Q1.

Susie cooked sausages on a barbecue.

(a) Fat and water in the sausages changed state.

Draw **one** line from each statement to the correct change of state.
Draw only **two** lines.

statement	change of state
	liquid to gas
fat melted	gas to liquid
	liquid to solid
water evaporated	solid to liquid
	solid to gas

2 marks

(b) Susie uses charcoal as the fuel for the barbecue.

(i) Which statement is true about all fuels?
Tick the correct box.

All fuels are sources of energy. ☐

All fuels are black. ☐

All fuels are made from wood. ☐ All fuels are solid. ☐

1 mark

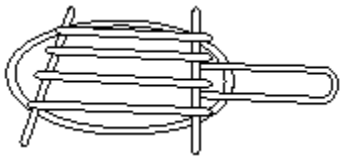
(ii) Which gas in the air is needed for fuels to burn?
Tick the correct box.

water vapour ☐ oxygen ☐

nitrogen ☐ carbon dioxide ☐

1 mark

(c) The metal grill of the barbecue is made of steel.



Six properties of steel are given below.

Which properties are needed for the metal grill?
Tick **two** correct boxes.

It conducts electricity. ☐ It is rigid. ☐

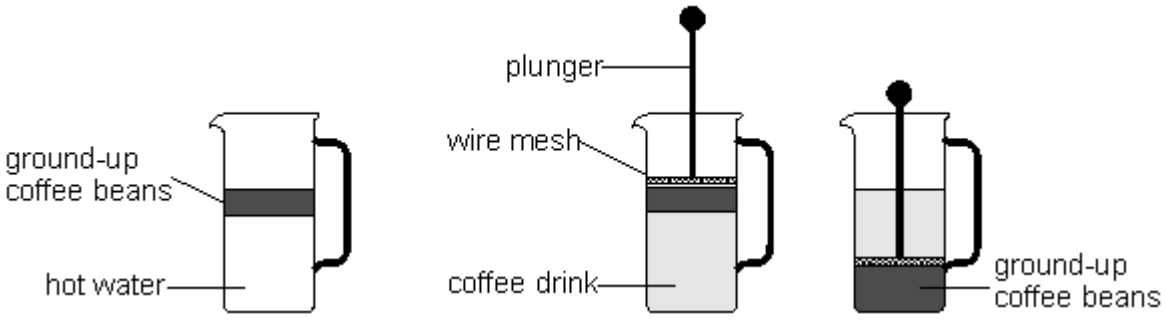
It has a very high melting point. ☐ It is magnetic. ☐

It is shiny. ☐ It rusts. ☐

2 marks
maximum 6 marks

Q2.

Russell put ground-up coffee beans in a coffee maker and added hot water.



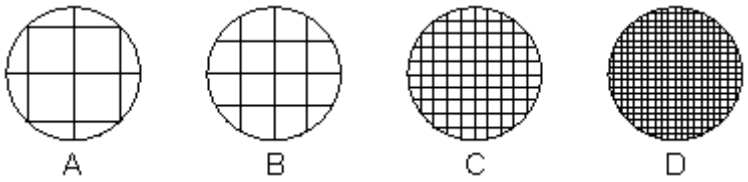
He pushed the plunger down.
This separated the coffee drink from the ground-up coffee beans.

(a) How could Russell see that some coffee had dissolved in the water?

.....

1 mark

(b) The end of the plunger is a circle of wire mesh.

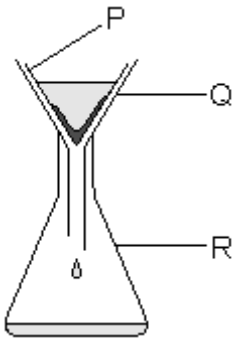


(i) Which mesh would be best to separate the coffee drink from all the ground-up coffee beans? Write the letter.

.....

1 mark

(ii) This method of making coffee uses a type of filter.
The apparatus used for filtration in a school laboratory is drawn below.

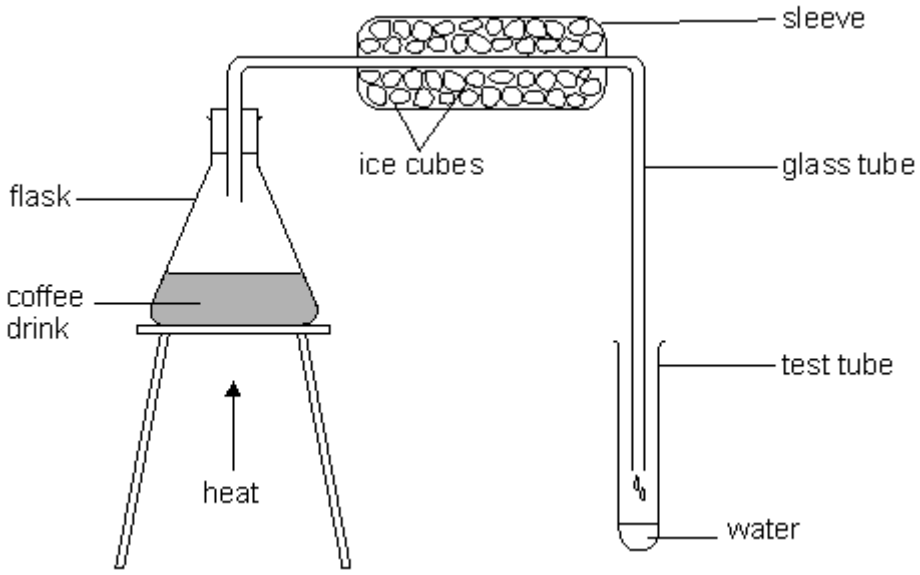


Which part of the apparatus above works in the same way as the wire mesh? Write the letter.

.....

1 mark

(c) Russell wanted to separate the water from the coffee drink.
He set up the apparatus shown below.



(i) Why did Russell put ice cubes around the glass tube?

.....

1 mark

(ii) Choose words from the box below to fill the gaps in the following sentences.

an acid	**a gas**	**a liquid**
a solid		
condensation	**crystallisation**	**evaporation**
filtration		

Russell heats the water. Water in the drink changes from

..... into ..... .

This change of state is called ..... .

Water vapour changes into liquid. This change of state is called

..... .

4 marks
maximum 8 marks

Q3.

Matthew measured the pH of different soils.

(a) Tick **one** box in each row to show if each soil is acidic, neutral **or** alkaline.

soil	pH of soil	acidic	neutral	alkaline
A	4.5			
B	5.5			
C	6.3			

D	7.0			
E	7.8			

2 marks

(b) A hydrangea is a flowering plant. Matthew notices that the colour of hydrangea flowers is different for plants grown in different places.

He records the colour of the flowers on each plant.

His results are shown in the table below.

hydrangea flower

soil	pH of soil	colour of flowers			
		blue	violet	light pink	dark pink
A	4.5	✓			
B	5.5		✓		
C	6.3		✓		
D	7.0			✓	
E	7.8				✓

Look at Matthew's results.
Do his results support the statement that the colour of hydrangea flowers depends on pH?

yes ☐ no ☐

Explain your answer.

.....

.....

1 mark

(c) Matthew measured the pH of the soil near hydrangea plants found in different places.

Suggest one **other** variable Matthew could **not** control in his investigation.

.....

.....

1 mark

(d) Matthew wants to find out if the colour of blue hydrangea flowers depends on inherited

factors **or** environmental factors.
The flowers were growing in soil of pH 4.5.
He plants them in soil of pH 6.3.

Complete the table below to show the colours of the new flowers in soil of **pH 6.3**

(i) if the colour is due to inheritance
(ii) if the colour is due to the environment

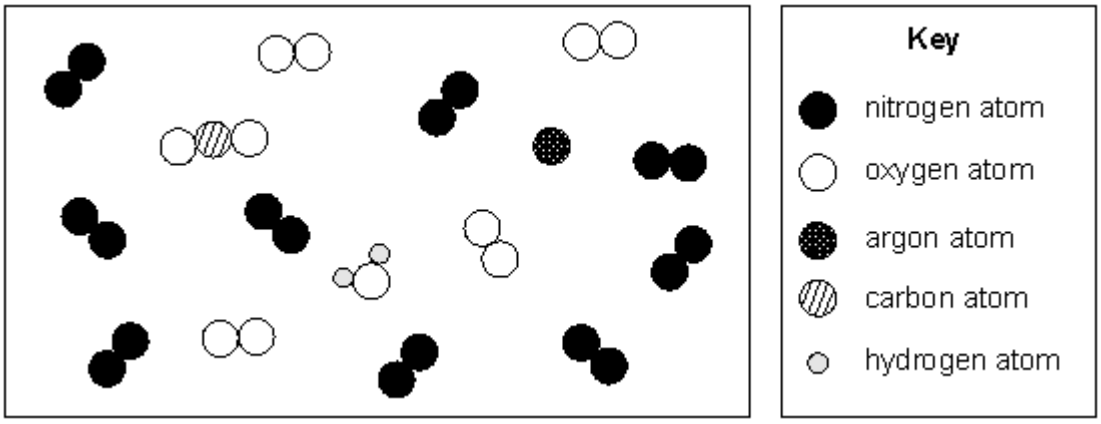
Use the table above to complete the table below.

	colour
starting colour of hydrangea flowers	blue
colour of new flowers if only due to inheritance	
colour of new flowers if only due to environment	

2 marks
maximum 6 marks

Q4.

