

Tutor support material

Entry Level

Edexcel Entry Level Certificate in Science
(8938)

Unit 5: What are Things Made From?

May 2008

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Contents

Introduction	1
Worksheets for Unit 5: What are Things Made From?	3

Introduction

This Tutor support material accompanies the Edexcel Entry Level Certificate in Science specification and has been designed to help teachers prepare for first teaching of the qualification.

This document is for Unit 5: What Are Things Made From? and includes worksheets to aid the teaching of this unit.

Additional documents are available for all other units within the Edexcel Entry Level Certificate in Science. There is also a *Teacher's guide* document available from the Edexcel website, which gives more information on specialist language, assessment of practical skills and information on *How Science Works*.

Attention is drawn to the need for safe practice when students carry out laboratory experiments or observe demonstrations. Centres are responsible for the overall risk assessment of experimental work undertaken by learners. Reference must be made to COSHH regulations and any specific local education authority restrictions.

Relevant advice can be obtained from the following publications.

- *CLEAPSS Laboratory Handbook* (available from CLEAPSS School Science Service, website www.cleapss.org.uk)
- *Control of Substances Hazardous to Health Regulations* (HSE, 2005) ISBN 0717629813
- *Hazcards* (2004 update available from CLEAPSS School Science Service)
- *Topics in Safety, Third Edition* (ASE January, 2001) ISBN 0863573169

Worksheets for

Unit 5: What are Things Made From?

Elements

Your teacher will show you some elements.

Look carefully at each element and fill in the table below.

Do you think it is a metal or a non-metal?

Element	Solid, liquid or gas	What it looks like	Metal or non-metal

Do you know the names of any other elements?

Missing words

Here are three words.

solids

metals

non-metals

Use them to complete the following sentences.

Most metals listed in the table above are _____.

Many of the _____ are hard with shiny surfaces.

Many gases are _____.

The periodic table

A standard way of arranging elements is to put them in a table. The elements are placed in order of the masses of their atoms. The table is called a periodic table.

Class activity

1 Look at a periodic table.

You will notice that every element has been given a number.

This is called the **atomic number**.

Hydrogen atoms have the smallest mass

Hydrogen atoms have an atomic number of 1.

Uranium atoms have one of the largest masses.

Uranium atoms have an atomic number of 92.

2 Find out how many of the elements in the table are known to members of the class.

Try to give a use for each of these elements.

Chemical symbols

Every element has a symbol (or letter code).

The symbol is made of one or two letters.

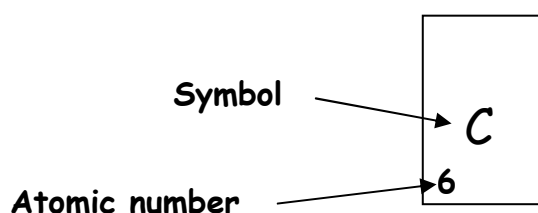
Atoms of every element can be identified from their symbol and their atomic number.

For example, an atom of hydrogen is written as ${}_1\text{H}$.

An atom of oxygen is written as ${}_8\text{O}$.

An atom of aluminium is written as ${}_{13}\text{Al}$.

The diagram shows how to represent an atom of carbon.



Making a periodic table

1 Cut out the 20 boxes showing the symbol and atomic numbers for the elements.

${}_1\text{H}$	${}_2\text{He}$	${}_3\text{Li}$	${}_4\text{Be}$	${}_5\text{B}$	${}_6\text{C}$	${}_7\text{N}$	${}_8\text{O}$
${}_9\text{F}$	${}_{10}\text{Ne}$	${}_{11}\text{Na}$	${}_{12}\text{Mg}$	${}_{13}\text{Al}$	${}_{14}\text{Si}$	${}_{15}\text{P}$	${}_{16}\text{S}$
${}_{17}\text{Cl}$	${}_{18}\text{Ar}$	${}_{19}\text{K}$	${}_{20}\text{Ca}$				

2 Paste the boxes that you cut out in the correct position in the grid that follows.

The full periodic table is made in the same way.

The elements become heavier as you go along the rows from the top left hand corner.

Elements lower in the periodic table have heavier atoms than those higher up.

A closer look at some elements

1 Shade the metals in your periodic table in one colour.
Use a different colour for the non-metals.

2 In your periodic table are all the metals in the same block? Which is the lightest element?

3 Gold is element 79. Is gold a heavy metal?

4 Which is the heaviest metal?

Did you know?

