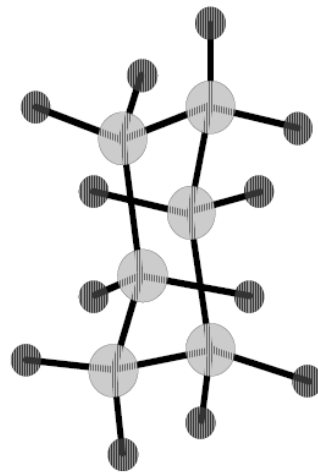
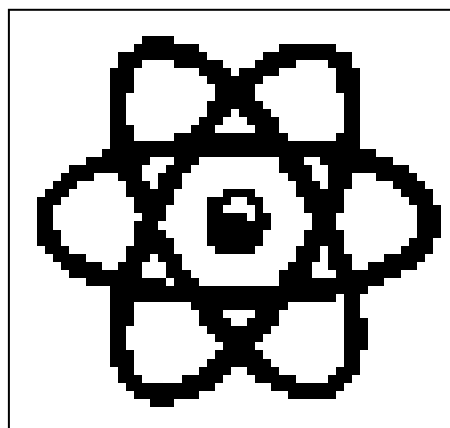
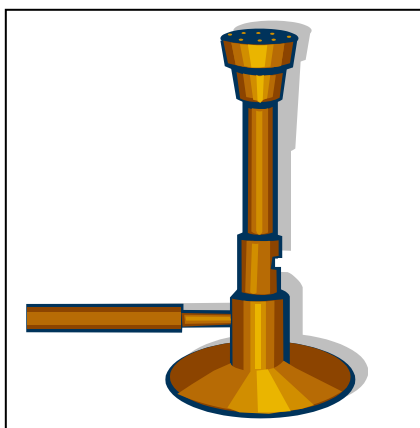


Task Booklet
Year 8 Science



Elements and Reactions

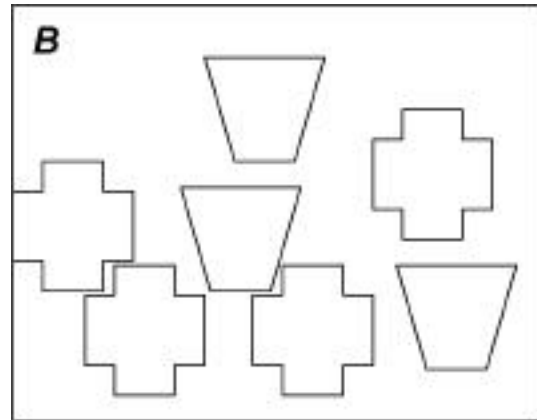
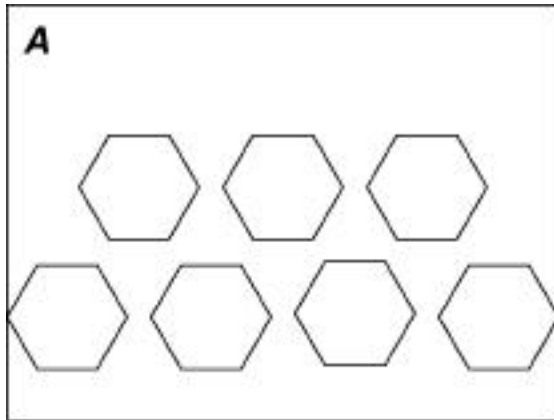


Student Name:
Teachers Name:

Task One - The Structure of Elements

Core

1. Elements can be described as the building blocks of all materials. Which of the diagrams below (A or B) is the best representation of an element?



2. If you split a piece of an element again and again you would eventually end up with very small particles that could not be pulled apart. What are these particles called? Circle the correct answer below.

pieces *bricks* *atoms* *grains*

Standard

3. Which of the following things are *materials*? Circle them.

<i>Chair</i>	<i>Wood</i>	<i>Polystyrene</i>
<i>Glass</i>	<i>Egg</i>	<i>Horse</i>
<i>Iodine</i>	<i>Tree</i>	<i>PVC</i>
<i>Gold</i>		

4. Which of the following are made from just one element? Circle them.

<i>Copper wire</i>	<i>Platinum ring</i>	<i>Glass</i>
<i>Wooden spoon</i>	<i>jar</i>	<i>Titanium bolt</i>
<i>Rubber horse</i>	<i>Aluminium</i>	<i>saucepan</i>
<i>Gold bar</i>		

Extension

5. Which of the following are elements? Circle them.

Wood

Rubber

Polythene

Marble

Zinc

Brass

Iron

Carbon

Chlorine

Copper

Sugar

Paper

6. Are there any materials which are not made up of elements?

7. Roughly how many elements are there? (You might need to look this one up in a book or do a little research on the internet).

8. All elements have a symbol which is like a shorthand version of their name. Match up the chemical symbols with the names of the elements.

S

carbon

N

oxygen

O

iron

C

sulphur

Fe

sodium

Na

nitrogen

Task Two - Types of Elements

Core

Look at the information on seven elements below. Use it to answer the first three questions.

