

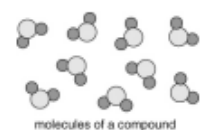
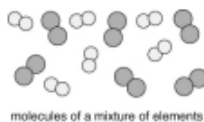
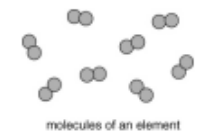
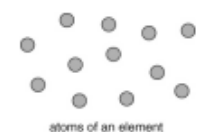
Atoms, molecules, elements and compounds

All substances are made up of tiny particles called **atoms**. Substances can be made of single atoms but they can also be made of atoms **bonded** together in small groups, called **molecules**. Substances can also be made of many trillions of atoms all bonded together.

Natural materials can be **pure** (containing one substance) or **mixtures** (containing two or more substances which are not joined together). A **mixture** is formed if elements are mixed without joining.

Elements are simple substances made up of only one kind of atom.

There are about 90 different types of atom found on Earth. Therefore there are about 90 different elements.



Most substances are **compounds**, which contain more than one kind of atom (more than one element) bonded (joined) together.

The Earth's elements

The **periodic table** lists all 118 known elements.

Elements are described by **symbols** of one or two letters.

The first letter is always a capital letter and the second is always lower case.

The same symbols are used in all countries.

Although there are only about 90 natural elements, there are millions of compounds.

We obtain all the elements and compounds we need for living from the Earth's **atmosphere** and **crust**.

Our **resources** are limited and some may run out in the near future. We need to take care of our resources, **recycle** more and make less waste.

Modelling chemical reactions using word equations

reactants → products

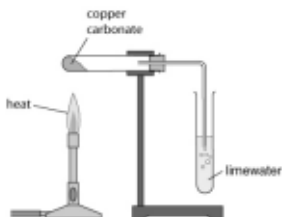
e.g. zinc + chlorine → zinc chloride

tin carbonate → tin oxide + carbon dioxide

Thermal decomposition reactions involve breaking down a single compound using heat.

Heating copper carbonate produces copper oxide and carbon dioxide.

Thermal decomposition reactions are used in industry to extract metals.



Metals and non-metals

Elements can be classified as **metals** or **non-metals**, depending on their properties.

The common properties of **metals** are:

- high melting point solids,
- strong and **flexible**,
- shiny (when polished),
- good **conductors** of heat,
- good conductors of electricity.

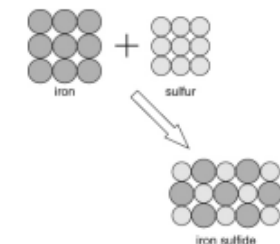
e.g. copper, iron, aluminium, zinc, and tin.

Note: mercury is the only liquid metal.

The **uses** of an element depend on its **properties**. For example, copper and aluminium are used for electrical cables as they are strong, flexible and conduct electricity very well.

Making compounds

Compounds are formed when elements are mixed and react so that the atoms join together.



Naming compounds

If there is a metal in the compound, the name of the metal goes first.

If the compound contains only two elements then one of the element's name has its ending changed to 'ide'.

e.g. zinc + oxygen = zinc oxide

iron + bromine = iron bromide

If a compound contains two elements plus oxygen, then the name ending of one of the elements is changed to 'ate'.

e.g. sodium + carbon + oxygen = sodium carbonate

Chemical reactions

Chemical reactions always form one or more new substances.

Many chemical reactions occur in everyday life, for example, burning, cooking, rusting, digesting food.

How chemical reactions start

Some reactions start just by mixing the right substances together.

Heat is often needed to start a reaction, but once started many reactions give out heat.

Others need a continuous supply of energy to keep them going.

Typical signs of chemical reaction include:

- a colour change,
- a gas being given off,
- a solid forming in a liquid,
- an energy change.

e.g. acid and alkalis

e.g. burning natural gas

e.g. breaking down metal ores

Sorting and presenting data

The way data is sorted and presented depends on the type of variable and what you want to show.

Tables – show values and order.

Bar charts – compare differences between qualitative/discrete variables.

Line graphs – shows trends between variables.