92 elements occur naturally.

Another 15 can be made.

Elements can be grouped as metals or non-metals.

Here are the names of some common elements:

iron, copper, gold, magnesium, aluminum, sulphur, carbon, silicon, nitrogen, oxygen, helium and neon.

Making fact files

For each of these elements, and any others that interest you, make up a fact file. You will find plenty of information on the internet or in science books.

List in your file:

- the name of each element
- is it a metal or a non-metal
- what it looks like
- its main properties
- its uses.

Elements — 1

Elements can be solids, liquids or gases at room temperature.

92 elements are found in nature.

Elements can be grouped as **metals** and **non-metals**.

A practical test for metals and non-metals

What you need

Iron nail.

Small lump of sulphur.

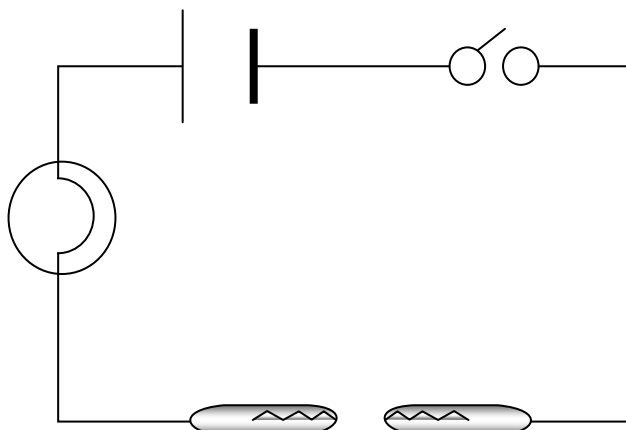
Aluminium strip.

A beaker containing warm water.

Copper wire.

Magnesium ribbon.

Carbon rod.



An electric circuit with a battery, switch, bulb and two crocodile clips as shown with a gap between them.

What you do

1 Build the circuit shown.

Leave a gap between the crocodile clips.

2 Grip each end of an iron nail with the clips.

This completes the circuit.

The bulb will light up if the nail conducts electricity.

3 Write down what happens in the table on the next page.

4 Write down the appearance of the nail in the table.

5 Repeat the test by replacing the nail with the other elements.

This test shows which elements are good conductors of electricity.

Elements – 2

Now you will test these elements to see whether they are good heat conductors.

- 6 Pour warm water into a beaker until it is about 1 cm from the top.
- 7 Hold each element in turn so that the bottom is dipping into the warm water.
- 8 Decide whether heat passes rapidly through each element to your finger.
- 9 Record your findings in the table below.

Element	Solid, liquid or gas	Colour	Shiny or dull	Conducts electricity (bulb lights)	Conducts heat	Metal or non-metal
Iron						
Copper						
Sulphur						
Magnesium						
Aluminium						
Carbon						

Details of some elements

Questions

1 Which simple test can you use to decide whether a certain element is a metal or non-metal?

2 Sulphur is a poor conductor of electricity.
What type of element do you think sulphur is?

3 Copper is a metallic element.
Name the smallest particle present in a piece of copper wire.

4 Is copper a good conductor of heat?

Properties of metals and non-metals

Decide whether the following statements are true or false.

Statement	True or False?
Most metallic elements are not solid	
Most non-metals do not conduct electricity	
Most metallic elements are shiny	
Most metallic elements are not hard	
Metallic elements conduct electricity	
Most non-metals do not conduct heat	
Metallic elements do not conduct heat	
Many non-metals are gases	

The light bulb

An electrical light bulb contains two elements in a glass bulb.

A gas called argon surrounds the tungsten filament.

Which of these elements is a metal and which is a non-metal?

Try to explain your answer.

Testing metals and non-metals

Your teacher will provide you with some different materials.
Take one of the materials and do the tests below.
Put your results in the table at the bottom of this page.

- 1 Test whether the material allows heat to pass along it.
Dip one end of the piece of material in warm water (**care**).
After one to two minutes, hold the other end.
Does it feel warm?
- 2 Test whether the material conducts electricity.
You are given a battery, lamp and connecting wires.
Join the connecting wires to the ends of the material.
Does the lamp light up?
- 3 Test the material to see if it is magnetic.
Place one end of the magnet on the material.
See if you can pick it up.
If a magnet can pick it up it is magnetic.