The diagram below represents the particles found in air.



(a) Complete the following table. Use the diagram and key above to help you.

name	**symbol**	**chemical formula**
argon		Ar
nitrogen		
oxygen		O_2
		

3 marks

(b) Air is a **gas** at room temperature.
What evidence in the diagram above shows this?

.....

1 mark

(c) A sample of air in a balloon is cooled.
Complete the sentences below using words from the box.
You may use each word more than once.

increases	**decreases**
stay the same	

When the air is cooled, the volume of the air ..... and

the mass of the air ..... .

When the air is cooled, the density of the air ..... .

1 mark

(d) In 1902, the scientist Carl von Linde cooled air to produce **liquid oxygen**.

The table below shows the melting points and boiling points of four substances that are found in air.

substance	melting point (°C)	boiling point (°C)
argon	–189	–186
oxygen	–218	–183
nitrogen	–210	–196
water	0	100

Before Linde, scientists tried to produce **liquid air** by cooling it to –190°C.
Give a reason why liquid air was not produced.

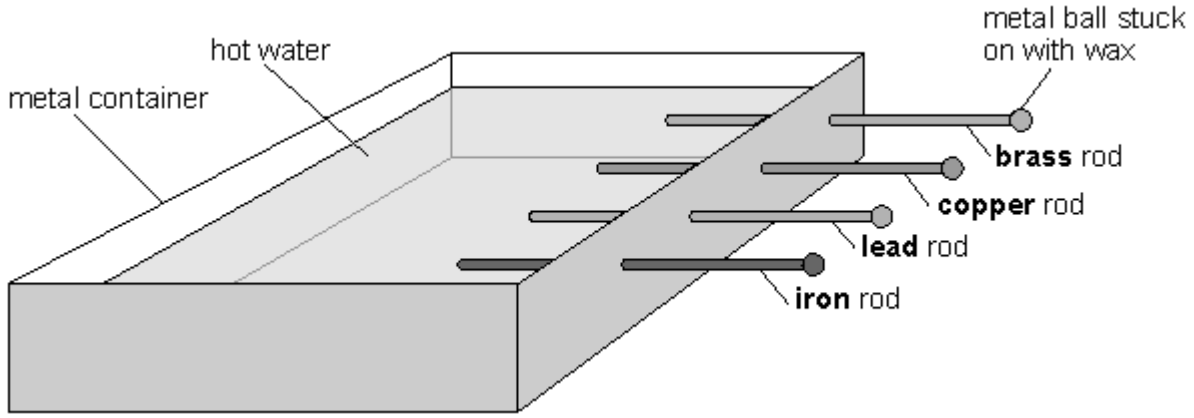
.....

.....

1 mark
maximum 6 marks

Q5.

Leanne had four rods, each made from a different metal.
She wanted to find out which metal was the best conductor of heat.
The diagram shows some of Leanne's equipment.



(a) Leanne's results are shown in the table.

metal rod	time for metal ball to drop off (seconds)
brass	36
copper	24
lead	246
iron	132

What measuring equipment did Leanne use to get her results?

.....

1 mark

(b) Give **two** things Leanne must do to carry out a fair test.

1 .....

2 .....

2 marks

(c) Which metal in the table was the best conductor of heat?
Tick the correct box.

brass ☐ copper ☐

iron ☐ lead ☐

1 mark

(d) Leanne left the rods in the water for a week.
One of the metal rods went rusty.

Which metal rod went rusty?
Tick the correct box.

brass ☐ copper ☐

iron ☐ lead ☐

1 mark
maximum 5 marks

Q6.

(a) The table below shows information about five elements.

element	melting point (°C)	boiling point (°C)	conducts electricity	colour
A	–7	59	no	brown
B	–218	–183	no	colourless
C	1535	2750	yes	silvery
D	113	445	no	yellow
E	1083	2567	yes	orange

(i) Which **two** of these elements are likely to be metals?

Write the letters.

..... and .....

1 mark

(ii) Which element in the table is liquid at room temperature?
Write the letter.

.....

1 mark

(b) What is the chemical symbol for copper?
Tick the correct box.

Cr ☐ Cu ☐ C ☐ Co ☐ Ca ☐

1 mark

(c) How many atoms of iron and oxygen are there shown in the formulas for FeO and Fe_2O_3?

Complete the table below.

compound	number of atoms of iron	number of atoms of oxygen
FeO		

Fe_2O_3		

2 marks
maximum 5 marks

Q7.

A long time ago sulphuric acid was made by heating a substance called **blue vitriol**.
The equations below show how sulphuric acid is produced by this method.

blue vitriol ⟶ copper oxide + sulphur trioxide + water

sulphur trioxide + water ⟶ sulphuric acid

(a) Name **three** elements contained in blue vitriol.

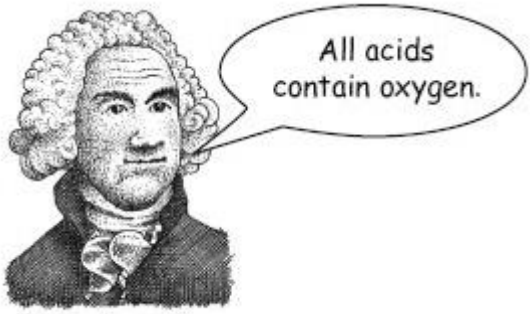
1. .....

2. .....

3. .....

3 marks

(b) (i) Anton Lavoisier was a scientist. He made acids by dissolving oxides like sulphur oxide and nitric oxide in water. They formed two acids; sulphuric acid and nitric acid. From this, he concluded:



Anton Lavoisier

The formulas for these two acids are H_2SO_4 and HNO_3.
How do these formulas support Lavoisier's conclusion about acids?

.....

.....

1 mark

(ii) Some time after Lavoisier's death, hydrochloric acid was identified.
The formula for hydrochloric acid is HCl.

Explain why scientists no longer supported Lavoisier's conclusion about acids.

.....

.....

1 mark

(c) Scientists now agree that **all** acids contain hydrogen.
Look at the two word equations below.

zinc + sulphuric acid ⟶ zinc sulphate + hydrogen

magnesium + nitric acid ⟶ magnesium nitrate + hydrogen

(i) Explain how these equations support the suggestion that acids contain hydrogen.

.....

.....

1 mark

(ii) Complete the equation below for the reaction between iron and hydrochloric acid.

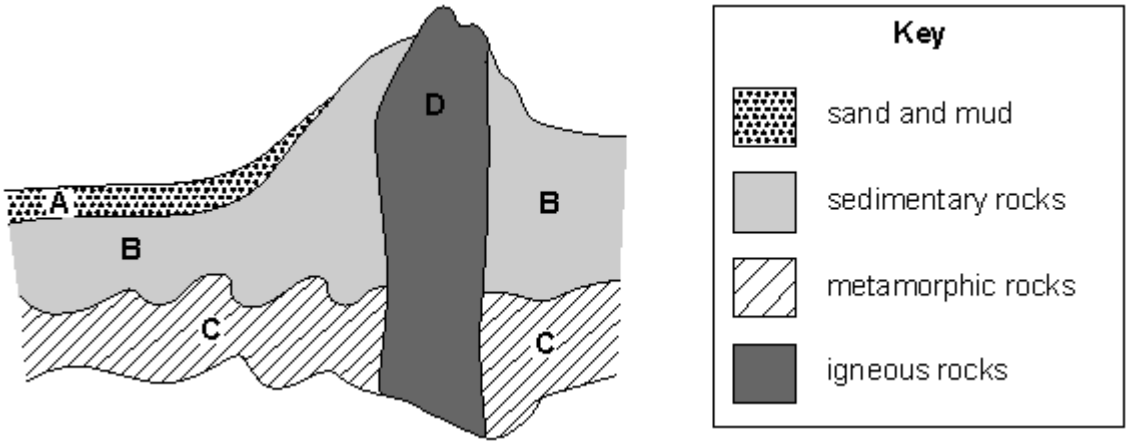
iron + hydrochloric acid ⟶ ..... + ...

1 mark

maximum 7 marks

Q8.

The diagram shows rocks in a mountain range.



(a) Choose the correct letter from the diagram to best match the descriptions below. You may write each letter more than once.

(i) rock changed by heat and pressure

.....

(ii) rock formed by magma cooling and solidifying

.....

(iii) the oldest rock shown in the diagram

.....

(iv) region where eroded materials are deposited

.....

(v) region not being affected by erosion

.....

3 marks

(b) Rainwater can damage rocks by physical and chemical weathering.

(i) Give one way rainwater causes **physical** weathering.
Give the name and describe the process in the table below.

(ii) Give one way rainwater causes **chemical** weathering.
Give the name and describe the process in the table below.

	name	**description of process**
physical weathering		
chemical weathering		

4 marks
maximum 7 marks

Q9.

Solder is a mixture of lead and tin.
The melting point of solder depends on the amount of tin in the mixture.

