

DAY 4**TOPIC: ELEMENTS AND COMPOUNDS- NAMES, SYMBOLS AND FORMULAE.**

Aims :

- identify correct chemical symbols for certain elements (as prescribed)
- identify correct chemical formulae for certain compounds (as prescribed)

Elements' names and symbols

Notes:

Every substance on earth is made from an element or a combination of elements (compound). There are about **116** known elements, and each element has its own symbol. The symbol is a letter (or letters) that is used and understood by all scientists all over the world, no matter what language they speak, and what they call the elements.

For year 9 you don't need to know all 116 elements and their symbols. The table below shows the elements, that you should be familiar with in year 9. You are to learn the names and the symbols of the elements

Element	Symbol
Hydrogen	H
Nitrogen	N
Sodium	Na
Sulphur	S
Calcium	C
Iron	Fe

Element	Symbol
Carbon	C
Oxygen	O
Magnesium	Mg
Chlorine	Cl
Copper	Cu

Compounds' Names and Formulae

When the atoms of different elements bond, they form a completely new substance called a compound. Eg. Water is a compound that is formed by chemically joining the two different elements, Hydrogen and Oxygen.

The formula of a compound tells you what elements were chemically joined together to form the compound.

For example Sodium Chloride has the formula **NaCl**, this shows that it is formed by chemically joining 1 atom of Sodium (Na) and 1 atom of Chlorine (Cl).

Water has the formula **H₂O**. This shows that water is formed by chemically joining 2 atoms of Hydrogen (H₂) with 1 atom of Oxygen (O).

Activity 1

Complete the table below by writing down which elements the compound is made of, then choose the correct chemical formulae, for the compound from the list below, and write it into your table. (The first one is already done for you)

CO₂, NaCl, H₂O, FeS, CuSO₄, CuCl₂

Compound Name	Elements in the compound	Chemical formulae
Water (dihydrogen oxide)	2 Hydrogen atoms + 1 Oxygen atom	H ₂ O
Carbon Dioxide		
Iron Sulfide		
Sodium Chloride		
Copper Chloride		
Copper sulphate		

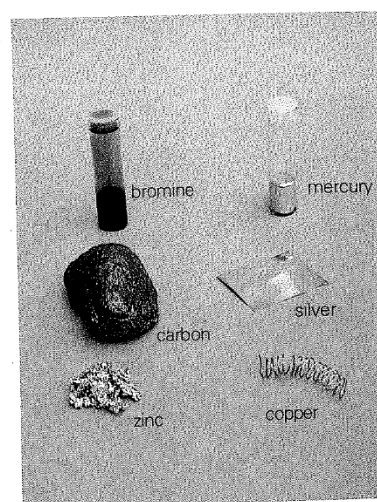
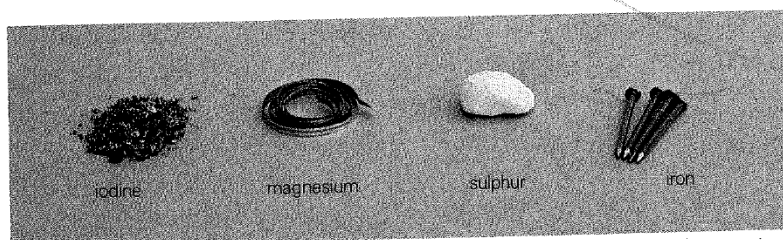
Activity 2

Read Hand out pages 44-47 below then answer questions on particles 7 and 8.

Each element has a **symbol**. 'H' is the symbol for hydrogen. 'He' is the symbol for helium. You will find a list of all the elements, with their symbols, on a chart called the **Periodic Table of the Elements**. You can see a Periodic Table, and photographs of a few of the elements, below. Some elements can't be seen in a photograph. Oxygen, hydrogen and nitrogen are three of the elements which are invisible gases.

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	+ more than 30 other elements														

The Periodic Table



Did you know?