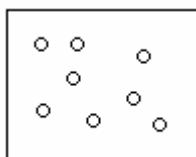
Test the other materials in the same way.
Complete the table.

Name of material	Does it conduct heat?	Does it conduct electricity?	Is it magnetic?

Elements, compound and mixtures — introduction

- Everything in the universe is made up of very small particles.
- These small particles are called **atoms**.
- Atoms are the building blocks of the universe.

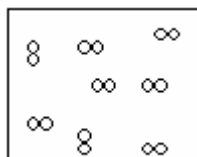
Substances that contain only one type of atom are called **elements**.



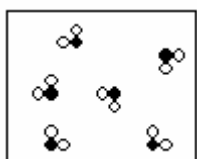
Each circle represents one type of atom.

There are more than 100 different types of elements.
Element cannot be separated into simpler substances.

When one type of atom join together they form groups called **molecules**.

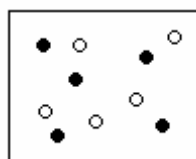


Two or more different types of atom can join together.
This forms the molecules of a **compound**.



The white circles represents one type of atom.
The black circles represent a different type of atom.

Different types of atoms may be mixed together to form a **mixture**.
The different types of atoms are not joined together in a mixture.



Keywords

atom

element

molecule

compound

mixture

Sorting out elements, compounds and mixtures

Here is a list of substances.

aluminium	iron sulphide	mayonnaise	polythene
baking powder	iron	hydrochloric acid	sulphur
carbon	milk	magnesium oxide	wood
oxygen	lemonade	copper sulphate	gold
air	water	carbon dioxide	mercury

The substances are elements, compounds or mixtures.

Put each substance in the correct column in the table below.

Element	Compound	Mixture

Group activity

Make a poster to show the difference between elements, compounds and mixtures.

You can use the substances from your table or find your own examples.

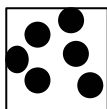
Particle pictures of elements, mixtures and compounds

Particle pictures can help you to understand the differences between elements, mixtures and compounds.

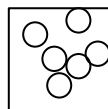
Elements are made up of very small particles called atoms.

Atoms of one element are different to atoms of another element.

Elements

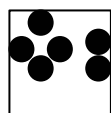


Particles (atoms) of iron



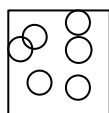
Particles (atoms) of sulphur

Mixtures



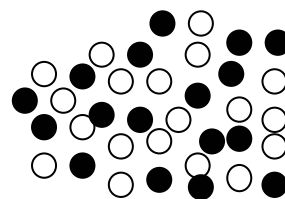
Iron

+



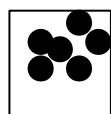
Sulphur

mixing



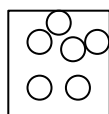
mixture

Compounds



Iron

+

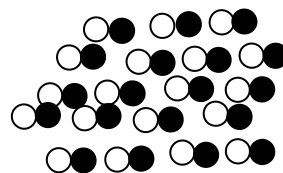


Sulphur

chemical
reaction



HEAT



compound

Mixtures and compounds

Differences between mixtures and compounds

Here are some words used in this unit.

elements mixture compound chemical different

Use these words to complete the sentences below.

A word may be used more than once.

A compound is made up of two or more _____.

A compound has _____ properties from the properties of its elements.

A compound is made by a _____ reaction.

The elements in a _____ cannot be separated by physical means, eg using a magnet.

A _____ can contain different elements and/or compounds mixed together.

A mixture is not made by a _____ reaction.

A mixture can be separated into _____ parts by physical means.

Elements, compound and mixtures — activity

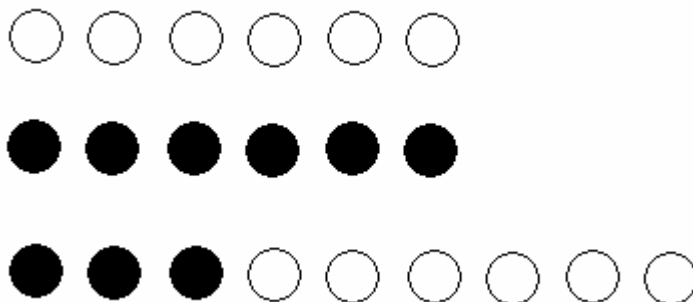
What you need

9 black circles.