Iron	Fe	Metal	Magnetic
Copper	Cu	Metal	Non-magnetic
Oxygen	O	Non-metal	Non-magnetic
Nitrogen	N	Non-metal	Non-magnetic
Sulphur	S	Non-metal	Non-magnetic
Titanium	Ti	Metal	Non-magnetic
Sodium	Na	Metal	Non-magnetic

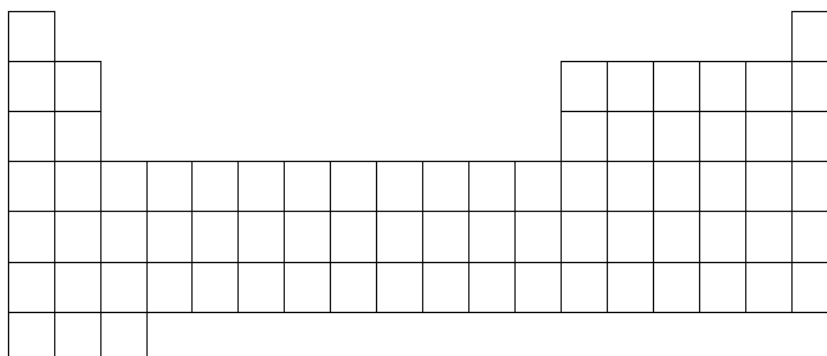
1. Name the elements which are metals.

2. Are most metals magnetic or non-magnetic?

Standard

3. Which of the elements would be gases at 20°C?

4. The diagram below represents the periodic table.



- (a) Where in the periodic table are the metals to be found – on the right or the left hand side?

(b) What is listed in the periodic table?

(c) In the periodic table, what is a group?

(d) Add numbers to the periodic table to show the eight groups.

(e) In the periodic table, what is a period?

5. Write 'T' or 'F' in the boxes to show whether the statements below are true or false.

Argon is an element

Water is an element

*Wood is only made of one type of atom
Water is made of hydrogen and oxygen atoms*

Carbon is made of only one type of atom

*There are over a thousand elements
Elements can be found in the periodic table*

Extension

You may need to do a little research to answer these questions.

6. Where on the periodic table are the non-metals?

7. Are there any metals that are NOT solid at 20°C? If so, which?

8. Which elements are magnetic?

Task Three - Elements and Compounds

Core

Look at the information below. Use it to answer the questions.

Gold, iron and magnesium are elements which conduct electricity.

Sulphur and phosphorus are elements which do **not** conduct electricity.

When iron and sulphur are heated together, they react to form a new substance called iron sulphide.

1. (a) From the substances named above give: (i)

the name of a metal

(ii) the name of a non-metal element

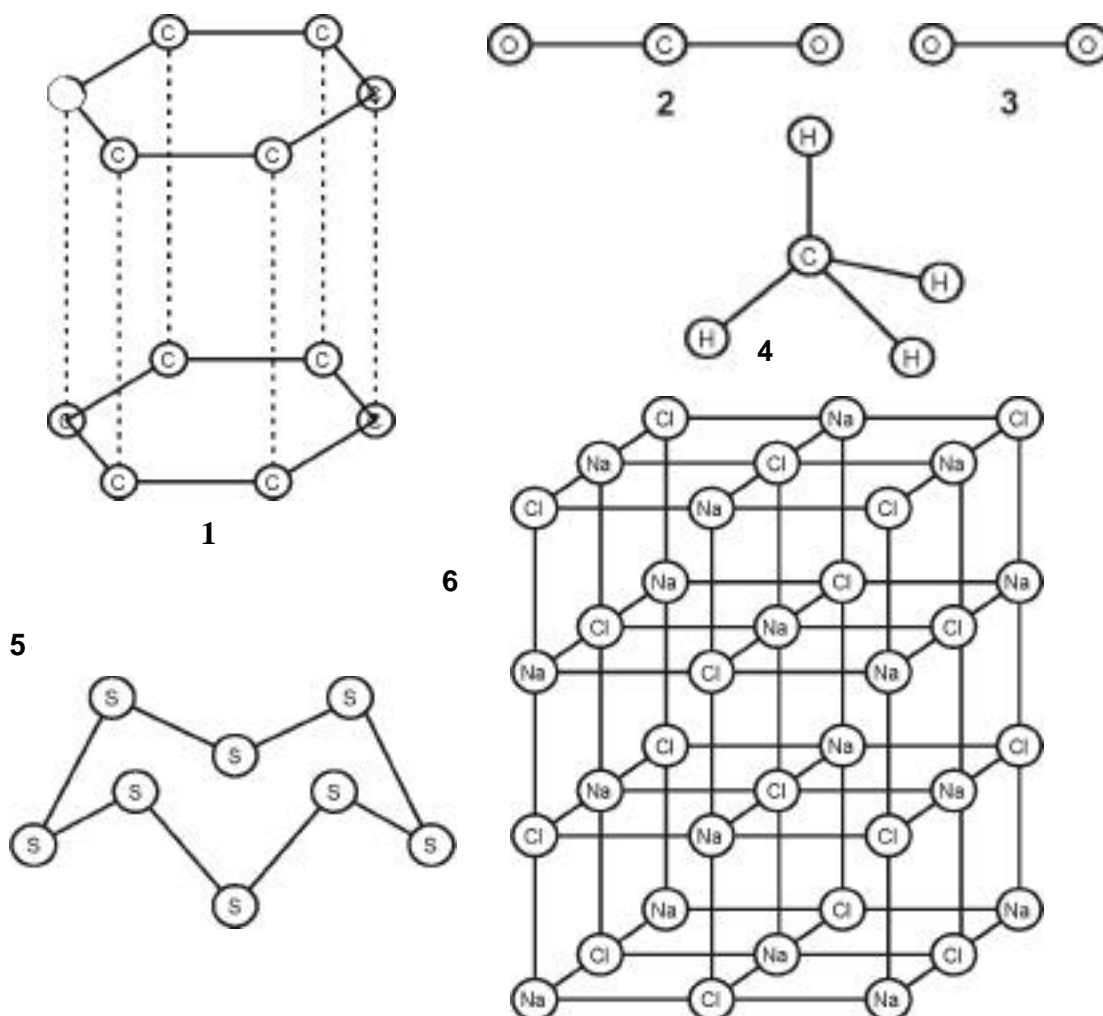
(iii) the name of an element that will rust