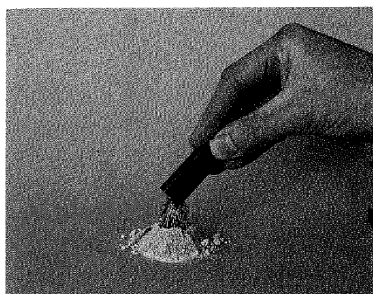
- 1 What is: a) an element b) the Periodic Table? ▲
- 2 Why is carbon an element? ▲
- 3 How many kinds of atom are in a lump of copper? Explain. ▲
- 4 Most elements are solids, a few are gases, two are liquids. Divide the elements mentioned on this page into 3 sets, solids, liquids and gases.
- 5 Carbon is a black solid.
Describe: a) sulphur b) mercury c) copper.
- 6 Which of the elements in the photographs is used: a) in jewellery b) in thermometers c) in plumbing?
- 7 **Try to find out:** what some of the other elements are used for.

- Diamond and charcoal are two different forms of the element carbon.
- The biggest diamond ever found weighed almost 600 g. That meant that it contained about 30 million, million, million, million atoms. But it only contained carbon atoms.

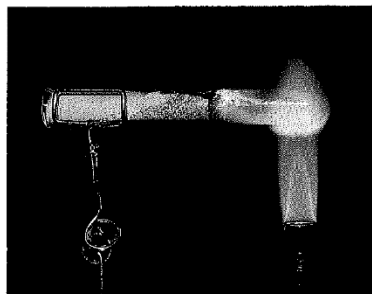
4.4 Compounds

Starting
off 2

Iron and sulphur are two of the elements.



1 You can mix powdered iron and powdered sulphur without making a new chemical. You can still see the sulphur in the mixture. You can still pull the iron away with a magnet.



2 But if you heat a mixture of iron and sulphur, a glow passes through the mixture. This time a new chemical is formed. (This is best done in a fume cupboard.)



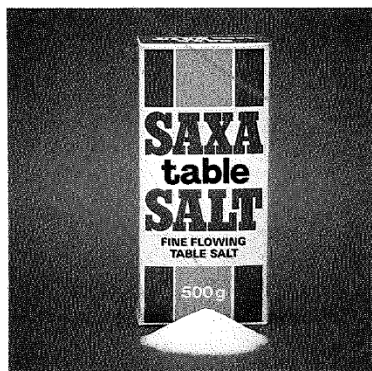
3 The new chemical is called **iron sulphide**. It contains sulphur (but you can't see any yellow in it). It contains iron (but you can't pull it away using a magnet).

Mixtures, chemical reactions, and compounds

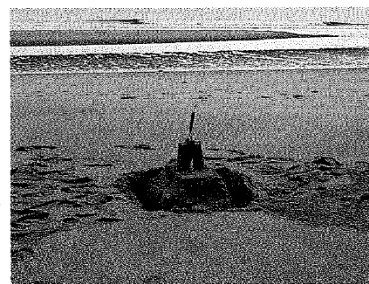
Whenever two or more substances are mixed together without joining up, a mixture is formed. The substances can usually be separated easily. The iron and sulphur powders make a mixture because the atoms don't join up. But when the mixture is heated, a **chemical reaction** takes place. The iron and sulphur atoms do join up. That's when the new chemical is formed.

Iron sulphide is called a **compound** because it contains iron atoms joined to sulphur atoms.

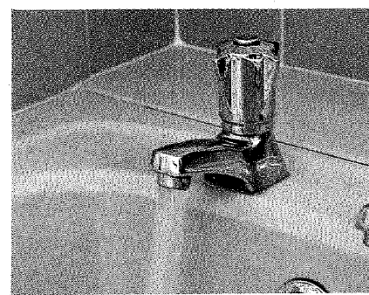
Most chemicals are compounds. The photographs shown here illustrate three common compounds. A compound's name may tell you which elements are joined up in it. **Copper iodide**, for example, contains **copper** and **iodine**.