Scissors.

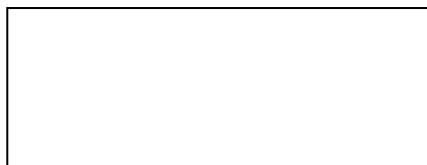
12 white circles.

Glue.



What you do

- 1 Cut out the black circles and white circles.
A **white** circle represents an **oxygen** atom.
A **black** circle represents a **carbon** atom.
- 2 Paste six black circles in the first box to show carbon atoms.
- 3 Write *carbon atoms* underneath the box.
- 4 Oxygen molecules contain two atoms of oxygen.
Paste six white circles in the second box to show oxygen molecules.
- 5 Write *oxygen molecules* under the second box.
- 6 A molecule of carbon dioxide contains one carbon atom and two oxygen atoms. Paste the remaining circles in the third box to show carbon dioxide molecules.
- 7 Write *carbon dioxide molecules* below the third box.



Looking at the elements iron and sulphur — 1

What you need

Iron filings.

Beaker.

Mixture of iron and sulphur.

Sulphur powder.

Water.

Bar magnet (wrapped in plastic).

Dilute hydrochloric acid.

Hand lens (optional).

Sheet of paper.

What you do

A. Tests on the elements

- 1 Place a small amount of iron filings on the sheet of paper.
Write down their appearance in the table on the next page.
- 2 Move the magnet around underneath the paper.
Write down what happens in the table on the next page.
- 3 Add a small amount of iron to water in a beaker.
Write down whether the filings float or sink in the table.
- 4 Pour off the water leaving the iron behind.
Carefully add a small amount of dilute hydrochloric acid to the iron.
Write down what happens in the table on the next page.

SAFETY PRECAUTIONS

Wear safety goggles and carry out the reaction in a fume cupboard.

- 5 Repeat tests 1, 2, 3 and 4 with sulphur in place of the iron.
Write down what happens in the same table.

Looking at the elements iron and sulphur — 2

Results

Substance	Appearance (what it looks like)	Effect of magnet	Float/sink in water	Reaction with dilute acid
Iron				
Sulphur				
Iron and sulphur mixture				
Compound of iron and sulphur				

B. Tests on the mixture of iron and sulphur

Carry out tests 1, 2, 3 and 4 from the previous experiment on the mixture of iron and sulphur.

Write down what happens in the table above.

Looking at the elements iron and sulphur — 3

C. Tests on a compound of iron and sulphur

You will produce a compound of iron and sulphur by making the two elements react together in a chemical reaction. This can be done by heating the mixture. This reaction must be done in a fume cupboard as a dangerous gas is produced.

What you need

A mixture containing fine iron filings (7g) and powdered sulphur (4g).

Dilute hydrochloric acid.

Stand and clamp.

Pyrex test tube.

Bunsen burner.

Safety glasses or goggles.

Access to a fume cupboard.

Heat proof mat.

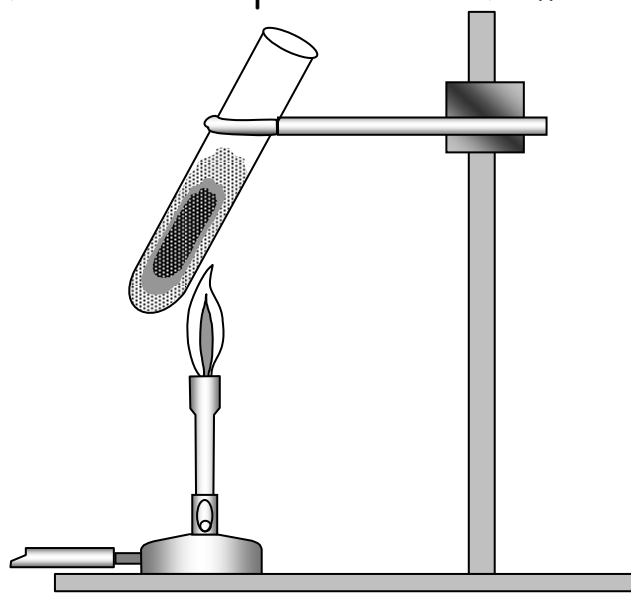
SAFETY PRECAUTIONS

Wear safety goggles and carry out the reaction in a fume cupboard.