(iv) the name of a compound

Standard

- (b) When magnesium and sulphur are heated together they react. What is the name of the compound that is formed when magnesium and sulphur react together?

2. The diagrams represent the way atoms are arranged in six chemical substances. Each atom is represented by a circle which is labelled with its chemical symbol.



(a) Give the numbers of the diagrams that represent the structures of chemical elements.

(b) Explain your answer.

(c) Give the formulae of two of the compounds in the diagrams.

(d) What is the name of substance 6?

Task Four - Elements Compounds and Molecules

Core

1. What is the name given to a material made of atoms of different elements joined together?

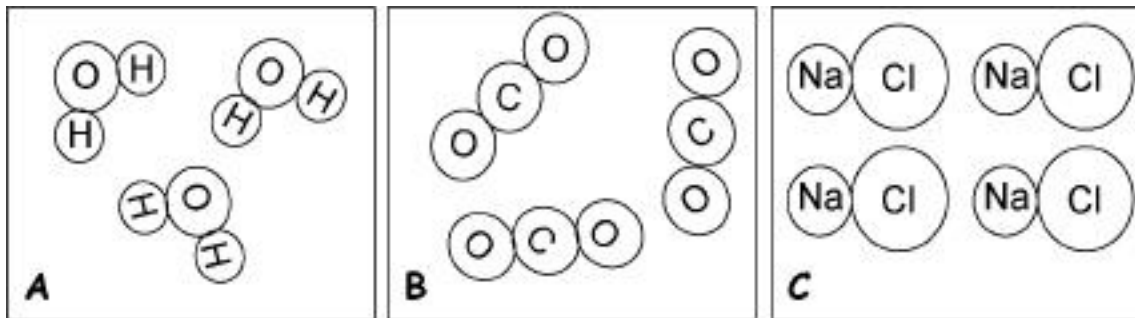
2. What is the name for a particle made of atoms joined together?

3. Which of these are made from atoms of different elements joined together? Circle the correct answers.

water salt carbon baking soda

Standard

4. Name the elements that are joined together to make these compounds.
(a) water _____
(b) carbon dioxide _____
(c) sodium iodide _____
5. Look at the diagrams and then answer the questions below.



- (a) Which diagram shows water?
- (b) Which diagram shows carbon dioxide?
- (c) How many atoms of oxygen are there in a molecule of water?

6. Water is made from one atom of oxygen joined to two atoms of hydrogen.

(a) What name do we give to one particle of water?

(b) Are oxygen and hydrogen solids, gases or liquids at 20°C?

(c) Is water a solid, gas or a liquid at 20°C?

Extension

7. Write word equations for the reactions between these elements.

(a) hydrogen and oxygen

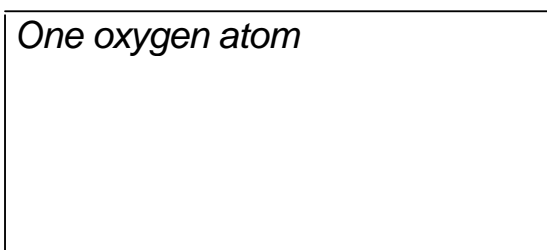
(b) iron and sulphur

(c) lithium and oxygen

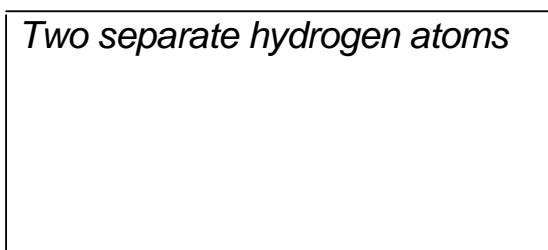
(d) silver and chlorine

8. Sketch rough diagrams to show the following. A rough diagram just needs circles with the element's symbol inside it.

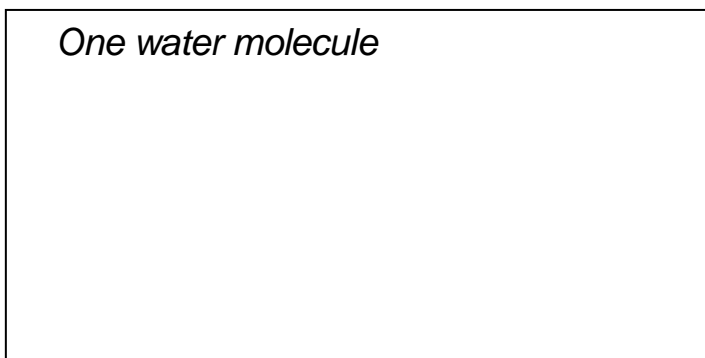
One oxygen atom



Two separate hydrogen atoms



One water molecule



Task Five - Chemical Reactions

Standard

1. Read the passage and then answer the questions.

John heated a strip of zinc strongly in air over a bunsen burner.