Common salt (sodium chloride)



Sand (silicon dioxide)



Water (hydrogen oxide)

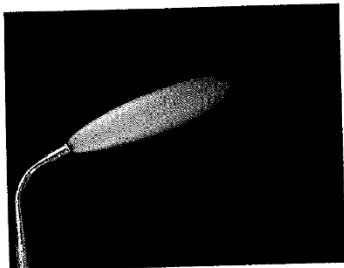
- 1 What is a compound? ▲
- 2 Heating iron and sulphur produces a chemical reaction. What happens in the reaction? ▲
- 3 Why is it easier to separate atoms from a mixture than from a compound?
- 4 Which elements are joined up in: a) sand b) salt c) water?
- 5 **Try to find out:** the name of the main compounds found in: a) ruby b) rust c) the 'rotten egg' gas.

Did you know?

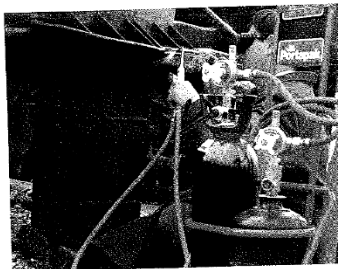
- Over one million chemical compounds are known.
- Some compounds contain five or more different elements joined together.

4.4 Joining up makes a difference

Going
further



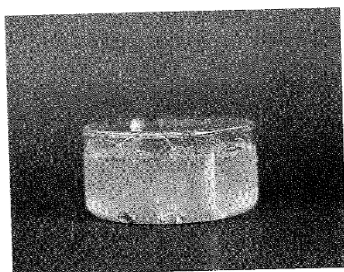
Hydrogen is an element. It is a gas which burns well. It can even explode when you light it.



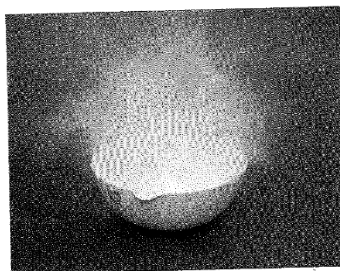
Oxygen is another element. It is a gas which helps things to burn.



Hydrogen and oxygen join to give the compound **hydrogen oxide**. You know it better as water. It puts out fires.



The element **calcium** bubbles and fizzes in water.



Phosphorus is a rather nasty element. It catches fire in air when it gets dry.



Calcium, phosphorus and oxygen are joined in the compound **calcium phosphate**, found in teeth. Luckily it does not fizz in water or burn when dry!

As you can see, compounds are usually very different from the elements which make them up. And that's just as well. Your body is made up of a number of elements, some of which are very dangerous. These dangerous elements include chlorine (a poisonous gas), iodine (a poisonous solid), sodium and potassium (which fizz in water) as well as calcium, hydrogen and phosphorus. Fortunately, your body contains these elements joined up in harmless compounds!

- 1 a) What is the chemical name for water? ▲
b) How is water different from the elements which make it up? ▲
- 2 a) Which chemical compound is found in teeth? ▲
b) What would happen to your teeth if they were made of the element calcium? Why?
c) Milk is good for making teeth because it contains calcium. Do you think that milk contains calcium as an element or a compound? Explain your answer.
- 3 **Try to find out:** what phosphorus element is used for.

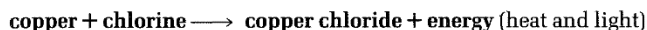
Did you know?

- Bones contain calcium phosphate.
- A compound can be more dangerous than the elements which make it up. Hydrogen sulphide – rotten egg gas – is much more poisonous than either hydrogen or sulphur.

4.4 Energy changes in chemical reactions

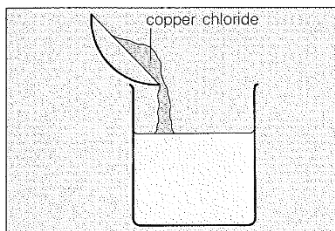
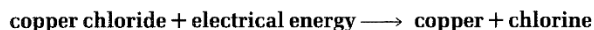
*For the
enthusiast*

When a piece of very thin copper foil is put into chlorine gas, there is a flash of flame. A chemical reaction takes place. A blue green solid called **copper chloride** is produced. Heat and light energy are produced, too. You can write down what happens in the reaction like this:

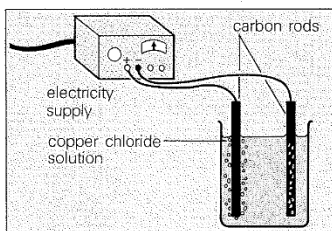


This 'shorthand' way of writing down what happens is called a **chemical equation**.

