

# 9 Element



**What**

**you will learn**

**The elements**

**Atoms and molecules**

**Metals and non-metals**

# The elements

In Science, an element is a substance that is made of only one kind of atom. There are just over 100 different elements. Each has its own kind of atom. Around 90 elements have been found in nature. The rest have been made by scientists. So that means there are 90 different kind of atoms of which these elements are made.

Most elements are solids. Ten elements are gases at room temperature, and only two elements are liquids.

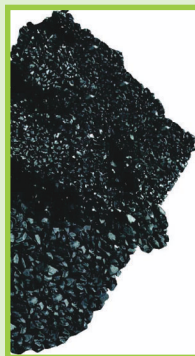


## ★ Carbon

Coal, charcoal and even the 'lead' in your pencil are all made from the element carbon. Carbon is a solid at room temperature. Its melting point is very high, nearly 4000C.

Carbon is usually black and soft, but one form of carbon is colourless and very hard.

What is it?



### Do you Know?

The word atom is derived from the Ancient Greek word *atomos*, meaning 'indivisible'.

## ✦ Sulphur

Yellow crystals of sulphur are often found in rocks around volcanoes. Sulphur melts easily but it also catches fire, giving off choking fumes. Since ancient times it has been mixed with carbon and other chemicals to make gunpowder. Today it is used in making rubber hard and medicine.

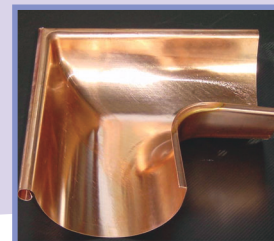


## ✦ Copper

Copper is usually found in nature in association with sulphur.

Copper is one of the oldest metals ever used and has been one of the important materials in the development of civilisation.

Because of its properties like it is a good conductor of heat and electricity, high ductility, malleability and its resistance to corrosion, copper has become a major industrial metal, ranking third after iron and aluminium in terms of quantities consumed.



## ✦ Oxygen

Oxygen is a gas in the air. You need oxygen when you breathe.  
**Oxygen is the most common element on Earth.**



**1** Fill in the blanks using the following words.

**sulphur    90    element    atoms**

Everything is made up of \_\_\_\_\_. There are about \_\_\_\_\_ different kinds of atoms. A substance that is made up of one kind of atom only is called and \_\_\_\_\_.



### Ideas

☞ *Element is a substance made up of only one kind of atom.*

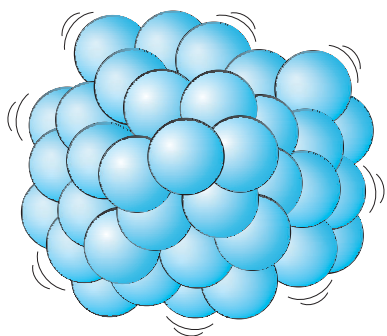
☞ *Around 90 elements have been found in nature.*

# Atoms and molecules

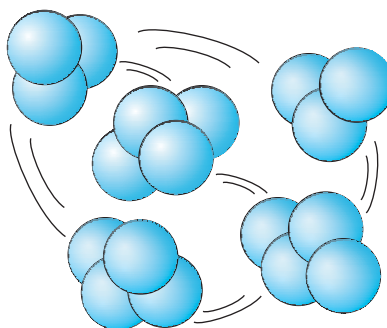
All materials are made up of particles that are too small to see, even with a microscope.

How many particles do you think there are on the head of this pin?

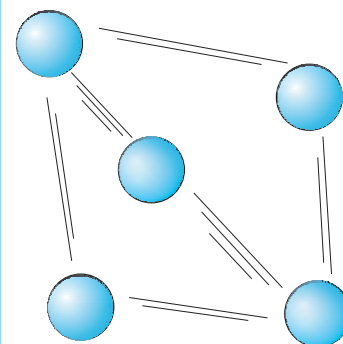
Millions and millions.



In solids, the particles are closely packed and stuck together.



In liquids, the particles are closely packed but free to move.



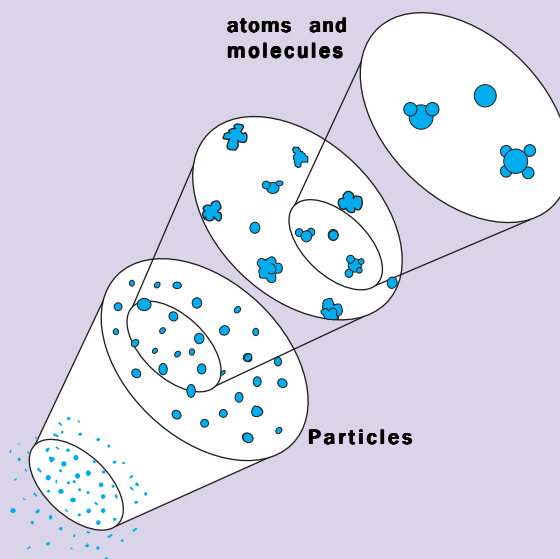
In gases, they are widely spaced.

## ★ Magnify a lot more

You probably drew these particles as little round balls in your book. But imagine you could make them enlarge, so you could see them more clearly. You would find that different particles come in different shapes and sizes.

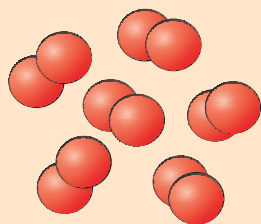
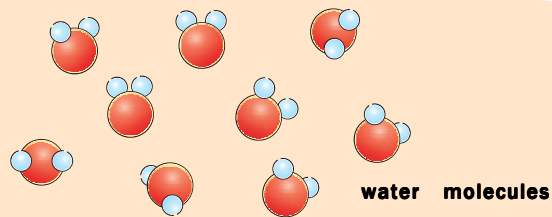
The clumpy- looking particles in the picture are called molecules. They are made up of smaller round particles called atoms.