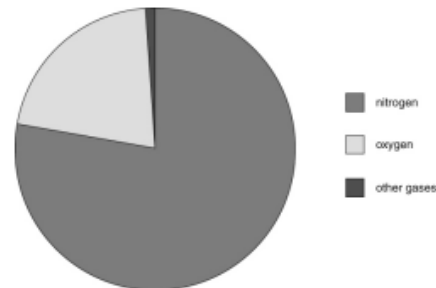
Scatter graphs – look for relationships between quantitative variables.

Pie charts – shows proportions of a total.

Note: Qualitative data = words. Quantitative data = numbers.

Discrete data = only certain number values.

| Gases in air | % |
|--------------|----|
| nitrogen | 78 |
| oxygen | 21 |
| other gases | 1 |

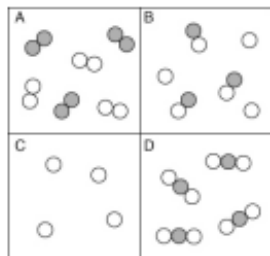


Pie chart of gases in air

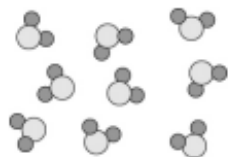
On your answer sheet, write in or circle the correct letter for each question.

7Ha

- What happens in all chemical changes?
A A gas is produced.
B Heat energy is given out.
C Elements change into a compound.
D One or more new substances are formed.
- A compound contains:
A only one type of atom.
B only one element.
C only two elements joined together.
D at least two elements joined together.
- Which of the following particle diagrams show molecules of a mixture of elements?



4



The particle diagram above shows:

- A an element.
- B a compound.
- C a mixture of elements.
- D a mixture of compounds.

7Hb

- Which of the following lists contains only elements?
A air, iron, iodine, magnesium
B zinc, gold, aluminium, oxygen

- nitrogen, copper, mercury, water
D chlorine, argon, sodium, limestone
- The correct way to write the chemical symbol for the element calcium is:
A ca
B CA
C Ca
D cA
- Which of these elements is used to build bridges?
A Iron
B Gold
C Oxygen
D Carbon
- We need to recycle some of our metals more because recycled metals ...
A have better properties.
B do not corrode as easily.
C produce more carbon dioxide.
D save our limited natural resources.

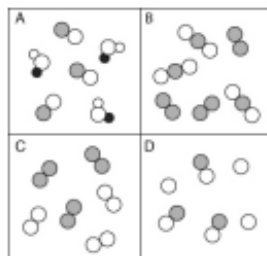
7Hc

- Which list contains only non-metal elements?
A oxygen, nitrogen, argon, silicon
B chlorine, oxygen, sulfur, iron
C bromine, helium, carbon, air
D gold, silver, platinum, mercury
- Which list contains only typical properties of metals?
A good conductor of heat, brittle, low melting point
B poor conductor of heat, strong, high melting point
C good conductor of electricity, strong, high melting point
D poor conductor of electricity, weak, low melting point

- Metals like aluminium are used to make cooking pots because they are ...
A brittle and good conductors of heat.
B malleable and good conductors of heat.
C brittle and poor conductors of heat.
D malleable and poor conductors of heat.
- All metals are ...
A solids.
B strong.
C brittle and easily broken.
D conductors of electricity.

7Hd

- Which of the following shows the particles in a mixture of compounds?



- When iron and sulfur react they form:
A a new element.
B a mixture of elements.
C a new compound.
D a mixture of compounds.
- The reaction between calcium and oxygen forms:
A calcium oxide.
B calcium oxide.
C calcium oxygen.
D calcium carbonate.

- When metals and non-metals form a compound, the compound will usually:
A be easily broken up.
B have the same properties as the elements.
C take up a larger volume than the elements.
D have different properties to the elements.

7He

- The breakdown of a compound into simpler substances is called a thermal:
A filtration.
B precipitation.
C elementation.
D decomposition.
- When iron and sulfur are mixed and heated, what changes might you see to tell you a reaction has started?
A A gas is given off.
B A solid is formed.
C The mixture changes into a liquid.
D The mixture glows red.
- What is the missing substance in the equation below?
 $\text{copper carbonate} \rightarrow \text{copper oxide} +$
_____.
A carbon
B water
C oxygen
D carbon dioxide
- To break down the compound silver oxide into its elements you would need to:
A heat it.
B dissolve it water.
C mix it with oxygen.
D change it into a new compound.