

INTRODUCTION

In the previous chapter you have learnt that all substances are made up of matter. On the basis of its state, matter can be a solid, liquid or gas although they may contain the same kind of matter.

For example : Water, water vapour and ice are the three states of the same kind of matter.

Classification of matter can also be done on the basis of some **similarities and dissimilarities in their chemical composition.**

For example :

- Salt and sugar both are solids but they differ from each other because they are made up of different kinds of atoms.

- Water and oil are both liquids but their matter differ from each other.

The substances made up of different kinds of matter may be **pure or impure, homogeneous** (uniformly mixed) **or heterogeneous** (distinct from each other).

- A substance in which some other substances are also present in smaller amounts is called an impure substance.

- The purity of a substance can be checked by measuring or examining some of its characteristic properties

such as colour, taste, melting or boiling point, etc.

PURE SUBSTANCES

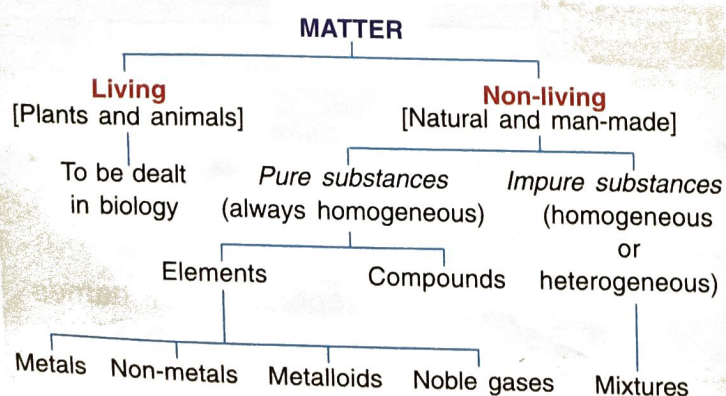
A substance of a definite composition which has consistent properties throughout, is called a **pure substance**.

- Pure substances are of two types, *i.e.*, **elements** and **compounds**.
- Elements are made up of only one kind of atoms and compounds are made up of only one kind of molecules.
- They have uniform composition throughout, *i.e.*, they are homogeneous.
- They have a definite set of physical and chemical properties.
- They have fixed melting and boiling points.
- Pure substances have characteristic colour, odour and taste.
- Pure substances cannot be broken into simpler substances by any physical means.

For example : Water is a pure substance, it has a fixed boiling point of 100°C and it freezes at 0°C . If some common salt is mixed in it, the resulting solution boils at a higher temperature and freezes at a lower temperature, that means it has some impurity.

ELEMENTS

There are millions of substances in this world. But they are all made up of a limited number of basic substances. **These basic substances are called elements.** Oxygen, hydrogen, nitrogen, carbon, copper, silver, gold, iron, tin and zinc are a few examples of elements.



To be done by the subject teacher

Show the samples of iron powder, zinc granules and sulphur to the students to make them familiar with elements.

Scientists have so far discovered 118 elements. Of these, 92 are found on earth, which occur in nature like in rocks, soil, air and water. The remaining 26 have been created artificially.

An element is defined as a pure substance made up of only one kind of atoms that cannot be converted into anything simpler than itself by any physical or chemical process.

Thus, each element has its own unique properties. *e.g.* A gold bar is made up of only gold atoms.

Elements are the basic substances from which all other substances are made.

On the basis of their properties, elements are classified into :

- (i) metals (ii) non-metals
- (iii) metalloids (iv) noble (or inert) gases.

Metals

Most of the elements known to us are metals. *Examples* : Gold, silver, iron, copper, aluminium, tin, zinc, magnesium, lead, calcium, *etc.*

Properties of Metals :

1. Metals are usually shiny (lustrous) and hard (*Exception* : Sodium is a soft metal).
2. They are solids (*Exception* : Mercury is a liquid metal).
3. They are ductile, *i.e.*, they can be drawn or stretched into thin wires.
4. They are malleable, *i.e.*, they can be beaten into thin sheets (*Exception* : Zinc is brittle; on beating it breaks into pieces).

5. They are good conductors of heat and electricity. (*Exception* : Tungsten which is a poor conductor).
6. They have high melting and boiling points.
7. They produce a specific sound when struck, *i.e.*, they are sonorous substances.



Activity 1

Identify the metal which is used to make :

- (i) electric wires
- (ii) ornaments
- (iii) filament of bulb
- (iv) silvery foil over sweets
- (v) foils to wrap food
- (vi) pipes to supply water.

Non-metals

1. These are elements with dull surfaces, *i.e.*, they do not shine. *Exception* : Iodine and carbon (in the form of diamond and graphite) shine.
2. They are less in number as compared to metals.
3. Non-metals are either *soft solids*, [*Examples* : sulphur, phosphorus, iodine] or *gases* [*Examples* : oxygen, nitrogen, hydrogen, chlorine] (*Exception*: Bromine is the only liquid non-metal).
Note : Carbon exists as soft solid like charcoal, soot, coal and graphite and as hard solid like diamond.
4. Non-metals cannot be drawn into wires or beaten into thin sheets, *i.e.*, they are neither ductile nor malleable.
5. They are mostly brittle in nature.
6. Non-metals are bad conductors of heat and electricity. (Carbon as graphite is the only

ception since it is a good conductor of electricity).

They have low melting and boiling points except diamond and graphite.

They do not produce sound when struck. i.e. they are non-sonorous.



Do You Know ?