(a) Look at the table below.

amount of tin in solder (%)	**melting point of solder (°C)**
0	327
30	255
40	235
50	212
60	188
70	192
80	205
90	220
100	232

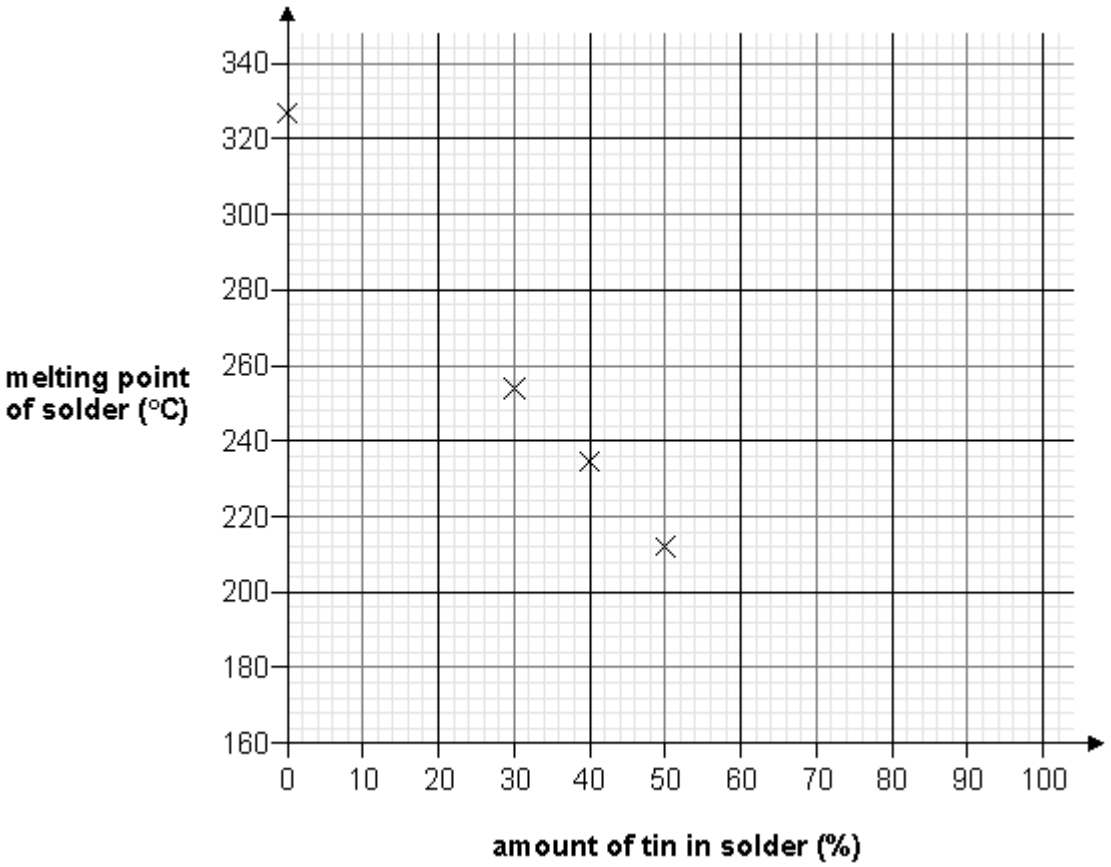
(i) The melting point of pure tin is 232°C.
What is the melting point of pure lead?

..... °C

1 mark

(ii) Use the data in the table to plot the points on the grid below.
Four of the points are plotted for you.

Draw an appropriate line of best fit.



3 marks

(b) Use your graph to estimate the amount of tin needed to make solder with the **lowest** melting point.

..... %

1 mark

(c) Describe how the melting point of solder changes with the amount of tin in the solder.

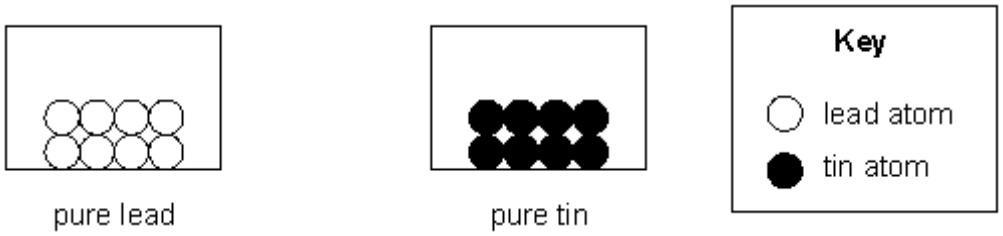
.....

.....

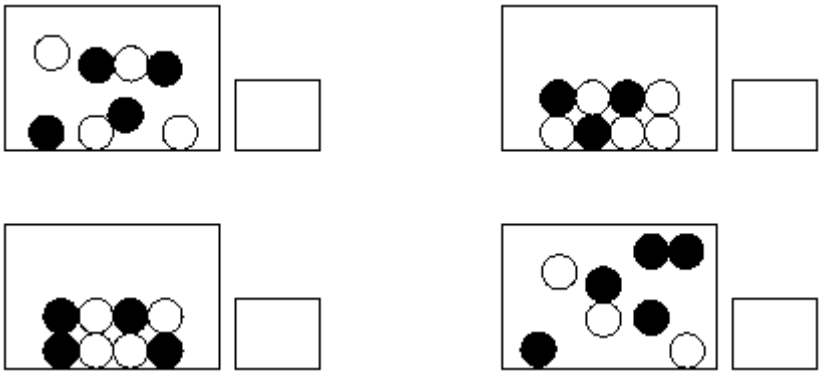
.....

2 marks

(d) The diagrams below show the arrangement of atoms in solid samples of pure lead and pure tin.



Which box shows the correct arrangement of the lead atoms and tin atoms in a sample of solder that has a melting point of 212°C at room temperature?
Use the table above.
Tick the correct box.



1 mark
maximum 8 marks

Q10.

Stefan is on holiday in the mountains. It is snowing.

(a) (i) Choose words from the box to complete the sentence below.

solid	**liquid**	**gas**

A snowflake falls on Stefan's nose and melts.
When the snowflake melts, it changes

from a ..... to a ..... .

1 mark

(ii) Snow that falls on the ground melts slowly.
Snow that falls on Stefan's nose melts **very quickly**.
Give a reason for this.

.....

1 mark

(iii) In his hotel, Stefan sees some changes.
Are the changes below reversible?
Write **yes** or **no**.

ice melting .....

wood burning .....

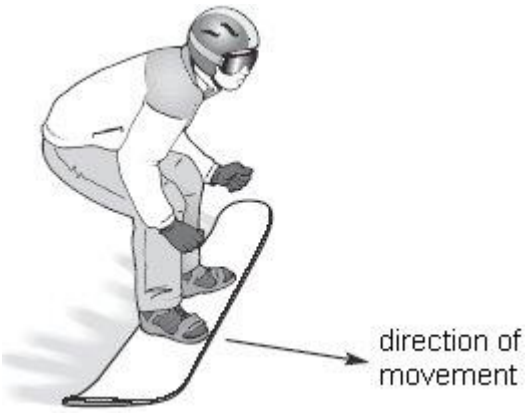
toasting bread .....

1 mark

(b) (i) Stefan is snowboarding. Gravity acts on Stefan.
On the diagram below, draw an arrow to show the direction of the force of gravity.

1 mark

(ii) When Stefan wants to slow down, he pushes one edge of the snowboard into the snow.



What force between the board and the snow makes him slow down?

.....

1 mark
maximum 5 marks

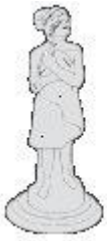
Q11.

The drawings below show six objects found in Sophie's garden.
The objects are all made of different materials as shown.

aluminium
greenhouse frame

slate
roof tile

iron
gate



plastic
plant pot

marble
statue

steel
watering can

not to scale

(a) Which two **objects** shown above are made of **rock**?

1. .....

2. .....

1 mark

(b) Write two of the **objects** shown above which are made of **metal.**

1. .....

2. .....

1 mark

(c) (i) A gas in the air reacts with iron to make it rusty.
Give the name of this gas.

.....

1 mark

(ii) What could you do to an iron gate to protect it from this gas in the air?

.....

1 mark

(d) Sophie tests each material with a magnet.

Which two materials are attracted to the magnet?
Tick the **two** correct boxes.

aluminium ☐ slate ☐

iron ☐ plastic ☐

marble ☐ steel ☐

2 marks
maximum 6 marks

Q12.

Michelle added some universal indicator solution to four liquids.

Michelle uses the pH chart to fill in her table of results.

pH chart

pH	1	2	3	4	5	6	7	8	9	10	11	12	13	14
colour	red			orange			green	blue			purple			

(a) The table below shows some of Michelle's results.

Complete Michelle's table of results below.
Use the pH chart to help you.

liquid	colour of universal indicator solution	pH
milk	green	
rain water		5
hydrochloric acid	red	
bleach		11

2 marks

(b) Explain why using acids can be dangerous.