The surface of the zinc became white and a white powder was formed.

- (a) What is the chemical name of the white powder?

- (b) Write the word equation for the reaction.

2. For each of the following compounds say which two elements it is made from.

(a) copper oxide _____

(b) silver chloride _____

(c) carbon dioxide _____

(d) chromium oxide _____

(e) iron chloride _____

Extension

3. For each of the following compounds say which two elements it is made from.

(a) NaCl _____

(b) FeBr₂ _____

(c) MgO _____

(d) Ag(Br₂) _____

(e) CaCl₂ _____

Task Six – Compounds

Core

1. Match the descriptions with the number of atoms they are made of and with their chemical formulae.

Description:	One particle of this material is made of:	Formula:
A colourless gas	Two atoms of oxygen joined together	CO ₂
A white solid	Two atoms of chlorine joined together	H ₂ O
A colourless liquid	One atom of carbon joined to two atoms of oxygen	O ₂
A colourless gas	One atom of zinc joined to one atom of oxygen	Cl ₂
A greenish gas that smells of swimming pools	Two atoms of hydrogen joined to one atom of oxygen	ZnO

Standard

2. How many atoms of oxygen are there in each of these compounds?
- (a) CuO _____ (d) Li₂O _____
- (b) H₂O _____ (e) H₂SO₄ _____
- (c) MnO₂ _____ (f) CaCO₃ _____

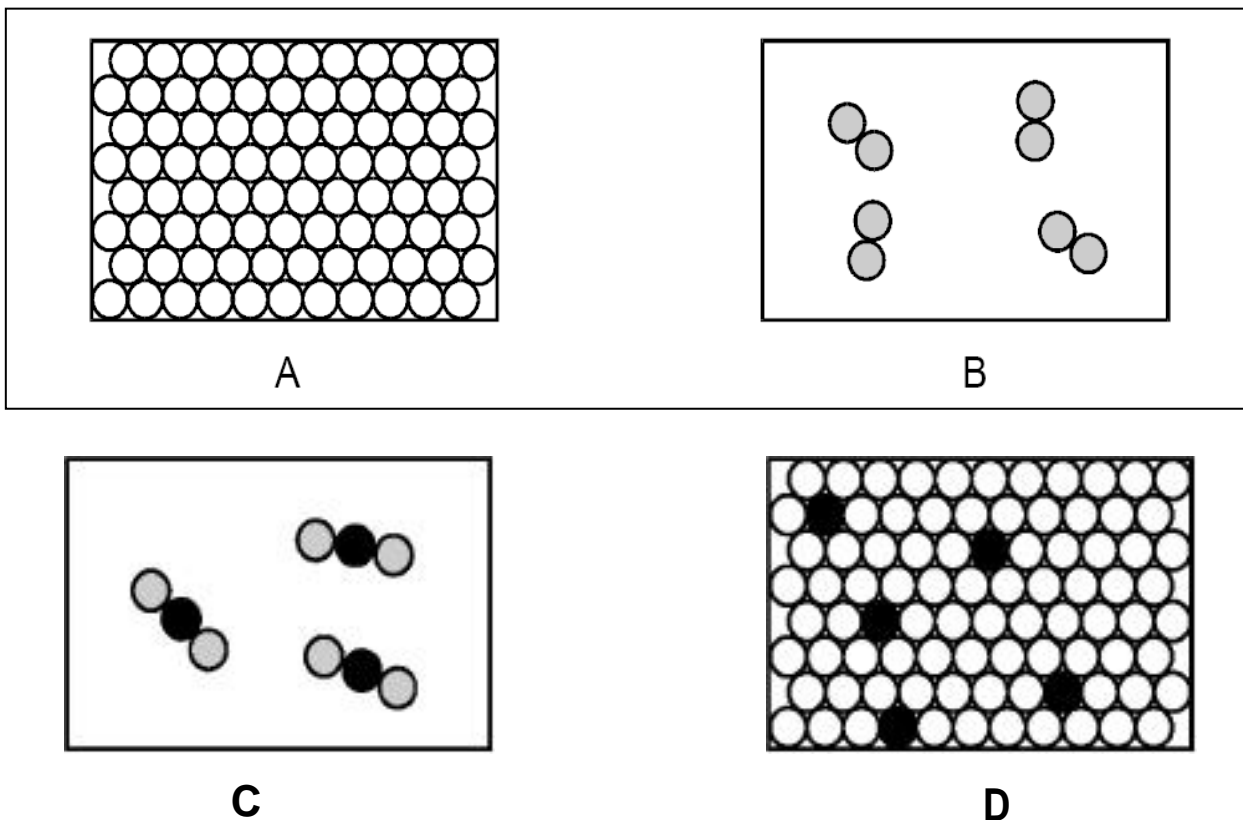
Extension

3. Which elements, and how many atoms of each, are there in each of these compounds? The first one is done for you as an example.
- (a) FeCl₂ _ One atom of iron and two atoms of chlorine
- (b) NaBr
- (c) NH₃ _
- (d) HNO₃ _
- (e) CaCO₃
- (f) H₂SO₄ _