Different molecules are made of different collections of atoms, so they have different shapes.

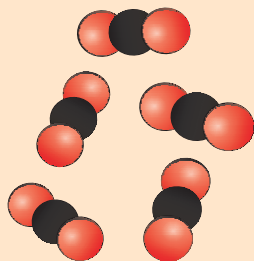


## Shape of molecules

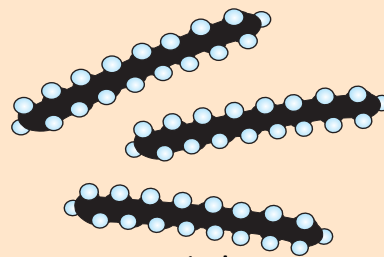
The molecules in any one substance are always the same. Water molecules are made from three atoms. They look rather like famous cartoon mouse!



oxygen



carbon dioxide



petrol

## Breaking up molecules

If you splash some water, you get lots of little droplets of water. If you could break up these little droplets again and again, you would get tinier and tinier droplets of water.

Imagine you could break the tiny droplets up into molecules of water. Now imagine breaking the molecules up into separate atoms. You would no longer have water! The water molecule is the smallest particle of water that you can get. If you break up the water molecule, you change it into different substances.



### Ideas

→ Many substances are made up of particles called **molecules**.

→ Different substances have different molecules.

→ Molecules are made up of smaller particles called **atoms**.

→ If you break up a molecule, you no longer have the same substance.



1 Fill in the blanks using the following words.

**atoms different molecule smaller same**

The smallest particle in many substances is a ..... . All the molecules of one substance are the ..... Different substances have ..... molecules. Molecules are made up of ..... particles called .....

# Metals and non-metals

Scientists have classified elements into two main groups, **metals** and **non-metals**. Out of all the elements that occur naturally, seventy of them are metals and they are solids except mercury.

All metals conduct electricity and heat, and have a shiny metallic appearance.

The remaining 22 elements are non-metals. These generally do not conduct electricity or heat well. Some non-metals, like carbon and sulphur, are solids. Others, like chlorine and oxygen, are gases.



Copper



Gold



Silver



Chlorine Gas



Bromine



Mercury

## Using metals

**Gold** is used to make jewellery and ornaments because of its shiny appearance.

**Silver** reflects light so well that it is plated onto glass to make mirrors.

**Aluminium** is used to make aircraft body because it is light and resists corrosion.

**Tin** is used for coating food cans. The tin coating will protect the steel (which is used to make the cans) from being corroded by the food.

**Steel** conducts heat well and has a high melting point. Hence, it is suitable for making cooking utensils.



Silver



Gold



Aluminium



Steel



Tin

## Using non-metals

**Sulphur** is used for making insecticides, for making medicinal drugs, for hardening rubber that is used in making car tyres.

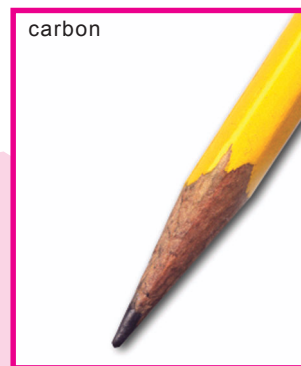
**Hydrogen** is used as rocket fuel, for making margarine, for filling weather balloons.

**Oxygen** is used for respiration, for oxyacetylene flames for welding.

**Carbon** is used for the formation of living tissues, as a fuel and in pencil leads.



Sulphur



carbon



Oxygen cylinder



Hydrogen (waether balloons)

## A shorthand for elements

We use symbols containing one or two letters as a kind of shorthand for the elements. The first letter is always a capital letter. Some symbols are obvious from the name of the element. Others are based on older names for the elements that are no longer used.

### Metals

<b>Al</b>	Aluminium
<b>Ag</b>	Silver
<b>Au</b>	Gold
<b>Fe</b>	Iron
<b>Cu</b>	Copper

### Non-metals

<b>H</b>	Hydrogen
<b>N</b>	Nitrogen
<b>C</b>	Carbon
<b>Si</b>	Silicon



- 1 List the properties of metallic and non - metallic elements.
- 2 Why is carbon an element?
- 3 How many kinds of atoms are in a lump of copper? Explain.



## Ideas

More than three- quarters of all the elements are metals.

Metals are used for different purposes according to their characteristics.

Every element has its own symbol.

# MARIE CURIE

Born in 1867



Marie Sklodowska was born in 1867 in Poland. Although she came from a poor family, she went to Paris to study science at the University. She was often hungry and cold, but she still managed to become the best student in her class.

She married a French physicist called Pierre Curie when she was 28. Together they worked with a rock called pitchblende. It was interesting because it gave out rays that could go through solid objects. They called these rays radioactivity. Marie Curie wanted to find out what was causing this radioactivity.

The Curies' laboratory was just a horrible damp shed. Nevertheless, after eight years, the two scientists managed to separate two new radioactive elements from the pitchblende. They called the two elements polonium (after Poland) and radium.

In 1906 Pierre Curie was knocked down in the road by a horse-drawn carriage and killed. Marie Curie went on to become a professor at the Sorbonne (a university in Paris). She won two Nobel prizes for science and her work became famous throughout the world.

One of the two elements that she discovered, radium, is now used to save many cancer patients. The radiation from radium kills the cancer cells.

*(J. Boyd & W.WhiteLaw 1989 John Murray)*