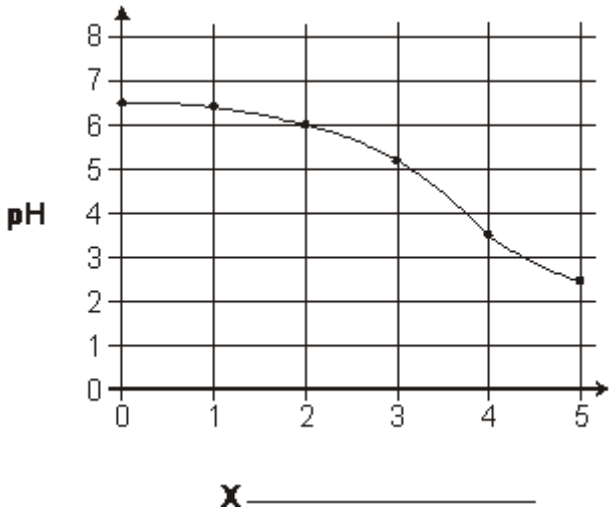
.....

.....

1 mark

(c) Michelle measured the pH of some milk stored at room temperature for five days.

The graph of Michelle's results is shown below.
One of the axes has been labelled.



1 mark

(i) Write the axis label for the graph **at X.**

(ii) Use the graph. How does the pH of the milk change over the five days?

.....

1 mark
maximum 5 marks

Q13.

The drawing below shows the remains of an animal found in a rock.

(a) Some scientists think the animal in the drawing above was a bird.

(i) Give **one** feature of the animal above that suggests it was a bird.

.....

1 mark

Other scientists think the animal was a reptile.

(ii) What are reptile skins covered with?

.....

1 mark

(b) The animal lived millions of years ago. Scientists used the remains to draw what they think the animal looked like when it was alive.

Why can scientists **not** be certain that the animal looked like the drawing above?

.....

.....

1 mark

(c) Give the name for the remains of living things found in rocks.

.....

1 mark

(d) Igneous rocks can be formed from lava from volcanoes.
The remains of living things are **not** found in rocks made from lava.
Why does lava destroy the remains of living things?

.....

1 mark
maximum 5 marks

Q14.

(a) Amy's family are at the beach during the summer.
Amy and her sister have a bucket containing seawater and sand.

Read the following statements.
Which are **true** and which are **false**?

Tick **one** box for each statement.

	true	**false**
Water is a solvent for salt.	☐	☐
Sand sinks in water because water is more dense than sand.	☐	☐
When a solid dissolves in water, the solid is called a solute.	☐	☐

2 marks

(b) Seawater contains dissolved salt.
Describe what Amy can do to separate **and** collect pure water from seawater.

.....

.....

2 marks

(c) Draw a line from each of the **substances** below to the **group** that it belongs to.
Draw only **three** lines.

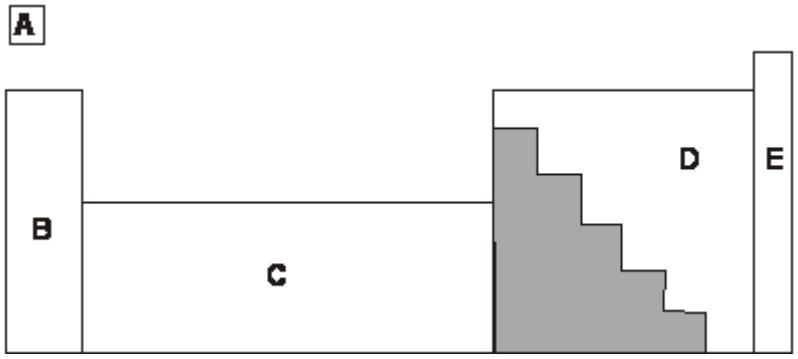
Draw a line from each **group** to the correct **description**.
Draw only **three** lines.

substance	group	description
seawater	compound	It contains two or more types of atoms or molecules which can be physically separated.
salt	mixture	It contains only one type of atom.
oxygen	element	Two or more types of atoms are chemically joined together.

2 marks
maximum 6 marks

Q15.

(a) The diagram below shows part of the periodic table of elements.



The shaded area contains **only** metal elements.

Two other areas also contain **only** metal elements.

Which areas contain only metal elements?
Tick the **two** correct boxes.

A ☐ B ☐ C ☐ D ☐ E ☐

1 mark

(b) Copper is a metal.

At room temperature copper is a strong solid.
Give **two** other properties of copper that show it is a metal.

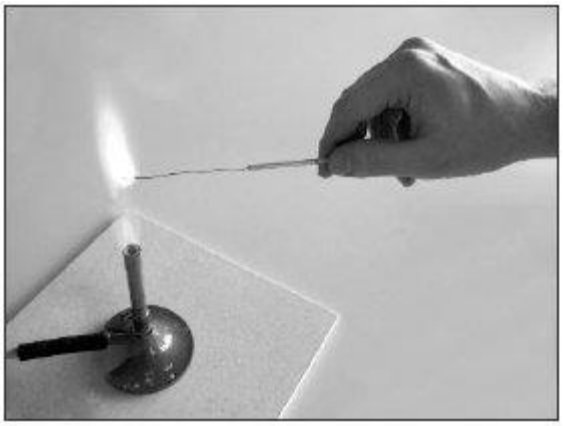
1. .....

1 mark

2. .....

1 mark

(c) When copper metal is heated it reacts with a gas in air.



What is the chemical name of the **product** formed when copper reacts with a gas in air?

.....

1 mark

(d) Which statement below describes what happens in a **chemical change** but **not** in a physical change?

Tick the correct box.

The product is a solid. ☐

The change only happens at a high temperature. ☐

The atoms have combined in a different way to make a new substance. ☐

The types of atoms at the start are the same as in the end product. ☐

1 mark

maximum 5 marks

Q16.

(a) The fire extinguisher below contains a compound called sodium hydrogencarbonate.

The formula for sodium hydrogencarbonate is $NaHCO_3$.

When sodium hydrogencarbonate is heated it breaks down to produce carbon dioxide, water and a compound with the formula Na_2CO_3.

This is shown in the equation below.

(i) Complete the word equation below.

sodium hydrogencarbonate ⟶ carbon dioxide + water + ... (Na_2CO_3)

1 mark

(ii) Complete the table below to show the mass of water produced when 168 g of sodium hydrogencarbonate breaks down completely.

compound	reactant or product	mass (g)
sodium hydrogencarbonate	reactant	168
carbon dioxide	product	44
water	product	
Na_2CO_3	product	106

1 mark

(iii) How much carbon dioxide is produced when 336 g of sodium hydrogencarbonate breaks down completely?

..... g

1 mark

(b) The diagram below shows two other types of fire extinguisher.

contains carbon

contains

dioxide gas water

To put out a fire, you have to do one or more of the following:

- keep oxygen away from the fire
- take the heat away from the fire
- take the fuel away from the fire.

The density of carbon dioxide is about 1.8 g per 1000 cm^3.
The density of air is about 1.2 g per 1000 cm^3.

(i) Use the information above to explain why carbon dioxide is used to put out fires.

.....

.....

.....

2 marks

(ii) When water from the fire extinguisher is sprayed over a fire, the water evaporates.

Why does evaporation cool the fire down?

.....

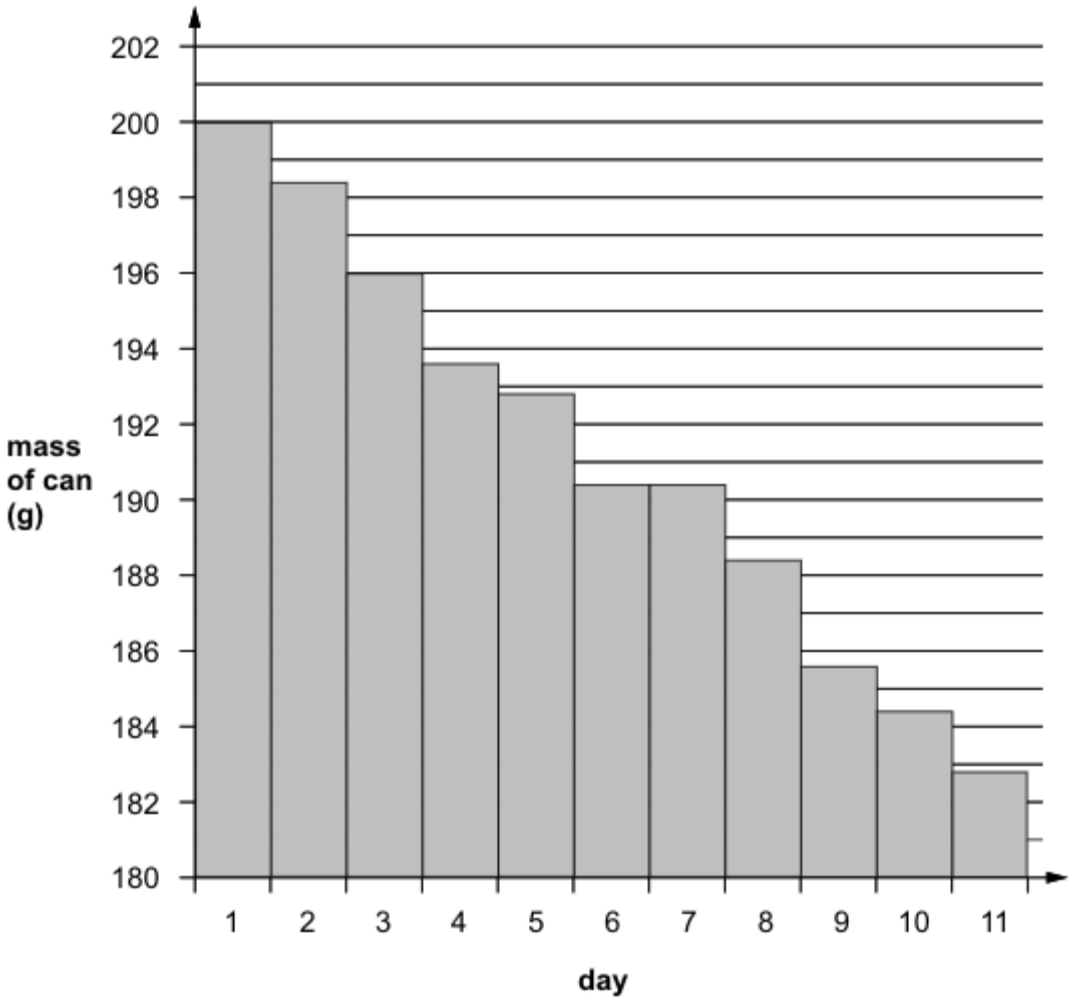
.....

