

A. Elements and Compounds

INTRODUCTION

There are millions of substances in this world such as iron, aluminium, water, common salt, air, etc. They all are different from one another in their composition, properties and uses.

- They are made up of different kinds of matter.
- They may be pure and impure.

To study these substances accurately and conveniently, they have been classified on the basis of similarities and dissimilarities into three main classes : elements, compounds and mixtures.

Pure substances : Pure substances have a definite composition and a definite set of properties such as boiling point, melting point, density, etc. They are all homogeneous *i.e.*, their composition is uniform throughout the bulk. **Both elements and compounds are pure substances.**

Impure substances : Impure substances are made up of two or more pure substances mixed together in any proportion. They do not have any definite set of properties. They retain the properties of constituent substances.

They may be homogeneous or heterogeneous, *i.e.*, their composition is not uniform throughout the bulk. They are all mixtures, *e.g.* : air, sugar solution, sand and stone, etc.

Activity 1

Make a list of five pure and five impure substances which you use in your daily life.

You have already studied about pure substances, elements and compounds and symbols of some of the elements and compounds in your previous class (VI).

Let us first recall the two main classes of pure substances *i.e.* elements and compounds with the following activity.

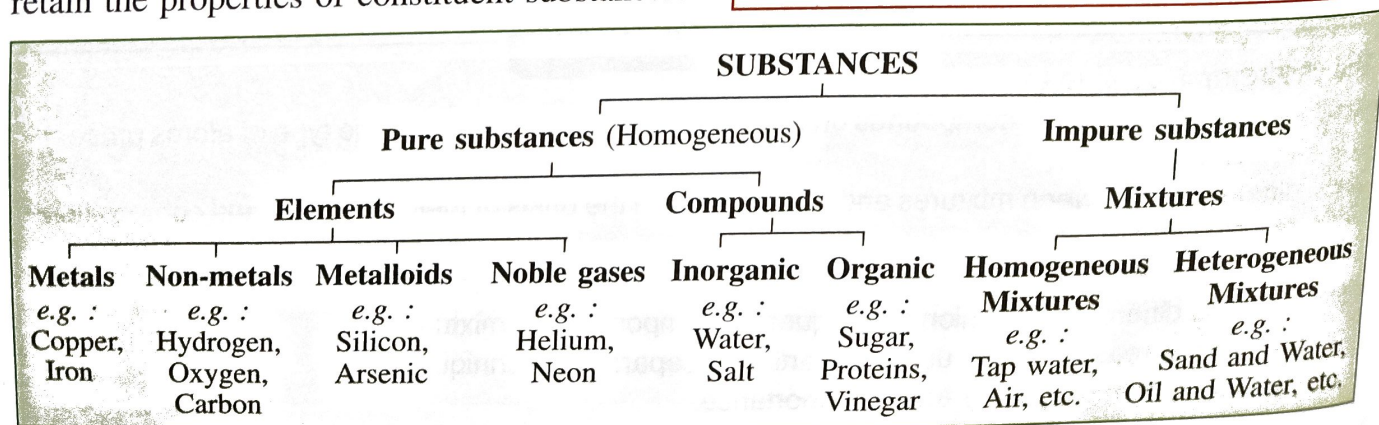
Activity 2

Following are the symbols and formulae for some of the elements and compounds.

Na, H₂, CO₂, NH₃, O₂, Fe, He, HCl, N₂, H₂O, FeS, Cl₂.

Separate them as elements and compounds and give their names.

What conclusion do you make on the basis of the above activity ?





Activity 3



Following is a list of some elements and compounds. Classify them as elements and compounds and form two separate groups.

Water, iron, sodium chloride, copper, plaster of paris, calcium oxide, aluminium, silicon, sodium sulphate, helium and sodium hydrogen carbonate.

ELEMENTS

Elements : An element is a pure substance that cannot be converted further into anything simpler than itself by any physical or chemical process. Thus, each element has its own unique properties.

Some of the examples are oxygen, hydrogen, sulphur, carbon, iron, gold, silver, etc.



Do You Know ?

Robert Boyle was the first scientist to use the term element in 1661.

Antoine Laurent Lavoisier (1743-94) was the first to establish experimentally useful definition of an element.

These elements are made up of extremely small particles called atoms which cannot be seen through naked eyes.

Atoms are the smallest units of an element.

Examples : A piece of aluminium sheet contains only aluminium atoms and oxygen molecules contain only atoms of oxygen. Atoms of oxygen and aluminium are different from each other.

