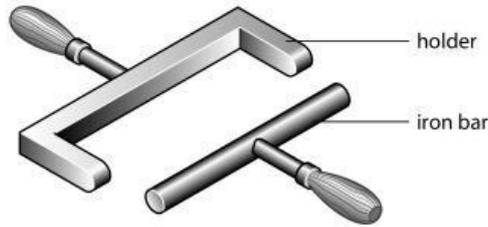




2 Materials and their structure

2 When the solid iron bar in the diagram is heated, it no longer fits the holder.



Use particle theory to explain why this happens.

.....  
.....

3 Use the terms below to match each of the statements **a** to **g**. Each word may be used once, more than once or not at all.

- boil   compressed   condensation   evaporation   gas   heat**  
**liquid   freeze   solid   vibrate   melting   move**

**a** A state of matter where the particles do not touch each other:

.....

**b** When a gas is cooled to form a liquid: .....

**c** Particles in solids, liquids and gases do this:

.....

**d** Solid changing to a liquid: .....

**e** When a liquid changes into a gas: .....

**f** The particles in liquids and gases can do this:

.....

**g** The state of matter that can be compressed:

.....

## Exercise 2.3C Explaining changes of state

### Challenge

This exercise gives you practice in using particle theory to explain changes of state.

Use the correct scientific vocabulary in your explanations.

- 1 Use particle theory to explain what happens when a solid is heated and it changes into a liquid.

.....

.....

.....

.....

.....

- 2 Use particle theory to explain what happens when a gas reaches a cold surface and it changes into a liquid.

.....

.....

.....

.....

.....

- 3 Use particle theory to explain what happens when a liquid is heated and it changes into a gas.

.....

.....

.....

## 2 Materials and their structure

.....

.....

- 4 Look back at your answers and think about the scientific words you have used. Are there any more that you should have included?

.....

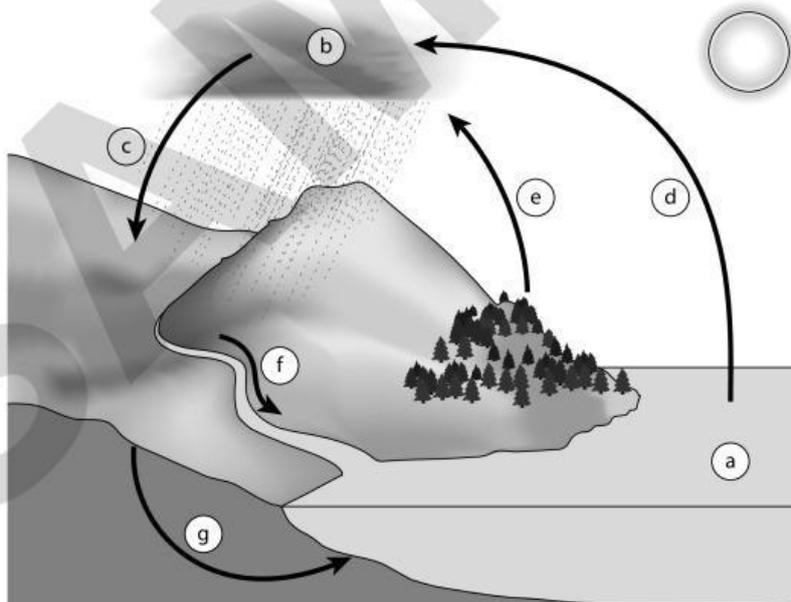
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## > 2.4 The water cycle

### Exercise 2.4 The water cycle

In this exercise, you will label a diagram of the water cycle and explain some of the processes involved.

#### Focus



1 Write the names of the stages that are labelled **a** to **d** on the diagram.

- a .....
- b .....
- c .....
- d .....

### Practice

2 Write the names of the stages that are labelled **e** to **g** on the diagram.

- e .....
- f .....
- g .....

3 The process that takes place at **d** needs energy. Where does the energy come from?

.....

4 Use particle theory to explain how water from the ocean reaches the clouds.

.....  
.....  
.....  
.....  
.....

5 Explain why it rains.

.....  
.....  
.....  
.....

## Challenge

- 6 Explain what is meant by precipitation. What forms can precipitation take?  
What conditions are needed for these different forms of precipitation to occur?

.....  
.....  
.....  
.....

## > 2.5 Atoms, elements and the Periodic Table

### Exercise 2.5 Atoms, elements and the Periodic Table

This exercise will give you practice in using the symbols for elements and help you to remember facts about the Periodic Table.

