

## Matter

## 4. Elements

## CONCEPT 1

## LESSON GUIDE

## COMBINING ELEMENTS

## PRECISE LEARNING POINTS

## KNOW

I know how to describe the difference between an element and a compound.

## APPLY

I can apply my knowledge to explain how elements combine to make compounds.

## EXTEND

I can extend my knowledge of compounds to be able to predict its structure from its chemical formula.

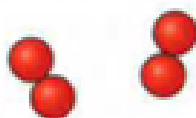
## NOTES

**Elements** can combine together to form new **compounds** that have **different properties** from the original elements.

In Topic 5.1 (and Topic 5.3) we see how the periodic table lists all of the elements. Elements are the building blocks of materials. Each element is made up of only one type of **atom**. Here is a list of elements and their symbols that you need to be familiar with:

Sometimes atoms of the same element combine to form a **molecule**. Molecules of an element may contain two to thousands of the same type of atom joined together. Examples are hydrogen and oxygen. A hydrogen molecule contains 2 hydrogen atoms joined together and has the formula  $H_2$ . It is the same for oxygen, 2 oxygen atoms are joined together, which has the formula  $O_2$ .

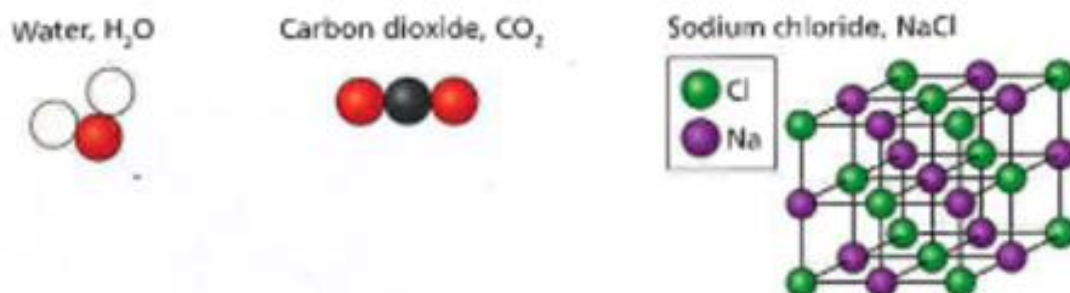
When atoms of different elements combine they form a compound. A compound is a pure substance made up of two or more elements strongly joined together.

Hydrogen molecules,  $H_2$ Oxygen molecules,  $O_2$ 

Name of element	Symbol
hydrogen	H
oxygen	O
nitrogen	N
carbon	C
iron	Fe
zinc	Zn
copper	Cu
sulphur	S
aluminium	Al
iodine	I
bromine	Br
chlorine	Cl
sodium	Na
potassium	K
magnesium	Mg

The **chemical formula** of the compound represents which elements are present in the compound as well as the ratio of atoms in each unit of the compound.

The chemical formula for water is  $H_2O$ . This formula tells us that there are 2 hydrogen atoms and 1 oxygen atom in each molecule of water. Look at the diagram below for water, the 2 white circles represent hydrogen and the red circle represents oxygen.



There are rules that help us to understand and write the names of the compounds:

1. When non-metals form a compound, their name changes to end in '-ide'.

2. The name of the compound sometimes gives us a clue to the elements that make it up and the ratio they are in. For example, carbon dioxide,  $CO_2$ , has 1 carbon and 2

oxygen atoms. The '**di**' in '**dioxide**' tells us that 2 oxygen atoms are included. In carbon **monoxide**, the '**mono**' means that there is only 1 oxygen attached to the carbon. Carbon monoxide has the formula  $CO$ .

Element	Compound name	Example	Proportion of atoms
chlorine	chloride	sodium chloride, $NaCl$	1 sodium: 1 chlorine
oxygen	oxide	carbon dioxide, $CO_2$	1 carbon: 2 oxygen

3. If the compound name ends in '**ate**' the compound will contain **oxygen**.

Compounds known as **carbohydrates**, which are an essential energy source, contain **carbon**, **hydrogen** and oxygen. Can you work out why they are called carbohydrates?

The table below shows the names of some common compounds that you will come across in your science courses at Kings'. Look carefully at their name and formula, and the subsequent information that tells us.

Compound	Formula	Elements present	Proportion of atoms
sodium hydroxide	$NaOH$	sodium, oxygen, hydrogen	1:1:1
sodium nitrate	$NaNO_3$	sodium, nitrogen, oxygen	1:1:3
copper sulfate	$CuSO_4$	copper, sulfur, oxygen	1:1:4
copper carbonate	$CuCO_3$	copper, carbon, oxygen	1:1:3