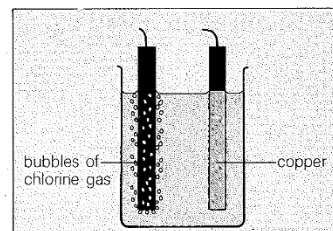
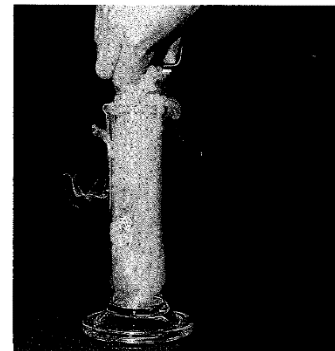
The heat and light are produced when the copper and chlorine atoms join together. If you want to split up the copper chloride to get the copper and chlorine atoms back again, you have to supply energy. Electrical energy will do this:



1 The copper chloride is dissolved.



2 Carbon rods are put in the solution and connected up to an electrical supply.



3 As the current passes, solid copper and chlorine gas are produced.

In many reactions between elements, energy is produced.

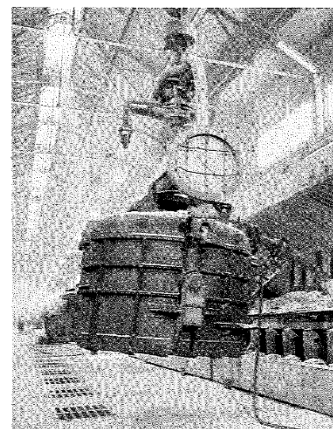
In these reactions, energy may have to be supplied to start the reaction off. But once it has started, a lot more energy is produced.

To split up compounds, energy is needed. The energy is needed to separate the joined atoms.

Did you know?

- Aluminium, calcium, sodium and magnesium are all produced from their compounds by using electricity.
- A reaction in which electricity is used to break up a compound is called an **electrolysis**.

- 1 How do you know that a chemical reaction takes place when thin copper foil is put in chlorine? (Give 2 pieces of evidence.) ▲
- 2 Why is energy needed to split up a compound? ▲
- 3 What is meant by an electrolysis? ▲
- 4 a) Describe what you would do to produce copper and chlorine from copper chloride. ▲
b) Is this reaction an electrolysis? Explain your answer.
- 5 **Try to find out:** how silver plate is put on teaspoons.

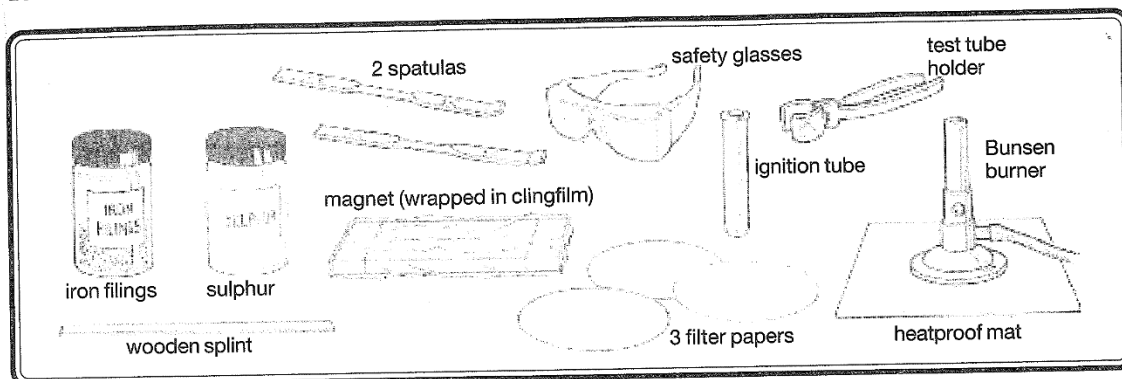


A huge amount of electricity is used to release aluminium from its compounds. This factory is in Sweden, where electricity is cheap

Particles 7

Mixing and joining elements

You will need:



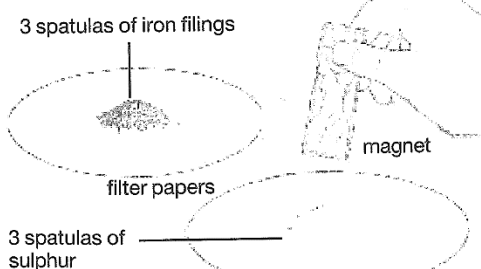
Elements are made of tiny particles called atoms. All the atoms in an element are the same type. The atoms of different elements are not the same.