Task Seven - Elements, Compounds and Mixtures

Core

1. The diagrams represent the arrangement of atoms or molecules in four different substances, A, B, C and D.



Each of the circles represents an atom of an element,

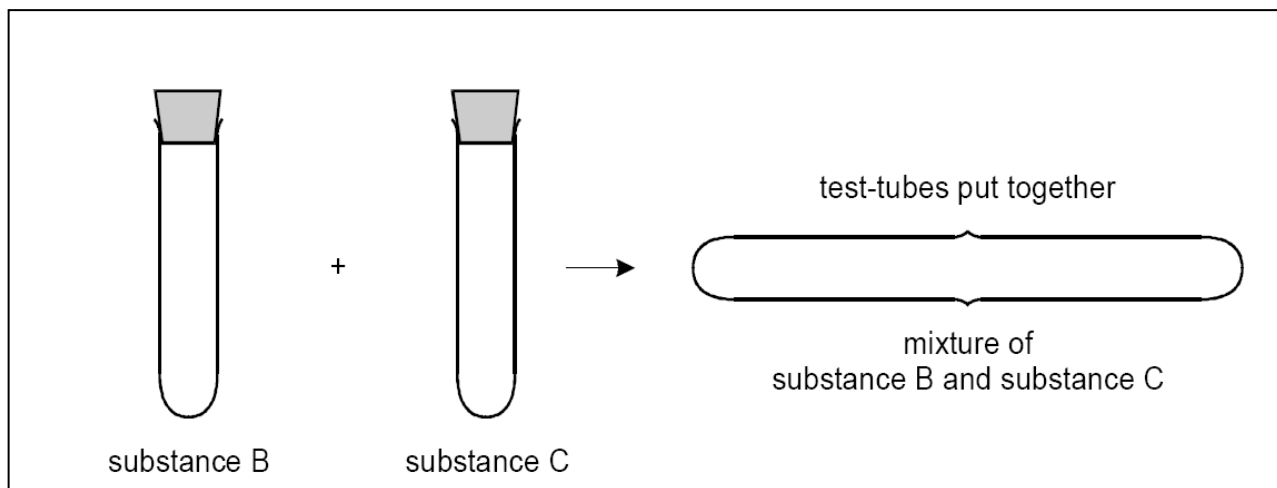
- (a) Which substance is a compound? _____
- (b) Which substance is a mixture?
- (c) Which two substances are elements?
- (d) Which substance could be carbon dioxide?
- (e) Which two substances could be good thermal conductors?

Extension

2. The following experiment was set up.

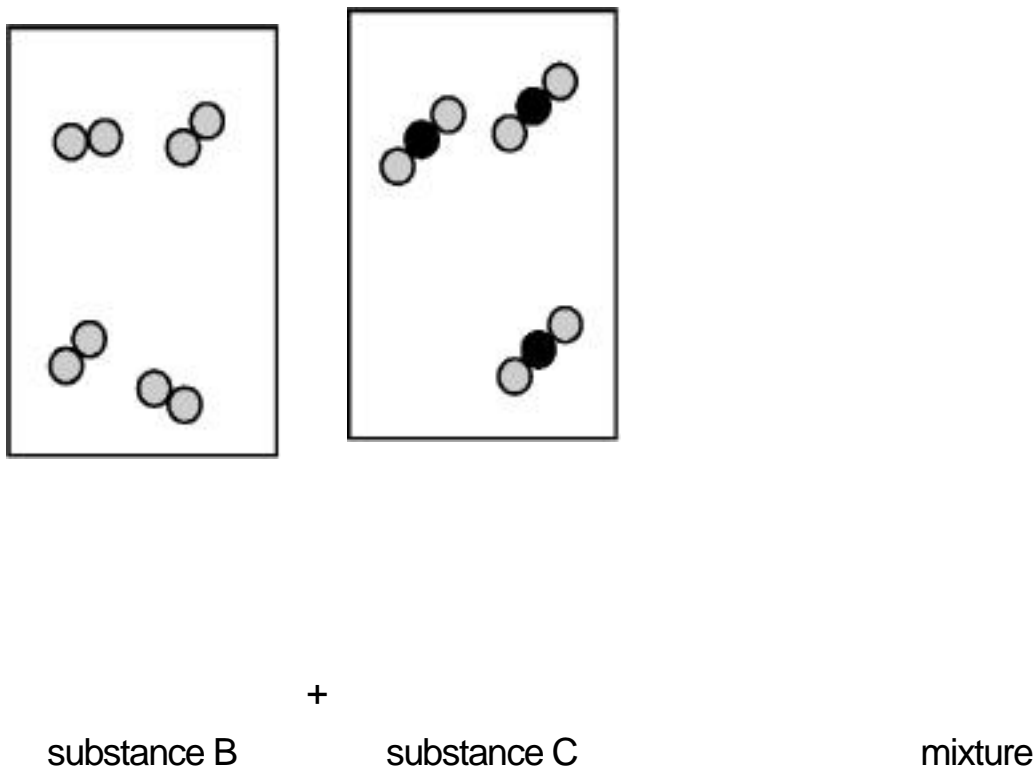
Test tubes containing substances B and C (from question 1) were placed together as shown. The substances did **NOT** react together.

They were left for five minutes.



(a) How many molecules are there in the mixture compared to the total number in substances A and B?

(b) Complete the particle diagram below which is a model of this experiment.