1 mark
maximum 6 marks

Q17.

Anna has a can of deodorant that she uses once each day.
Before she uses the deodorant she measures the mass of the can.

(a) Her results are shown in the graph below.



(i) What was the mass of the can of deodorant on day 1?

..... g

1 mark

(ii) How did the mass change as Anna used the deodorant?

.....

1 mark

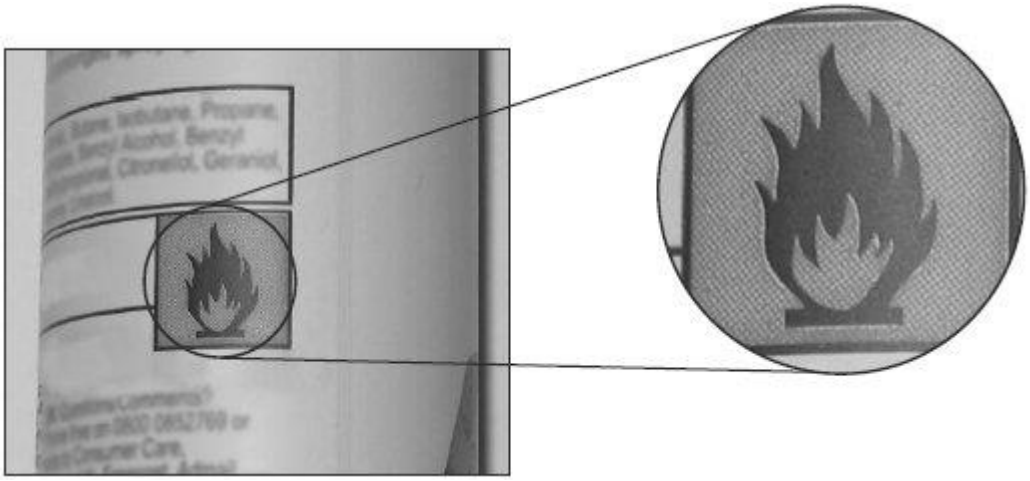
(iii) Anna did **not** use the deodorant on day 6.
How can you tell this from the graph?

.....

.....

1 mark

(b) The deodorant can has a warning sign on it.



What does this warning sign mean?

.....

1 mark

(c) A deodorant contains a solution of perfume and alcohol.

What happens to the perfume when it is mixed with the alcohol?
Tick the correct box.

It boils.	☐	It dissolves.	☐
It freezes.	☐	It melts.	☐

1 mark

(d) Anna sprayed the liquid deodorant under her arms.
After a few minutes, her skin had dried.

What happened to the liquid?
Tick the correct box.

It evaporated.	☐	It dissolved.	☐
It boiled.	☐	It condensed.	☐

1 mark
maximum 6 marks

Q18.

(a) The diagrams below show how much heat is lost from different parts of a house every second.

Through which part of the house above is most heat lost?

.....

1 mark

(b) Part of the house is insulated to reduce the loss of heat.
This is shown below.

(i) Which part of the house has been insulated?

.....

1 mark

(ii) Explain your answer.

.....

.....

1 mark

(c) The table below gives information about three fossil fuels that can be used to heat a house.

fuel	physical state	energy released when 1g is burned (J)	Does the fuel produce these substances when burned?	
			water	sulphur dioxide
coal	solid	25000	yes	yes
oil	liquid	42000	yes	yes

methane	gas	55000	yes	no

(i) Which fuel in the table releases the **least** energy when 1 g is burned?

.....

1 mark

(ii) Methane **can** be compressed.
Which information in the table shows that methane can be compressed?

.....

1 mark

(iii) Sulphur dioxide causes acid rain.
Use the table to explain why burning methane does **not** produce acid rain.

.....

.....

1 mark
maximum 6 marks

Q19.

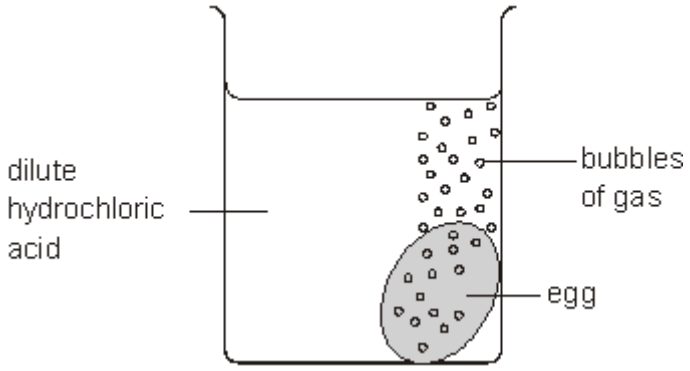
(a) The table below shows the pH of four acidic liquids.

acidic liquid	pH
grapefruit juice	3.1
ethanoic acid	3.0
lemonade	4.4
dilute hydrochloric acid	1.0

Which of these liquids is the **least** acidic?

1 mark

(b) Emilio cooked an egg until it was hard-boiled.
He put the egg in a beaker of dilute hydrochloric acid as shown.



(i) The egg shell reacted completely with the acid.
After two days the pH of the liquid in the beaker was 2.5.

How did the **acidity** of the liquid in the beaker change?

Use the table above to help you.

.....

1 mark

(ii) Emilio put another hard-boiled egg in some ethanoic acid.
It took longer for the shell to react completely.

Use the table opposite to suggest a reason for this.

.....

.....

1 mark

(c) The chemical formulae for four acids are shown in the table below.

sulphuric acid	hydrochloric acid	nitric acid	ethanoic acid
H_2SO_4	HCl	HNO_3	CH_3COOH

(i) Give the **name** of the element that is present in all four acids.

.....

1 mark

(ii) Give the **names** of the two **other** elements present in sulphuric acid.

1. .....

1 mark

2. .....

1 mark

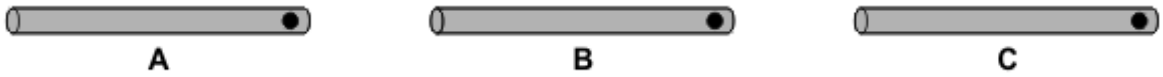
(iii) How many atoms are there in the formula HNO_3 (nitric acid)?

.....

1 mark
maximum 7 marks

Q20.

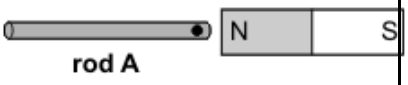
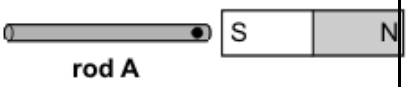
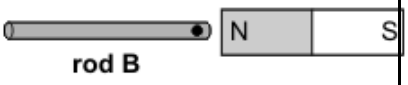
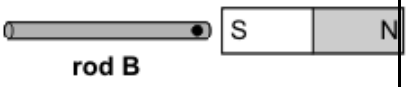
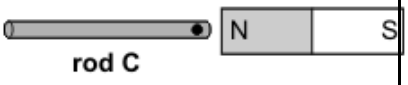
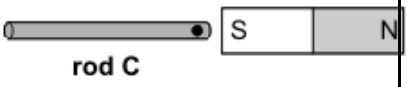
Hannah has three rods (A, B and C) made from different metals.
One rod is a **magnet**; one is made of **copper**; and one is made of **iron**.
She does not know which rod is which.



Each rod has a dot at one end.