What you do

- 1 Place sufficient amount of the mixture into the test tube so that when it is tilted, as shown in the diagram, it reaches the middle of the test tube.

Make sure there is an air space above the mixture.



Looking at the elements iron and sulphur — 4

- 2 Clamp the tube at its open end and heat it at its midpoint using a Bunsen burner.
- 3 When you see a red glow in the tube stop heating and note what happens.
- 4 If any unreacted mixture remains, reheat the tube to complete the reaction.
- 5 Let the tube and its contents cool.
- 6 Gently tap out the residue from the tube on to a heatproof mat. Let it cool.
This residue is a new substance called iron sulphide.
- 7 Look at the residue using a microscope or hand lens. Write down its appearance in the same table as before.
- 8 Test the compound with a magnet. Write down what happens in the same table.
- 9 See if the compound floats or sinks in water as before. Write down what happens in the same table.
- 10 **DANGER! THIS MUST BE CARRIED OUT IN A FUME CUPBOARD USING ONLY A SMALL AMOUNT OF THE RESIDUE.**

Transfer a small quantity of the residue to a clean test tube and add dilute hydrochloric acid.
- 11 Write down what happens in the same table as before.

Iron and sulphur — missing words

Here is a list of words.

not compound can elements mixture different

Use the words to complete the following sentences.

Iron and sulphur are _____.

Iron sulphide is a _____.

The properties of iron sulphide are _____ from the properties of iron and sulphur.

It is easy to separate iron and sulphur from a _____ of iron and sulphur.

It is _____ easy to separate iron and sulphur from the compound iron sulphide.

A mixture of iron and sulphur _____ be separated by physical means.