At present 118 elements are known. Of these, 92 are natural elements (most of them are found in combined state in the earth's crust) while rest 26 have been artificially

created. Some elements are solids, some are liquids and some are gases. In fact, elements are the basic pure substances from which millions of substances are made.



Do You Know ?

Of the 118 elements, known to us, some are radioactive in nature, because they emit radiations which may be harmful.

CLASSIFICATION OF ELEMENTS

Based on their properties, elements have been 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, copper, aluminium, iron, zinc, tin, lead, etc.



Do You Know ?

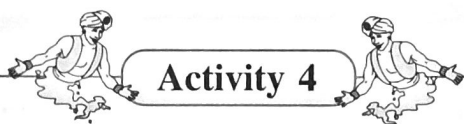
- Chalk, milk and our bones contain a common metal **calcium**.
- Chlorophyll contains **magnesium** which helps to capture the energy from sunlight for photosynthesis by plants.
- In mammals **iron** is found in red blood cells in haemoglobin which carries oxygen in the body.
- Chocolate wrappers are made of aluminium (metal).

Non-metals : Non-metals are very less in number in comparison to metals. Excluding inert gases, there are only eleven non-metals known to us. *Examples* : Hydrogen, oxygen, nitrogen, carbon, chlorine, sulphur, phosphorus, fluorine, bromine, iodine and astatine.

Metalloids : These elements show some properties of metals and some properties of

non-metals. They are hard solids. *Example* : Boron, silicon, germanium, arsenic, antimony tellurium and polonium.

Inert or noble gases : These elements do not react chemically with other elements or compounds, so they are known as noble or inert gases. They are found in air, in traces. They are only six in number — helium, neon, argon, krypton, xenon and radon.



Activity 4

Following is a list of elements. Select metals, non-metals, metalloids and noble gases from the list : gold, graphite, chlorine, sodium, arsenic, helium, sulphur, xenon, antimony.

SYMBOLS OF ELEMENTS

Now let us revise the method by which each element was given a symbol (studied in class VI).

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

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

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

Example : (i) Carbon and cobalt are elements whose first letter is 'C'. *Carbon* is denoted by the symbol 'C'. *Cobalt* is denoted by two letters 'Co'. (ii) Boron is represented by symbol 'B' while bromine is denoted by 'Br' and barium by 'Ba'.

3. These symbols also represent an atom of that element.

Example :

- (i) 'H' represents the element hydrogen as well as one atom of hydrogen.
- (ii) 'C' represents the element carbon as well as one atom of carbon.

4. Some symbols have been taken from the names of elements in Latin, German or Greek.

Example : The symbol of iron is Fe from its latin name Ferrum, sodium is Na from Natrium, potassium is K from Kalium. Copper is Cu from Cuprum etc. Therefore, each element has a name and a unique chemical symbol.

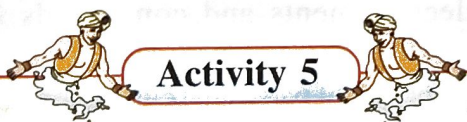
Now-a-days, IUPAC (International Union of Pure and Applied Chemistry) approves names of elements.

Table 3.1 : Names and symbols of some elements derived from their English name.

Name in English	Symbol	Name in English	Symbol
Hydrogen	H	Helium	He
Nitrogen	N	Neon	Ne
Oxygen	O	Argon	Ar
Carbon	C	Krypton	Kr
Sulphur	S	Radon	Rn
Phosphorus	P	Xenon	Xe
Boron	B	Chromium	Cr
Chlorine	Cl	Cobalt	Co
Fluorine	F	Radium	Ra
Bromine	Br	Manganese	Mn
Iodine	I	Nickel	Ni
Arsenic	As	Barium	Ba
Platinum	Pt	Uranium	U
Germanium	Ge	Silicon	Si

Table 3.2 : Names and symbols of some elements derived from Latin and Greek languages.

Name in English	Name in Latin/Greek	Symbol
Sodium	Natrium	Na
Potassium	Kalium	K
Magnesium	Magnesia	Mg
Aluminium	Alumen	Al
Calcium	Calx	Ca
Iron	Ferrum	Fe
Copper	Cuprum	Cu
Zinc	Zinke	Zn
Silver	Argentum	Ag
Gold	Aurum	Au
Mercury	Hydragyrum	Hg
Lead	Plumbum	Pb
Tin	Stannum	Sn
Antimony	Stibium	Sb



Activity 5

Write the names and symbols of first twenty elements you have studied in class VI.