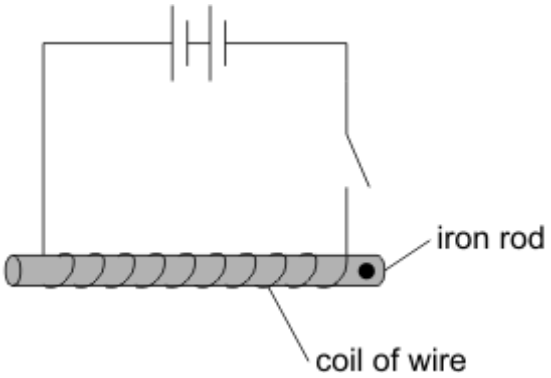
(a) Hannah uses **only** a bar magnet to identify each rod.
She puts each pole of the bar magnet next to the dotted end of each rod.

Complete Hannah's observations in the table below.
Write if each rod is **copper**, **iron** or a **magnet**.

test	observations	type of rod
 rod A	attract	Rod A is ..... .
 rod A	attract	
 rod B	nothing happens	Rod B is ..... .
 rod B	.....	
 rod C	attract	Rod C is ..... .
 rod C	.....	

3 marks

(b) Hannah uses the iron rod to make an electromagnet.



When the switch is closed the iron rod becomes an electromagnet.
Give **two** ways Hannah could make the electromagnet stronger.

1. .....

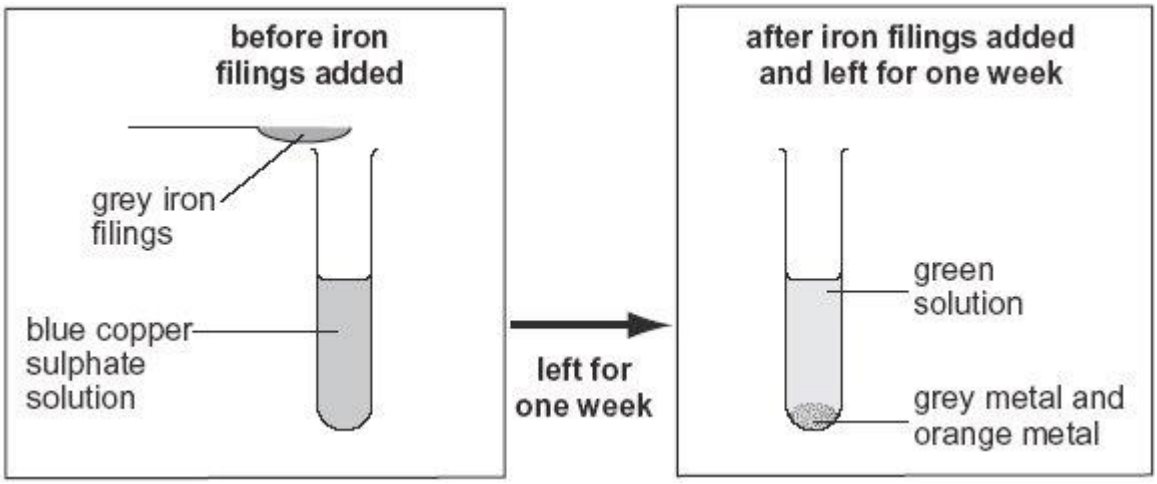
1 mark

2. .....

1 mark
maximum 5 marks

Q21.

Joanne added iron filings to copper sulphate solution.
She observed the reaction after one week.



(a) What evidence in the diagrams shows that a chemical reaction has taken place?

.....

1 mark

(b) The reaction between iron and copper sulphate is a **displacement** reaction.

(i) Give the name of the orange metal visible after one week.

.....

1 mark

(ii) What is the name of the compound formed in this reaction?

.....

1 mark

(iii) Joanne poured the green solution into another test tube. She added some copper pieces to the solution.

Will a displacement reaction occur?

yes ☐ no ☐

Explain your answer.

.....

.....

1 mark

(c) Part of the reactivity series of metals is shown below.

potassium
lithium
calcium
aluminium
zinc
lead

most reactive ↑ least reactive

Use the information above.
Which **two** metals would react with aluminium nitrate in a displacement reaction?

Tick the **two** correct boxes.

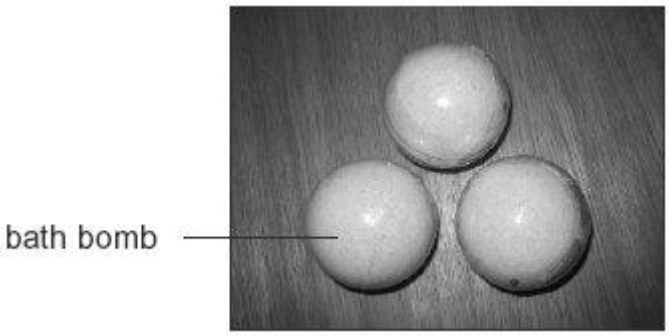
calcium ☐ potassium ☐

zinc ☐ lead ☐

1 mark
maximum 5 marks

Q22.

When bath 'bombs' are dropped into bath water they colour the water and make the water smell of perfume.



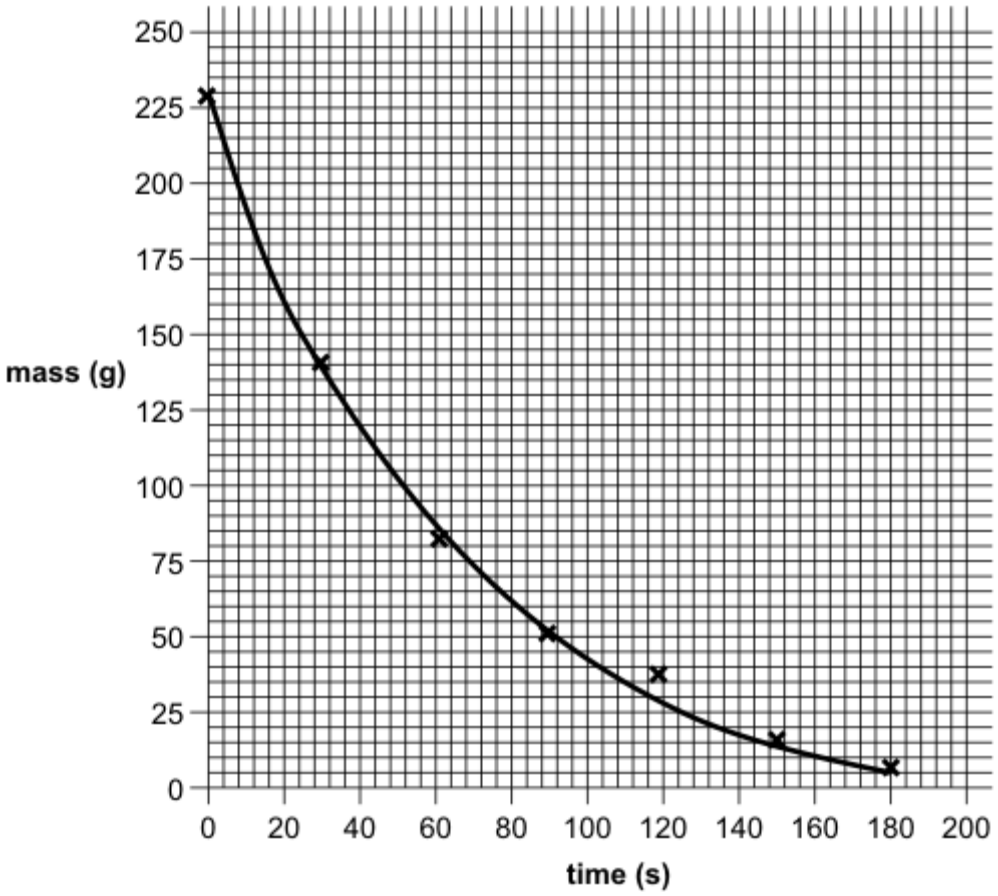
(a) Bath bombs contain citric acid and sodium carbonate. When they react a gas is produced.

Complete the word equation for the reaction that takes place.

citric acid + sodium carbonate → sodium citrate + water + ...

1 mark

(b) A bath bomb was dropped into hot water and its mass was measured every thirty seconds, for three minutes.
The graph below shows the results.



Between which two times on the graph does the mass of the bath bomb decrease fastest?
Tick the correct box.

between 0 s and 30s ☐

between 30 s and 60s ☐

between 90 s and 120s ☐

between 150 s and 180s ☐

1 mark

(c) (i) The bath bomb was 230g at the start.
How long does it take for the mass of the bath bomb to decrease by a half?

..... s

1 mark

(ii) The reactants in a bath bomb were 176g at the start.
129g of sodium citrate and 14g of water are produced in the reaction.
Calculate the mass of gas produced in the reaction.

.....

..... g

1 mark

(d) Some people on cruise ships practise golf. They hit golf balls into the sea. Turtles can swallow the golf balls. A new type of golf ball has been made from a bath bomb covered in hardened paper to use on cruise ships.

Suggest **one** reason why this type of golf ball might be better for the environment than a normal golf ball.

.....

.....

1 mark

(e) Complete the word equation for the reaction between citric acid and calcium carbonate. Use the equation in part (a) to help you.