Task Eight - Heating Washing Soda

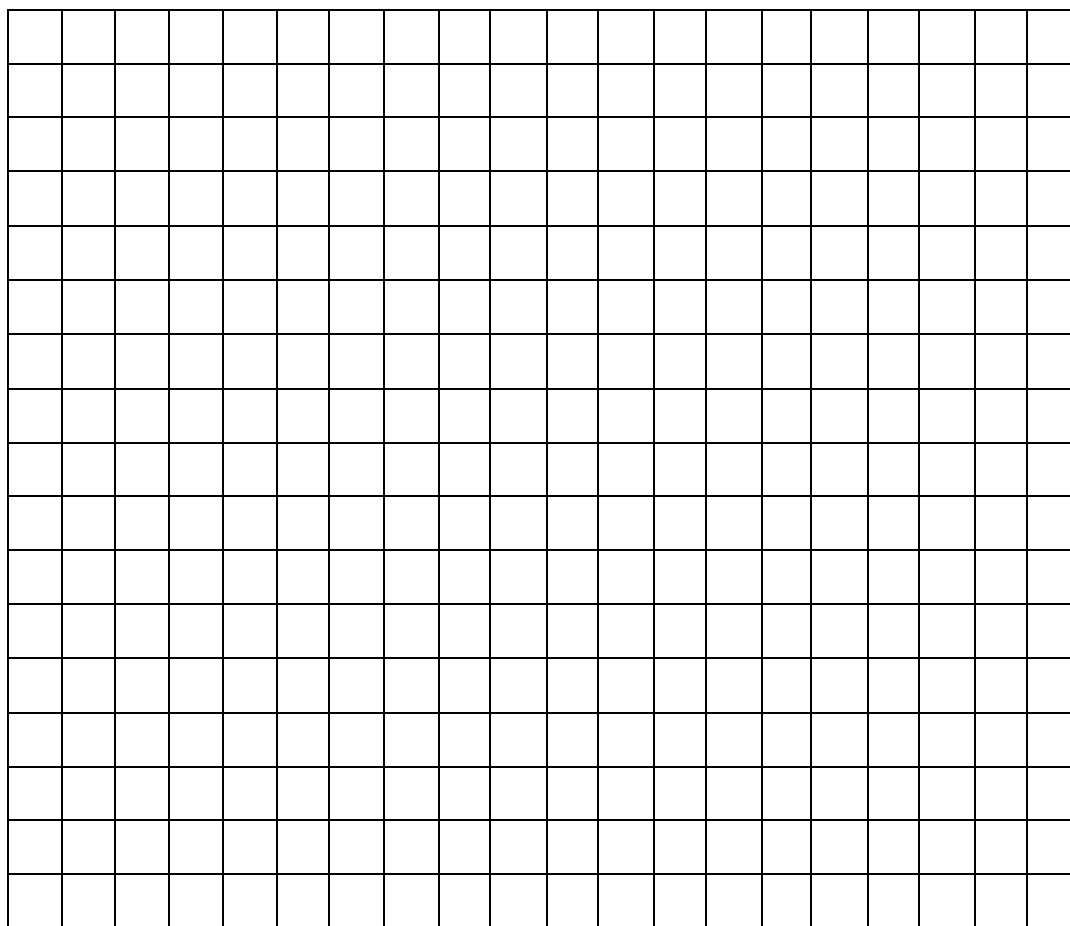
Core

Washing soda is a common cheap chemical used to make 'hard' water 'soft' so that expensive soaps and detergents last longer. Washing soda is sodium carbonate crystals.

A small amount of washing soda was heated in a steel container. The mass of the washing soda was recorded every minute. The results are given in the table below.

Time (mins)	0	1	2	3	4	5	6	7	8
Mass of washing soda (g)	14.63	10.25	8.16	6.04	5.52	4.80	4.73	4.74	4.73

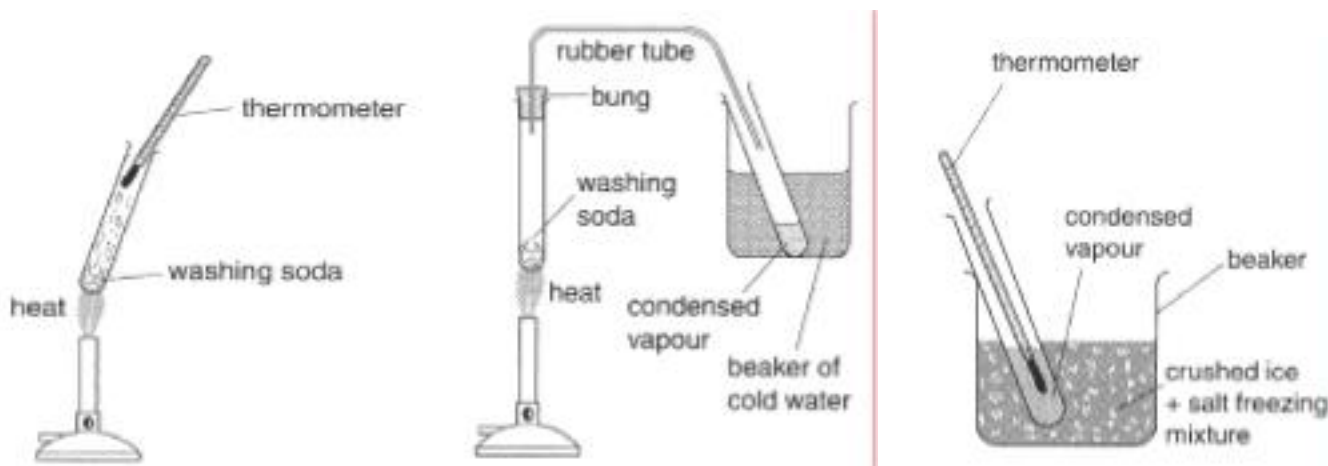
(a) Plot a graph of these results on the grid below.