#### Focus

- 1 Give the symbols for these elements.
- a sodium .....
  - b magnesium .....
  - c boron .....
  - d calcium .....
  - e potassium .....



## 2 Materials and their structure

- 6 Name an element in the same group as calcium.

.....

### Challenge

- 7 Name an element that has atoms with a mass greater than those of aluminium.

.....

- 8 Name an element that has atoms with a mass smaller than nitrogen but larger than beryllium.

.....

## > 2.6 Compounds and formulae

### Exercise 2.6 Compounds and formulae

This exercise will help you to sort out facts about compounds and practise using formulae.

#### Focus

- 1 Write **true** or **false** next to each of these statements.

a Each element is made of only one type of atom. ....

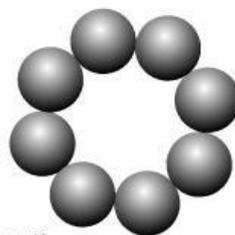
b Oxygen is a compound. ....

c Calcium is an element. ....

d Water is an element. ....

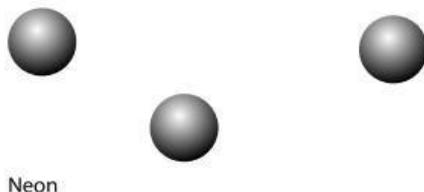
e This diagram shows an atom of sulfur

.....



Sulfur

f This diagram shows a compound of neon. ....



g A compound is made up of more than one type of atom.

.....

2 a Which elements are in potassium chloride?

.....

b Which is the metal in potassium chloride?

.....

c Which elements are in magnesium oxide?

.....

d Suggest the name of the compound that contains copper and oxygen.

.....

e Suggest the name of the compound that contains iron and chlorine.

.....

### Practice

3 What is the name of the compound formed when these elements are combined together?

a sodium and oxygen .....

b calcium, carbon and oxygen .....

c potassium, nitrogen and oxygen .....

**2 Materials and their structure**

- d potassium and nitrogen .....
- e hydrogen and fluorine .....
- 4 Which elements are found in these compounds?
  - a carbon dioxide .....
  - b copper sulfate .....
  - c aluminium chloride .....
  - d sodium sulfide .....
  - e calcium chlorate .....
- 5 The formula for potassium hydroxide is KOH.  
Which elements does it contain?  
.....
- 6 Complete this table.

Chemical name	Formula	What the compound contains
	MgO	
sulfur dioxide		one sulfur atom bonded to two oxygen atoms
aluminium chloride		one aluminium atom bonded to three chlorine atoms
calcium sulfide		one calcium atom bonded to one sulfur atom
	MgCO <sub>3</sub>	

## Challenge

7 These formulae are written incorrectly. Rewrite them correctly.

a  $\text{NA}_2\text{CO}_3$  ..... d  $\text{O}_2$  .....

b  $\text{CaCl}_2$  ..... e  $\text{K}_2\text{Co}_3$  .....

c  $\text{CaCO}^3$  .....

8 a The formula for the sugar maltose is  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ .  
What does this tell you about what the particle is made of?

.....  
.....

b Suggest what  $2\text{C}_{12}\text{H}_{22}\text{O}_{11}$  means.

.....

9 a  $\text{Mg}(\text{OH})_2$  is the formula for which compound?

.....

b How many oxygen atoms are there in this particle?

.....

c How many hydrogen atoms are there in this particle?

.....

10 Write the name and formula for a compound of calcium that contains oxygen and hydrogen atoms.

.....  
.....

## > 2.7 Compounds and mixtures

### Exercise 2.7 Compounds and mixtures

This exercise helps you to distinguish (tell the difference) between mixtures and compounds.

#### Focus

In a compound, two or more elements are bonded together to make a new product.

In a mixture, two or more elements are mixed together, but they do not form a new product.



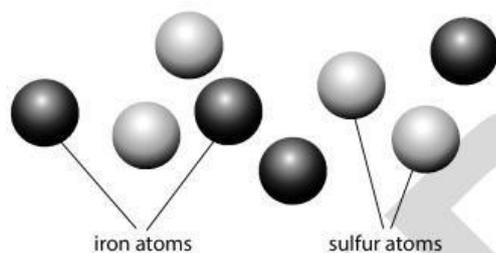
Marcus mixes iron filings and sulfur in a beaker. He stirs it until the two substances are completely mixed.