Mixing elements

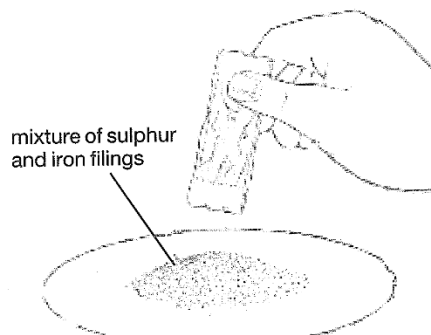
Q1 Copy this table.

Element	Appearance	Test with a magnet
sulphur		
iron filings		
iron and sulphur mixed		

- 1 Put three spatulas of sulphur on one filter paper. Then put three spatulas of iron filings on another filter paper. Record in the table the appearance of the two elements. Test each with a magnet. Record your results.



- 2 Using a wooden splint, mix together the iron filings and sulphur. Test the mixture with a magnet. Record in the table the result and the appearance of the mixture.



- Q2 Explain how a mixture of iron filings and sulphur can be separated.
- Q3 Can you still see the iron filings and the sulphur in the mixture?
- Q4 Copy this information.

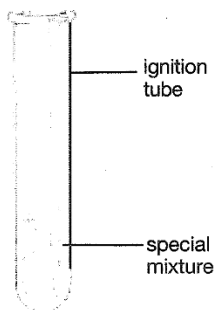
Iron filings and sulphur can form a **mixture**. The atoms of the elements have not joined and the elements are easy to separate.

YEAR 9

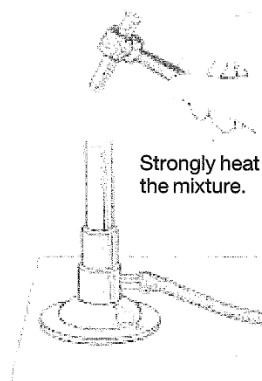
Joining elements

7

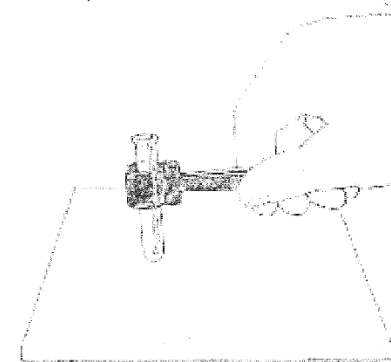
- 1** Collect some of the special mixture of iron and sulphur from your teacher.



- 2** Wear safety glasses.

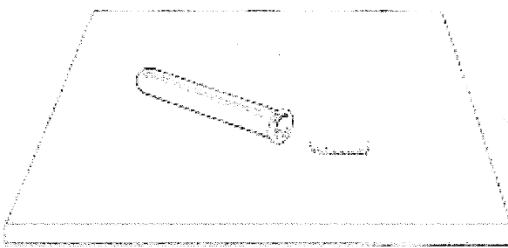


- 3** When the mixture starts to glow, hold the tube over the heatproof mat.

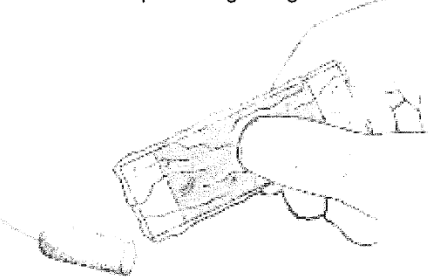


Q5 What can you see happening in the tube?

- 4** Leave the tube to cool on the heatproof mat. Then tap the tube so the contents fall out on to the mat.