(b) Describe the trend in the weighings.

Standard

2. The washing soda gave off a vapour when heated. Some of the vapour was tested as shown in the diagrams below. What do these tests show about the vapour that was given off? Explain your answer.



Extension

3. The experiment was repeated three times. Complete the table below and explain what it shows about the composition of sodium carbonate crystals. Hint:

$$\text{Percentage of original mass left} = \frac{\text{Mass after heating}}{\text{Original mass}} \times 100$$

Experiment	Original mass (g)	Mass after heating (g)	% of original mass left
1	14.63	4.73	
2	26.60	8.60	
3	20.00	6.40	
4	17.50	5.68	

Task Nine - Chemical Reactions

Core

1. Read the facts below and then answer the questions. (i)
Oxygen is a colourless gas at 20°C.
- (ii) *Carbon is a black solid at 20°C.*
- (iii) *Hydrogen is a colourless gas at 20°C.*
- (iv) *Water is a compound. Each water molecule is made of two hydrogen atoms joined to one oxygen atom. Water is a clear liquid at 20°C.*
- (v) *Each molecule of carbon dioxide is made of two oxygen atoms joined to one carbon atom. Carbon dioxide is a colourless gas at 20°C.*
- (a) Do compounds have similar properties to the elements that they are made from?
- _____
- (b) Are all water molecules identical or are some of them different?

Standard

2. The formula for calcium chloride is CaCl_2 . How many more chlorine atoms are there than copper atoms in a kilogram of calcium chloride? Circle the correct answer.

Twice as many

Half as many

Three times as many

3. When something burns, what element in the air is it reacting with?
- _____

4. Fill in the gaps using some of the words from the box.

elements compounds formula molecules compound rucksack
element mixture atoms

- (a) _____ are made of just one sort of atom.
- (b) The _____ in different elements can join in a chemical reaction.
- (c) A molecule of a _____ is made of different atoms joined together.
- (d) We know the elements in a compound by looking at the symbols in its

Task Ten - Elements: Metals and Non-metals

Core

1. The table shows the amounts of different elements in the human body.

<i>Element</i>	<i>% in human body</i>
Oxygen	65
Hydrogen	10
Nitrogen	3
Phosphorous	1
Metals	3
Carbon	16

(a) Which of these elements are non-metals?

(b) Which of the non-metallic elements are usually gases?

(c) Which common compound is made when hydrogen and oxygen react together?

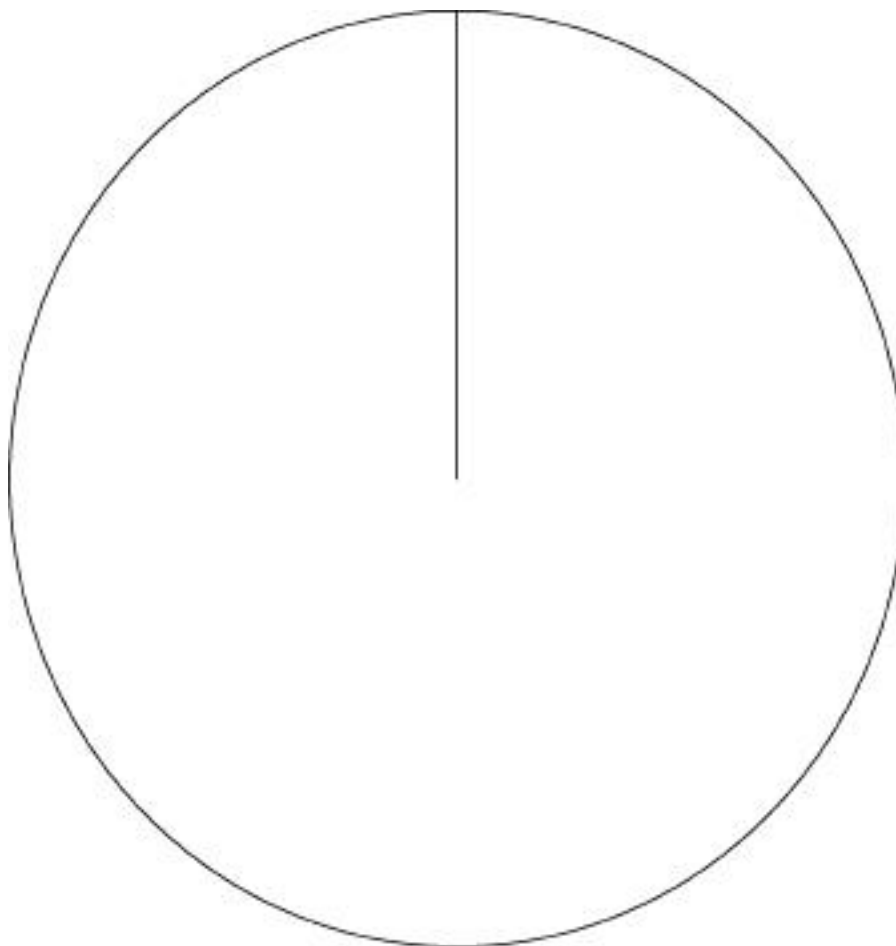
(d) How much carbon would there be in a 60 kg student?