Diamond (carbon) though a non-metal is the hardest naturally occurring solid substance.

Table 4.1 Differences between metals and non-metals

Property	Metals	Non-metals
Boiling point	High	Low
Melting point	High	Low
Conductivity	Good conductor	Bad conductor
Density	High	Low
Metallic lustre	Shining	Dull surface
Malleability	Malleable	Non-malleable
Ductility	Ductile	Non-ductile
State	Solid except mercury	Solid, liquid, gas

Metalloids

These are the elements which are neither metals nor non-metals. They show some properties of metals and some properties of non-metals. Metalloids are solids. These include boron, silicon, arsenic, antimony, germanium, tellurium and polonium.

Noble or Inert Gases

These are gaseous elements that do not react chemically with other elements. As a result, they are known as *inert gases* or *noble gases*. They are found in air only in traces. There are six in number : helium, neon, argon, krypton, xenon and radon.

SYMBOLS OF ELEMENTS

The symbols of chemical elements are abbreviations that are used to denote chemical elements. It was Berzelius who first of all used English alphabets to represent the elements.

Each element is denoted by a symbol, which is usually the first letter of its name in English or Latin, written in capital.

Example : Oxygen is an element which is denoted by the symbol 'O'. Similarly, hydrogen is denoted by the symbol 'H'.

However, when the first letter of more than one element is same, the elements are denoted by two letters. The first letter is written in capital while the second is written in small.

Example : Carbon, calcium and cobalt are three such elements whose first letter is same i.e. C.

Thus carbon is denoted by the symbol 'C', calcium is denoted by two letters 'Ca' and cobalt is denoted by the symbol 'Co'.

If the first two letters of the elements are same, then for one of them symbol is taken from its Latin name.

Example : Cobalt and copper.

Cobalt is denoted by 'Co' while copper is denoted by 'Cu' taken from its Latin name Cuprum. Element iron is denoted by 'Fe' taken from its Latin name Ferrum.

The symbol is a short form that also represents an atom of a specific element [atom is the smallest unit of an element].

Elements mentioned in Table 4.2 are called first twenty elements because they occupy first 20 positions in the **Periodic Table**

systematic arrangement of elements in a regular form for their convenient study.

Names and symbols of first 20 elements

Symbol	Name	Symbol
H	Sodium	Na
He	Magnesium	Mg
Li	Aluminium	Al
Be	Silicon	Si
B	Phosphorus	P
C	Sulphur	S
N	Chlorine	Cl
O	Argon	Ar
F	Potassium	K
Ne	Calcium	Ca

IA	IIA	IIIA	IVA	VA	VIA	VIIA	Zero
H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca						

Part of Periodic Table.

Horizontal rows are called **periods** numbered by 1, 2, 3, 4 while vertical columns are called **groups** represented by letters I to VIII and zero.

Every teacher should use the Periodic Table to show the first 20 elements.

BIRTH OF THE ELEMENTS

The simplest element is hydrogen, which was the first to be formed shortly after the Big-Bang. It was followed by helium. All the elements now known to us are created in the heart of stars which scatter through space when the star explodes.

COMMON ELEMENTS

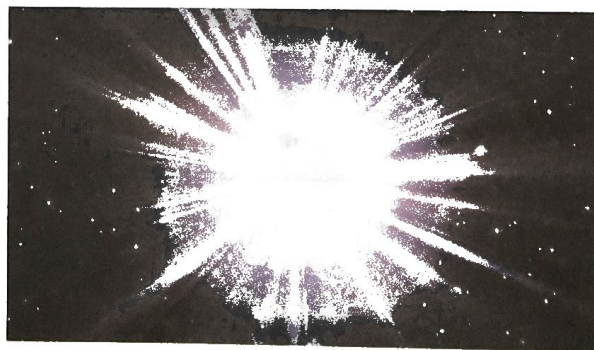
- In the universe** – Hydrogen and helium are the two most common elements.
- In the Earth's crust** – Oxygen is in greatest amount followed by silicon, aluminium and iron.
- In the atmosphere** – Nitrogen is the most abundant element.
- In the Human body** – Carbon, hydrogen and oxygen are the most common elements because they make up the different compounds in all the body cells.

COMPOUNDS

To understand the meaning of a compound, the following facts are to be considered.

- The 26 English alphabets make huge number of words with different combinations you read in a dictionary.
- The ten digits from 0-9 make infinite sets of numbers.
- Only a few basic units (building blocks) make a large number of objects and materials with various combinations.

That means most of the things known to us consist of combinations of different elements.



Exploding Star

09	September 2020						
Wk	M	T	W	T	F	S	S
36		1	2	3	4	5	6
37	7	8	9	10	11	12	13
38	14	15	16	17	18	19	20
39	21	22	23	24	25	26	27
40	28	29	30				

AUGUST 2020

DAY 244- 122 WEEK 36

MONDAY

31

APPOINTMENT / MEETING

Class - VII

Chap - 4 Elements, Compounds, Symbols and formula Part - 1
 Subject - Chemistry Date - 11-6-20

- ① What is pure substance?
- ② What is element?
- ③ Give the properties of element.
- ④ Name the classes of element.
- ⑤ What is metal? Give its properties.
- ⑥ What is nonmetal? Give its properties.
- ⑦ Give differences between metal and non metal.
- ⑧ What are metalloids? Give eg.
- ⑨ What are noble gases? Give eg.
- ⑩ What is periodic table?
- ⑪ What is group and period?

P. S. S.
11-6-20