- 5** Try to separate the iron and sulphur using a magnet.



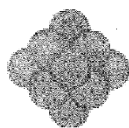
Q6 What does the heated mixture look like?

Q7 Can you still see the sulphur and iron filings in the heated mixture?

Q8 Can the iron and sulphur still be separated as before?

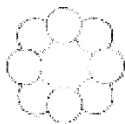
Q9 Copy this information.

Atoms of iron and sulphur have joined to form a new substance, a **compound**. The compound is called iron sulphide. The elements cannot be separated easily.

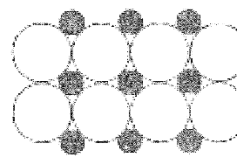


iron atoms

+



sulphur atoms



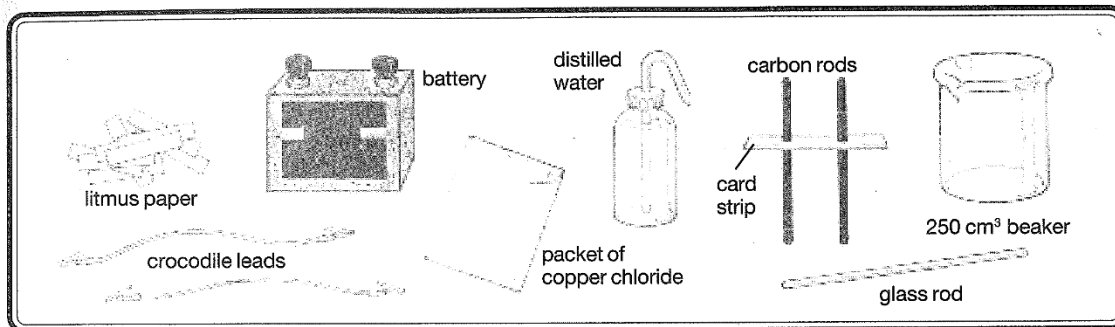
iron sulphide

NEW WORDS: mixture, compound

Particles 8

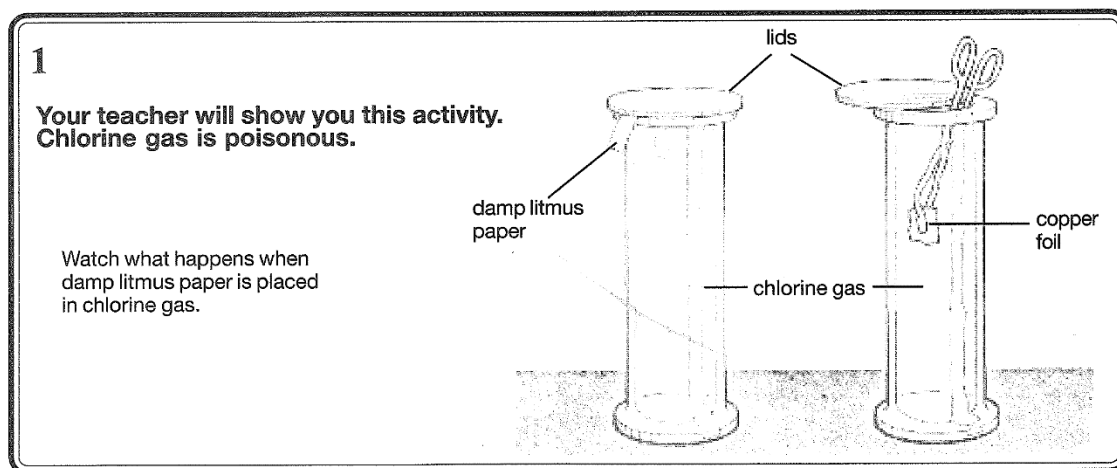
Elements and compounds

You will need:

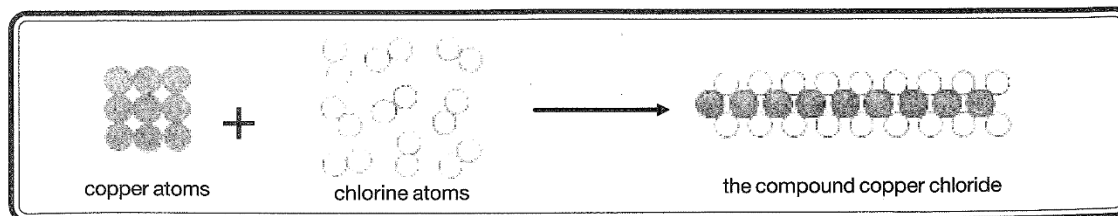


Making a compound

In a compound, the atoms of two or more elements are joined together.