Sofia heats iron filings and sulfur powder together.

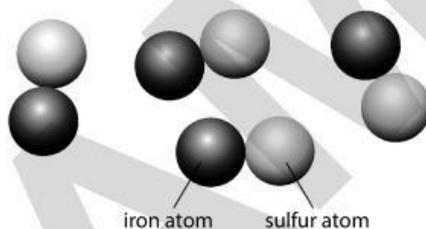
1 Tick (✓) **all** the correct statements.

- a Sofia produces a new product.
- b Marcus produces a new product.
- c Iron is magnetic.
- d Something in Marcus's beaker is attracted to a magnet.

- e At the end of Sofia's experiment, something in Sofia's test tube is attracted to a magnet.
- f At the end of Sofia's experiment the test tube contains a compound.
- g At the end of Marcus's experiment the beaker contains a compound.
- h At the end of the experiment the atoms in Marcus's beaker look like this.



- i At the end of the experiment the atoms in Sofia's test tube look like this.



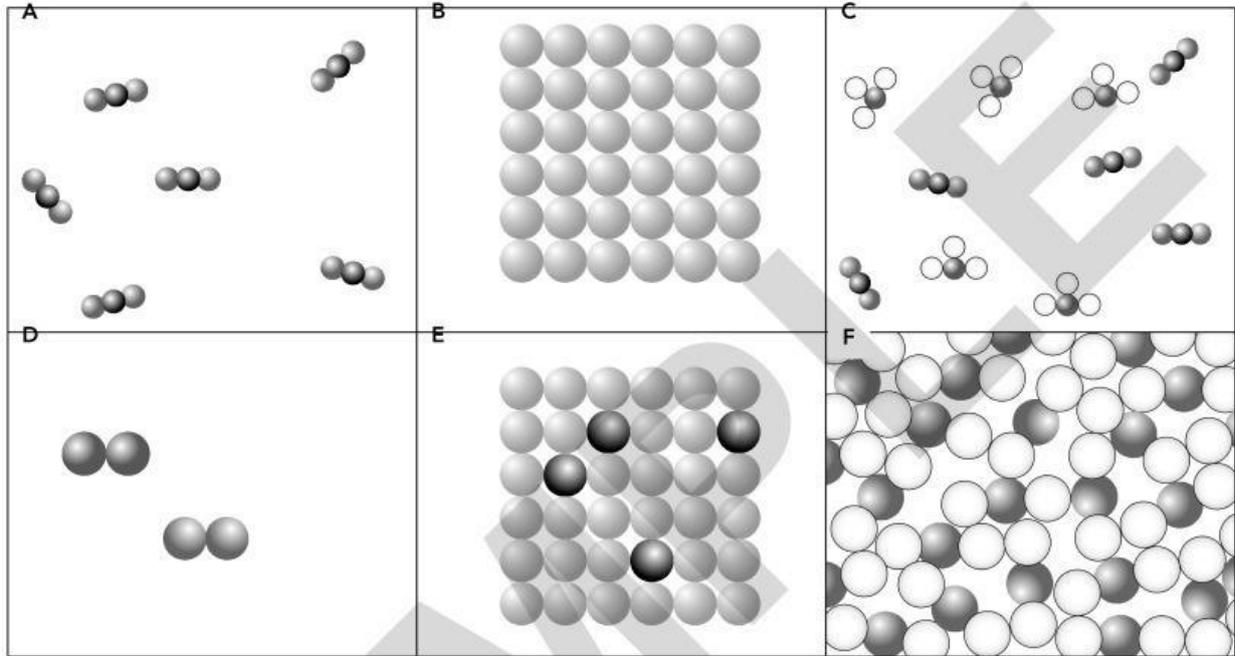
- j Compounds have the same properties as the elements they are made from.

2 Materials and their structure

## Practice

Look at these particle diagrams.

Use the diagrams to answer the questions.



2 Which boxes contain gases?

.....

3 Which boxes contain a mixture?

.....

4 Which box contains a liquid?

.....

## Challenge

5 Which box contains a mixture of elements?

.....

6 Which box contains a mixture of compounds?

.....

7 a Give an example of a compound made from two elements and an example of a mixture of the same two elements.

.....

b Explain the difference between a compound made of two elements and a mixture of the same two elements.

.....

.....

c Explain how the properties of the compound are different from the properties of the two elements.

.....

.....

d Explain how the properties of the mixture are different from those of the compound.

.....

.....

.....