2. Here is a list of non-metal elements found in the explosive TNT.

<i>Element</i>	<i>% in explosive</i>
Carbon	37
Hydrogen	3
Nitrogen	18
Oxygen	42

(a) Why is oxygen such a large percentage of the explosive? (Remember it has to burn very quickly).

(b) Complete the pi-chart to show the composition of TNT.



Elements and Reactions - Year 8**Core****Task Eleven - Melting and Boiling Points**

1. The table shows the amounts of different elements in the human body.

(a) Which column tells you about the freezing point of the material?

	Melting Point (°C)	Boiling Point (°C)
Iron	1535	2750
Sodium	97.8	552.9
Chlorine	-100.98	-34.6
Sodium chloride	801	1413
Ammonia	-78.3	-33

(b) Is ammonia a solid, a liquid or a gas at 20°C?

(c) Is the boiling point always higher than the melting point?

(d) Will all lumps of pure iron melt at the same temperature?

(e) Will pure ammonia always boil at the same temperature?

2. The melting point of nitrogen is -210°C. The boiling point of nitrogen is -196°C. What can you say about the temperature of liquid nitrogen?

3. Does air have a fixed boiling point? Explain your answer.

Extension

4. Read the following statements and answer the questions. *Pure water boils at 100°C and stays at 100°C while it boils. Salt solution boils at a slightly higher temperature and the temperature increases slightly as it boils.*

(a) Is salt solution a pure substance or a mixture?

(b) Do mixtures have fixed boiling points?

Task Twelve - Air

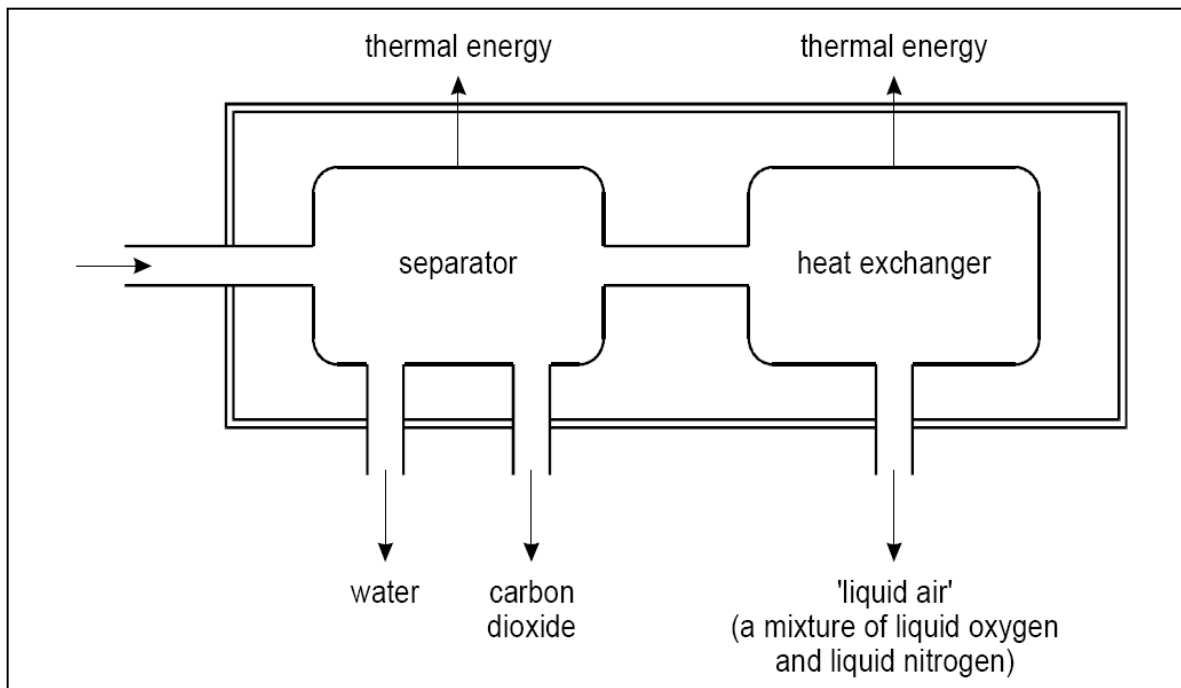
Standard

1. The table shows melting and boiling points for four gases present in air.

<i>substance</i>	<i>melting point (°C)</i>	<i>boiling point (°C)</i>
carbon dioxide	-78	-78
nitrogen	-210	-196
oxygen	-219	-183
water vapour	0	100

(a) What happens to a piece of solid carbon dioxide if it is heated from -100°C to -78°C?

(b) 'Liquid air' can be made in a heat exchanger. As the air passes through, thermal energy is transferred from the air to the surroundings. This is shown in the flow diagram below.



(c) Suggest a likely temperature for the 'liquid air' that leaves the heat exchanger.

Extension

(d) Use the information in the table to explain why carbon dioxide and water vapour need to be removed from the air before it is pumped through the pipes to the heat exchanger. What would be the consequences of **NOT** removing these gases?

(e) The 'liquid air' is a mixture of liquid nitrogen and liquid oxygen. Use the information in the table to suggest how liquid oxygen could be obtained from the mixture.

(f) How does the distance between the particles in atmospheric air compare to the size of the particles themselves?
