

Basic Chemistry

MATTER

- Matter is everything that we see around us. Anything that has mass (Weight) and occupies space.
- It can be Solid, Liquid & Gas.
- Matter is made up of smallest units or particles called Atoms.

ATOMS

Atoms are the smallest unit that make up matter. They are the building blocks and the basic unit of chemistry. All the matter in the universe is made of these *atoms*.

- There are 118 different kinds of atoms that known to us in nature. These 118 different atoms combine with one another to form different kinds of matter that we see in nature.
- **When matter is made of only one kind of atom, it is called an *element*.**
- For example, Gold is an element which is made of only gold atoms.
- Silver is made of only silver atoms.

ELEMENT

Element is a simple, single material that cannot be broken down into a simpler material. **Atoms of the same kind make an element**, each element is represented by the unique Symbol.

SYMBOL

An element is represented by a symbol which consists of the first letter of its English OR latin name .e.g. Symbol of Hydrogen is H → derived from its English name

Symbol of Sodium is Na → derived from its Latin name.

A few elements with their English & Latin names:

Element (English Name)	Symbol	Element (Latin Name)	Symbol
Hydrogen	H	Sodium- Natrium	Na
Oxygen	O	Potassium- Kalium	K
Aluminium	Al	Iron- Ferrum	Fe
Calcium	Ca	Copper- Cuprum	Cu
Tin-Stannum	Sn	Gold-Aurum	Au
Mercury- Hydrargyrum	Hg	Silver-Argentum	Ag

PERIODIC TABLE

The scientists have grouped all the elements that we find in the nature into groups called periods. These periods have been arranged into a table called the periodic table.

Each element is given a name and a symbol and each element has its own atomic number ([atomic number is determined by the number of protons in the nucleus of the atom of an element](#)).

Out of the 118 elements known till date, 98 elements occur naturally while others are synthetically or artificially produced.

Out these some are metals and others are non metals or gases.

Molecules

- Sometimes a substance can exist in nature as a single atom. They are happy being alone
- However, most of the times a substance is not stable as a single atom. In this case it joins up with one or more atoms to become stable. Hence, many a times atoms join together as 2 or more atoms.

When 2 or more atoms join together they are called a molecule.

- These atoms could be same (of the same element) or could be different (of different elements).
- **Two or more atoms of the same element OR of different elements combine to make a Molecule.**
- A molecule is the smallest unit made up of atoms that can exist independently.
- Gases like Oxygen and Nitrogen are examples of elements that exist as molecules made up of more than one atom with the same element.
- However, HCl (Hydrochloric Acid) is a molecule which has 1 atom of Hydrogen element, 1 atom of Chlorine element. i.e. molecule made up of atoms of 2 different elements
- Every molecule has a chemical formula which shows how many atoms it has.

Atomicity

The no. of atoms in a single molecule of an element is called its atomicity.
(e.g. H_2 , O_2 , O_3 , P_4)

Monoatomic: A molecule having only one atom of the same element.

e.g. He (Helium), Neon (Ne) are monoatomic.

Diatomic: A molecule having 2 atoms of the same element E.g. Oxygen $\rightarrow O_2$

Triatomic: A molecule having 3 atoms of the same element. E.g. Ozone $\rightarrow O_3$

Tetraatomic: A molecule having 4 atoms of the same element. E.g. Phosphorus $\rightarrow P_4$

Compounds

- Compound is a brand new material / substance which is formed when atoms of two or more elements join chemically. This compound formed has totally new properties than the elements which it is made up of. For example, **common salt is made up of two elements, Sodium (Na) and Chlorine (Cl).**
- If we just mix Sodium (Na) and Chlorine (Cl) together then their individual properties will not be changed and they can be separated. However, if they are combined chemically to form a compound called Sodium Chloride, then it is very difficult to separate them back into Sodium and Chlorine.
- Another example is of HCl. which is also a compound since Hydrogen and Chlorine have join together in a chemical manner to form a substance, Hydrochloric acid which has totally different properties than the individual properties of Hydrogen and Chlorine.

- Water (H₂O) is also a compound.

Every compound has its own name or chemical formula. A molecule of vinegar is written as CH₃COOH and it contains :

2 Carbon atoms, 4 Hydrogen atoms & 2 Oxygen atoms

Note :

All compounds are molecules (as they are made by combining of 2 or more same or different atoms). However all molecules need not be compounds as they could be made up of 2 or more atoms of the same element.

e.g. O₂, O₃ are molecules but are not compounds as they are made up of atoms of same element i.e. Oxygen

But HCl which is a compound is definitely a molecule. This is true for all the compounds that they are molecules.

Chemical Changes

- Occur when elements and compounds react amongst themselves or with each other.
- Chemical changes & chemical reactions are separated by Chemical equations.
- Initial substances in chemical reactions : 'reactants'
- Final substances obtained after a chemical reactions : 'products'
- For e.g. C + O₂ → CO₂

(reactants) (product)