- Q1** Describe the colour and smell of the gas.
- Q2** What effect does chlorine have on damp litmus paper?
- Q3** Describe what happens when copper foil is lowered into chlorine gas.
- Q4** What has happened to the atoms of chlorine and copper?
- Q5** Suggest a name for the compound formed.
- Q6** Copy this diagram.



YEAR 9

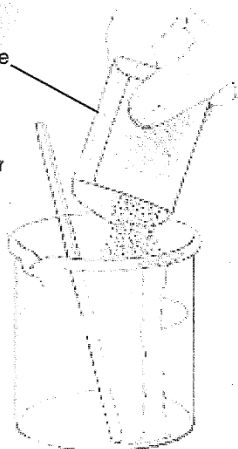
Breaking a compound

1

copper chloride

Add the copper chloride to a beaker half filled with distilled water.

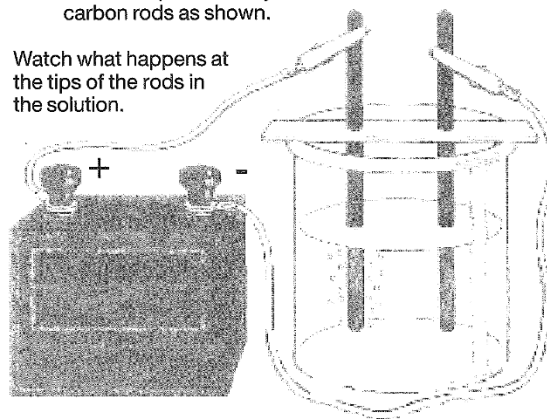
Stir with a glass rod.



2

Connect up the battery to the carbon rods as shown.

Watch what happens at the tips of the rods in the solution.

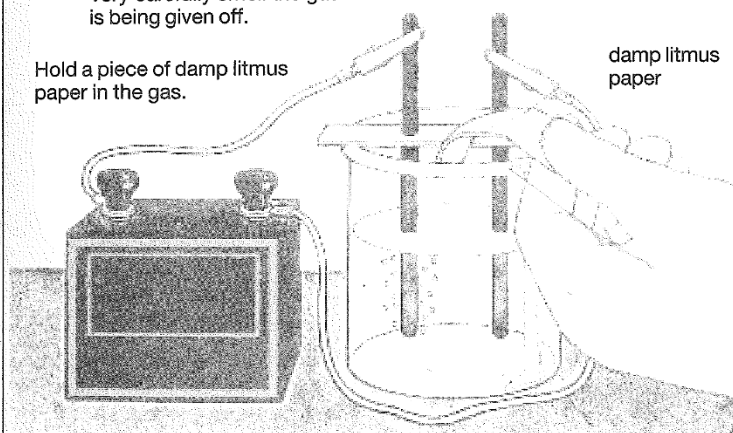


3

Very carefully smell the gas that is being given off.

Hold a piece of damp litmus paper in the gas.

damp litmus paper



Q7 Describe what happens at the tip of each carbon rod.

Q8 What effect does the gas given off have on damp litmus paper?

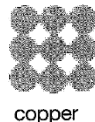
Q9 If the apparatus is left connected, the battery will run down. Why?

Q10 Copy and complete this information.

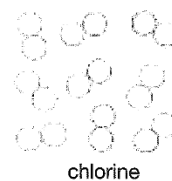
A solution of copper chloride is broken down by electrical energy into a gas called _____ and a brown metal called _____. Energy is needed to break a compound into its _____.



energy



+



Q11 Which elements do these compounds contain?

a) iron oxide; b) zinc sulphide; c) lead chloride.