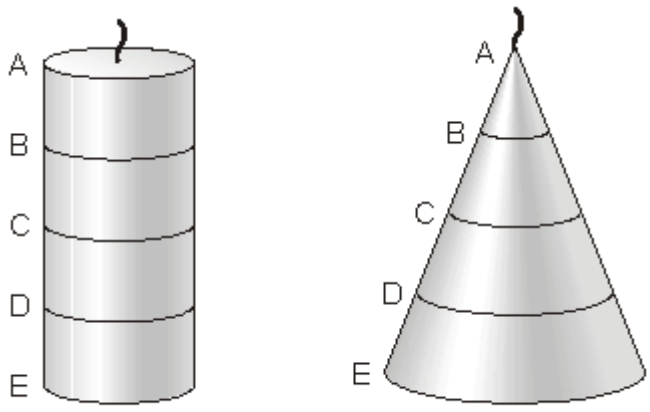
citric acid + calcium carbonate ⟶ water + ... + ...

1 mark

maximum 6 marks

Q23.

Simon made two candles from the same amount of wax.
He drew lines on both candles.



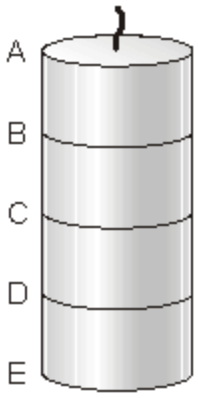
candle 1 candle 2

(a) What would Simon use to measure the **distance** between the lines?

.....

1 mark

(b) He timed how long **candle 1** took to burn.
His results are shown below.



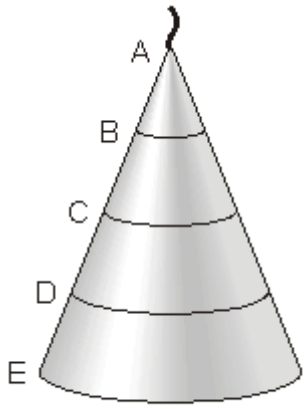
candle 1

(i) How long would it take for **candle 1** to burn from C to D?
Write your answer in the table.

part that burned	time for candle 1 to burn (minutes)
A to B	30
B to C	30
C to D	
D to E	30

1 mark

(ii) Simon timed how long **candle 2** took to burn.



candle 2

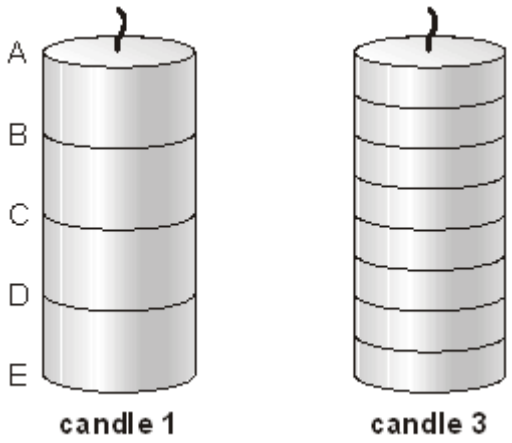
How long would it take for **candle 2** to burn from A to B **and** from D to E?
Write your answers in the table.

part that burned	time for candle 2 to burn (minutes)
A to B	
B to C	20
C to D	40

D to E	

2 marks

(c) Simon wanted to use a candle to measure time.
He made **candle 3** the same size as **candle 1**.



Why is **candle 3** more useful than **candle 1** for measuring time?

.....

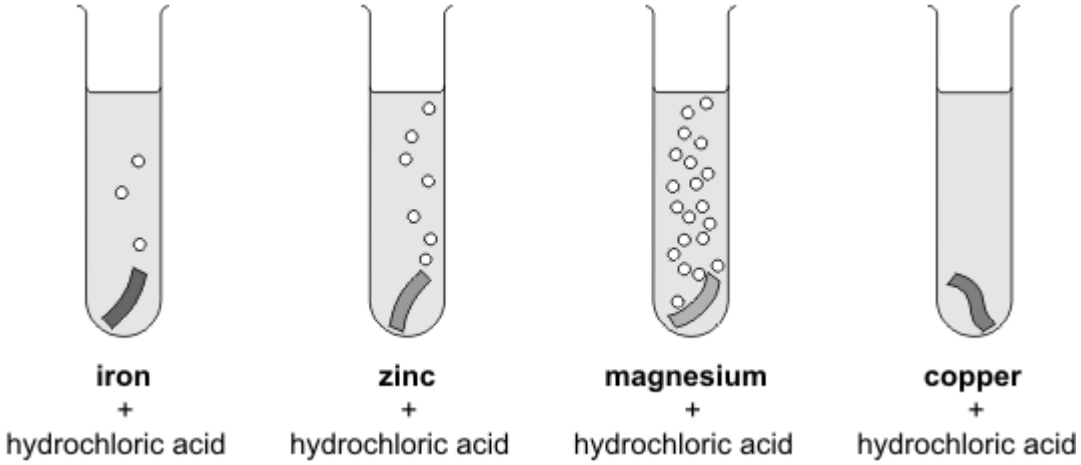
.....

1 mark
maximum 5 marks

Q24.

(a) Ruth put a piece of a different metal in each of four test tubes.

She poured 10 cm^3 of hydrochloric acid onto each metal.



Look at the diagrams above.

(i) How do these show if a metal reacts with the acid?

.....

1 mark

(ii) **On the lines below**, put the **four** metals in the order of how strongly they react with the acid.

most reactive .....

.....

.....

least reactive .....

1 mark

(b) Choose the name of a metal from the box below to answer each question.

copper	**iron**	**magnesium**	**zinc**

(i) Which metal from the box is used for electrical wires?

.....

1 mark

(ii) Which metal from the box goes rusty?

.....

1 mark
maximum 4 marks

Q25.

(a) The table below shows the melting points and boiling points of four elements.

element	melting point (°C)	boiling point (°C)
aluminium	660	2520
iron	1540	2760
magnesium	650	1100
mercury	−39	357

When answering the questions below, you may give the name of an element more than once.

Which element in the table is:

(i) a liquid at 0°C?

.....

1 mark

(ii) a solid at 1500°C?

.....

1 mark

(iii) a gas at 500°C?

.....

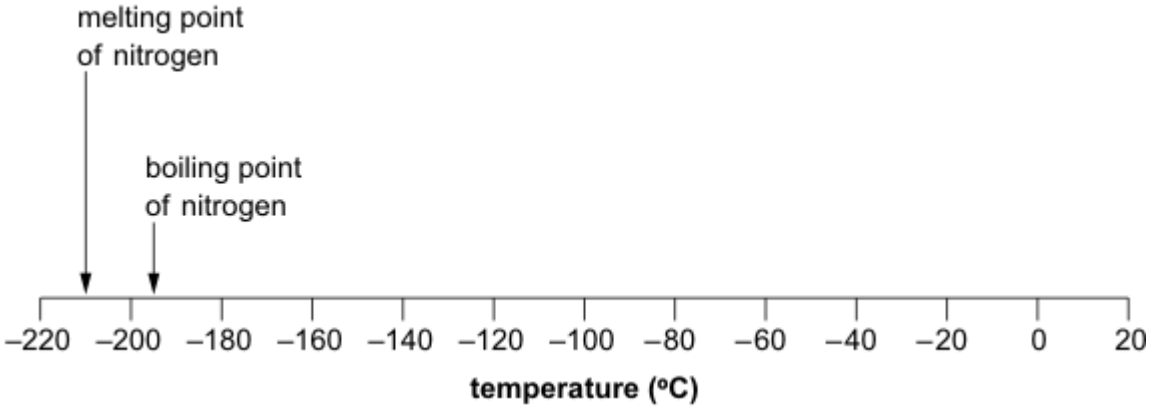
1 mark

(iv) a liquid over the biggest temperature range?

.....

1 mark

(b) The melting point and boiling point of nitrogen are marked on the scale below.



(i) **Draw an arrow** on the scale above to show the temperature at which water freezes.

1 mark

(ii) When water is a liquid, what is the physical state of nitrogen?
Tick the correct box.

solid ☐ liquid ☐ gas ☐

1 mark

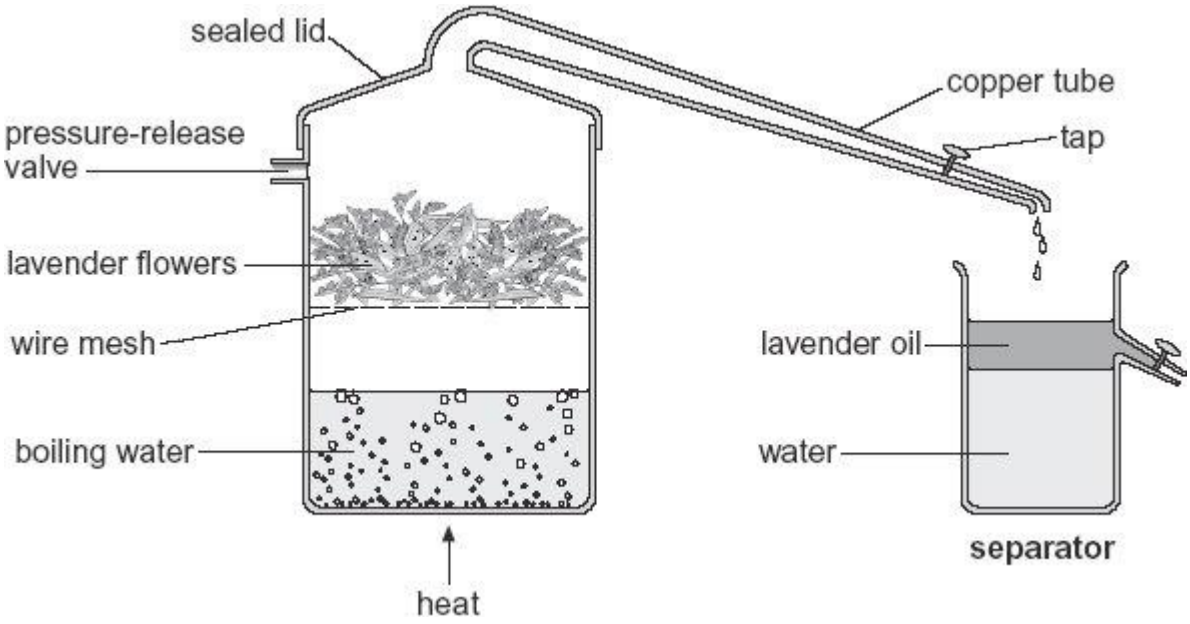
(iii) What is the physical state of nitrogen at −200°C?
Tick the correct box.