Questions on iron and sulphur

1 What do the separate tests on iron and sulphur show about the properties of these elements?

2 What can you see when you look at a mixture of iron and sulphur? _____

3 Do the properties of iron and sulphur change when the elements are made into a mixture? _____

4 What can you see when you look at the compound made from iron and sulphur?

5 How do the properties of the compound iron sulphide differ from the properties of the mixture? _____

6 How easy would it be to separate the compound iron sulphide into iron and sulphur? _____

7 Complete the word equation to describe the chemical reaction between iron and sulphur when they are heated together.

Iron + Sulphur \longrightarrow

Wordsearch

COMPOUNDS

SEPARATION

SULPHUR

METALS

CHEMICAL REACTION

IRON

MIXTURES

CONCENTRATION

ELEMENT

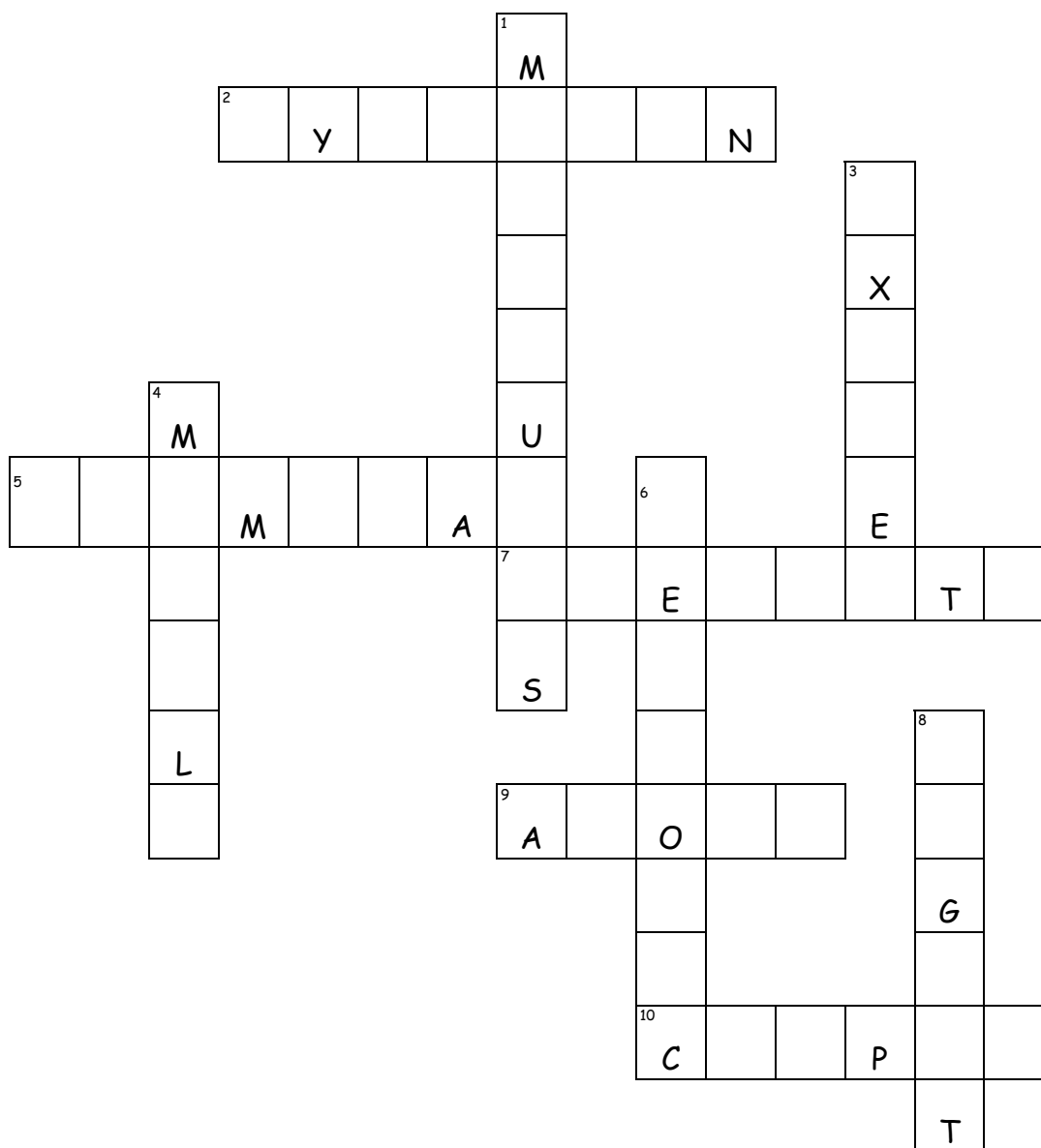
CONDUCT

PERIODIC TABLE

ATOM

S	D	Q	Y	U	M	O	T	A	P	K	F	S	D	Y	J	K	R
U	O	H	S	W	V	T	A	Y	R	S	E	H	G	L	E	C	V
L	Q	C	H	E	M	I	C	A	L	R	E	A	C	T	I	O	N
P	J	D	R	G	J	K	L	M	U	G	V	F	F	R	S	N	M
H	K	O	L	B	G	Y	O	T	B	O	A	H	D	F	W	C	N
U	D	N	C	Q	W	A	X	J	D	A	H	I	S	V	S	E	B
R	R	C	L	O	P	I	E	G	H	P	L	R	A	B	D	N	V
A	N	B	K	K	M	I	N	U	T	E	S	F	Q	G	F	T	C
R	O	S	H	F	W	P	H	S	W	V	M	G	W	T	G	R	X
E	I	R	G	W	E	U	O	L	K	R	E	B	E	K	H	A	Z
A	T	T	F	E	Q	D	M	U	F	K	T	H	R	F	J	T	L
M	A	Y	D	R	T	I	R	O	N	J	A	V	T	E	K	I	K
G	R	U	S	T	H	D	Q	S	F	D	L	I	Y	D	U	O	J
S	A	C	O	N	D	S	V	R	T	F	S	V	U	N	B	N	H
K	P	Q	S	F	I	J	D	B	F	M	G	K	I	D	P	T	D
P	E	R	I	O	D	I	C	T	A	B	L	E	O	G	L	K	R
I	S	L	C	O	N	D	U	C	T	O	L	H	P	H	K	J	P
G	F	K	V	A	W	T	N	E	M	E	L	E	J	S	J	H	D

Letter ladder



Across

- 2 Water contains atoms of oxygen and
- 5 A compound is made by a reaction.
- 7 What do we call substances that are made from one type of atom?
- 9 Everything in the universe is made from these small particles.
- 10 Electrical wires are made from this element.

Down

- 1 What is formed when atoms join together?
- 3 This element is a very important gas that we need to breathe in to live.
- 4 This is what we call elements on the right side of the periodic table.
- 6 This table has all the elements arranged in order.
- 8 Iron can be separated from a mixture using this.

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