from those of its constituents.	6. A mixture shows the properties of its constituents.
7. A compound cannot be separated into its constituents by ordinary physical methods. These can be separated by chemical or electrochemical reactions.	7. A mixture can be separated into its constituents by physical methods (like filtration, evaporation, distillation, sublimation, mechanical separation etc.)

Figure 1: Difference between Compounds and Mixtures



## Dalton's Atomic Theory

John Dalton proposed the first Atomic Theory in 1808.

- Matter consists of indivisible atoms.
- All atoms of a given element have identical properties, including mass. Atoms of different elements differ in mass.
- Compounds are formed by the combination of different elements in a fixed ratio.
- Atoms are neither created nor destroyed in a chemical reaction. Chemical reactions involve reorganisation of atoms.