Compounds : A compound is a pure substance formed by the chemical combination of two or more elements in a fixed ratio by mass.

Hence, it can be broken down into simpler substances by only chemical means.

Example : Common salt is a compound chemically known as sodium chloride, that can be broken

down into its constituent elements sodium and chlorine only by chemical means.

Similarly water, a compound, can be broken down into more simpler substances hydrogen and oxygen from which it is formed.

Some other common compounds are sand, carbon dioxide, sugar, chalk, washing soda, alcohol, etc.

The smallest unit of a compound is molecule.

Properties of molecules of one compound are different from that of molecules of other compounds.

CHARACTERISTICS OF COMPOUNDS

- The properties of compounds are entirely different from those of its constituent elements.

Example : Sodium is a highly reactive poisonous metal while chlorine is a greenish yellow gas but the compound formed by chemical combination of these two elements *i.e.* sodium chloride, known as common salt, is added to food and is completely safe to eat.

- Compounds can be broken down into their constituent elements only by chemical means, not by physical means.
- Compounds have fixed composition of their own.
- Energy is either absorbed or liberated during the formation of a compound.
- A compound is represented by a definite chemical formula.

3.3 Table showing some common compounds, elements present in them and their formulae

Compounds	Elements present	Formulae
1. Water	Hydrogen and oxygen	H ₂ O
2. Sodium chloride (common salt)	Sodium and chlorine	NaCl
3. Magnesium oxide	Magnesium and oxygen	MgO
4. Calcium oxide (quick lime)	Calcium and oxygen	CaO
5. Carbon dioxide	Carbon and oxygen	CO ₂
6. Sodium carbonate (washing soda)	Sodium, carbon and oxygen	Na ₂ CO ₃
7. Sodium bicarbonate	Sodium, hydrogen, carbon and oxygen	NaHCO ₃
8. hydrated calcium sulphate (plaster of paris)	Calcium, sulphur, hydrogen and oxygen	CaSO ₄ ·1/2H ₂ O
9. Cane sugar	Carbon, hydrogen, oxygen	C ₁₂ H ₂₂ O ₁₁
10. Silica (sand)	Silicon and oxygen	SiO ₂
11. Glucose	Carbon, hydrogen, oxygen	C ₆ H ₁₂ O ₆
12. Sodium sulphate	Sodium, sulphur, oxygen	Na ₂ SO ₄

EXERCISE - I

- Write the symbols of helium, silver, krypton, antimony, barium.
- Write the names of the following elements Na, C, Kr, U, Ra, Fe, Co.
- Define :
(a) Elements (b) Compounds
- Name the main metal present in the following:
(a) Haemoglobin (b) Chalk
(c) Chlorophyll (d) Chocolate wrappers
- Give *four* examples of non-metallic elements.
- What do you understand by
(a) Metalloids (b) Noble gases
Give *two* examples of each.
- Select elements and compounds from the following list :
Iron, plaster of paris, chalk, common salt, copper, aluminium, calcium oxide, cane sugar, carbon, silica, sodium sulphate, uranium, potassium carbonate, silver, carbon dioxide.

07

2020 JULY

DAY 189 - 177 WEEK 28

TUESDAY

07

July 2020

Wk	M	T	W	T	F	S	S
27			1	2	3	4	5
28	6	7	8	9	10	11	12
29	13	14	15	16	17	18	19
30	20	21	22	23	24	25	26
31	27	28	29	30	31		

APPOINTMENT / MEETING

Chapter-3

Date-2.6.20

Class - VII

8 Element, Compound and mixture

- ① What is pure and impure substance?
- ② What are elements? Give eg.
- ③ What are atoms?
- ④ What are metals? Give eg.
- ⑤ What are nonmetals? Give eg.
- ⑥ What are metalloids? Give eg.
- ⑦ What are inert gases? Give eg.
- ⑧ What is symbol?
- ⑨ What are the significance of the symbol of Carbon 'C'?
- ⑩ Give the symbols for the following
Uranium, Germanium, Arsenic,
Silicon, Sodium, Potassium.

NOTES

SUBJECT / MEETING

Give the Latin name for the following

Sodium, Copper, Tin, Lead, Silver, Iodine.

What are compounds? Give an example.

What is a molecule?

Give the characteristics of a compound.

Give the formula of the following compounds

Sugar, Glucose, Silica, Plaster Paris.

P. Sar
2.6.20