solid ☐ liquid ☐ gas ☐

1 mark
maximum 7 marks

Q26.

Lavender oil is a perfume obtained from lavender flowers.
Steam at 100°C is passed through the flowers in the apparatus below.



not to scale

Water vapour and lavender oil vapour pass down a copper tube towards a separator.

(a) (i) The lavender flowers are heated in a container with a sealed lid.

Why must the lid be sealed?

.....

.....

1 mark

(ii) What would happen if the container did **not** have a pressure-release valve?

.....

.....

1 mark

(b) Lavender oil vapour and water vapour cool as they pass down the copper tube.
A mixture of lavender oil and water collects in the separator.

(i) What is the change in the physical state of both lavender oil vapour and water vapour as they cool?

from ..... to .....

1 mark

(ii) Look at the separator.

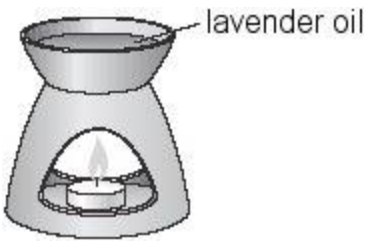
How does this show that the water is denser than lavender oil?

.....

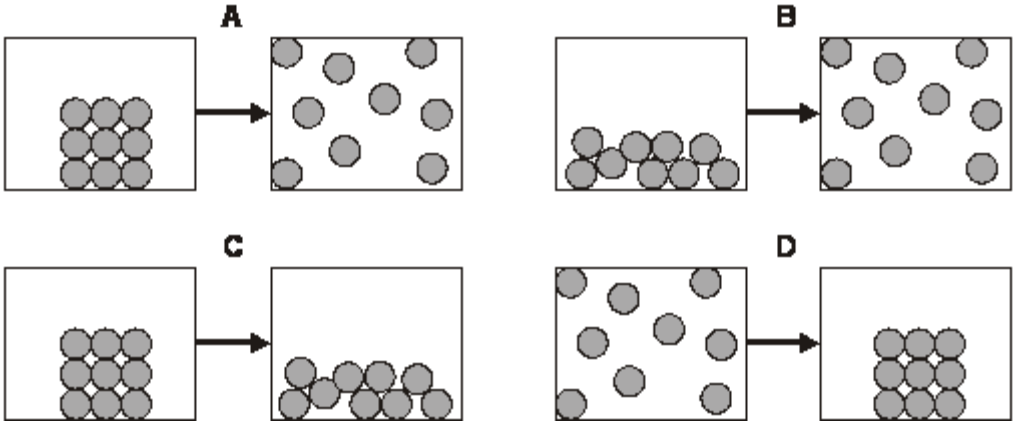
.....

1 mark

(c) Rosie poured some lavender oil into an oil burner.
She heated it with a candle.



The oil changed state.



Which diagram represents this change of state?
Write the letter.

.....

1 mark
maximum 5 marks

Q27.

(a) The chemical formula for hydrochloric acid is HCl.
The chemical formula for sodium hydroxide is NaOH.

When they react together, two products are formed.
The chemical formula for one product is NaCl.

(i) Complete the word equation below with the **names** of both products.

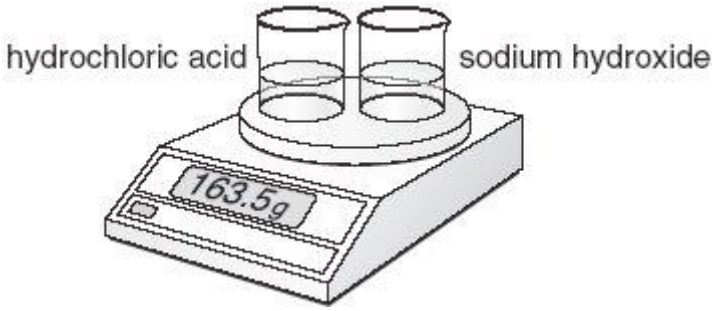
1 mark

(ii) **On the dotted line**, give the chemical formula of the other product.

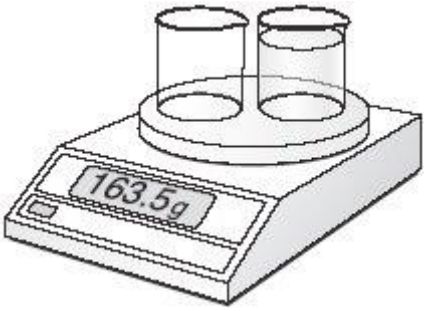
sodium hydroxide	+	hydrochloric acid	⟶	_____	+	_____
NaOH		HCl		NaCl		.....

2 marks

(b) In experiment 1, Molly put two beakers on a balance.
One contained 20 cm^3 of hydrochloric acid.
The other contained 20 cm^3 of sodium hydroxide solution.
The total mass was 163.5 g.



She poured the acid onto the sodium hydroxide. They reacted.



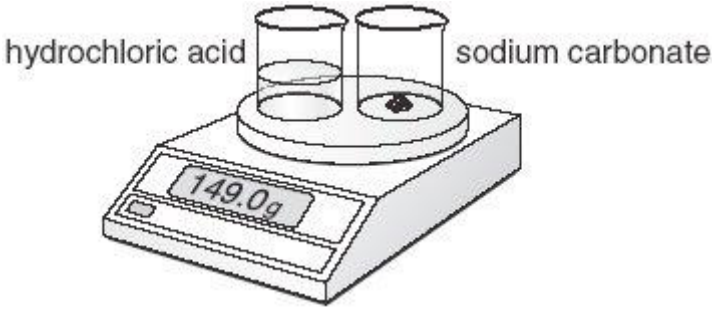
Why did the reading on the balance **not** change?

.....

.....

1 mark

(c) In experiment 2, Molly put two beakers on a balance.
One contained 20 cm^3 of hydrochloric acid.
The other contained 5 g of sodium carbonate.



She poured the acid onto the sodium carbonate. They reacted.
Two of the products are the same as in experiment 1.

(i) Complete the word equation with the names of the **three** products.

sodium carbonate + hydrochloric acid → ..... + ... + ...

1 mark

(ii) The total mass at the start was 149.0 g.
When the reaction stopped, the reading on the balance was 147.0 g.

Why was there a loss of mass in this reaction?

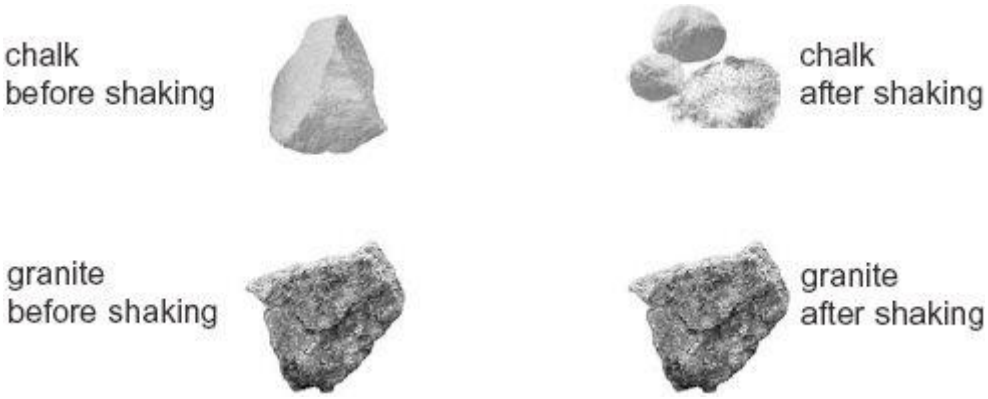
.....

.....

1 mark
maximum 6 marks

Q28.

Raj put a piece of chalk in one container and a piece of granite in another container.
He shook both containers for two minutes.
The photographs below show what happened.



(a) (i) Give **two** ways the **chalk** had changed.

1. .....

1 mark

2. .....

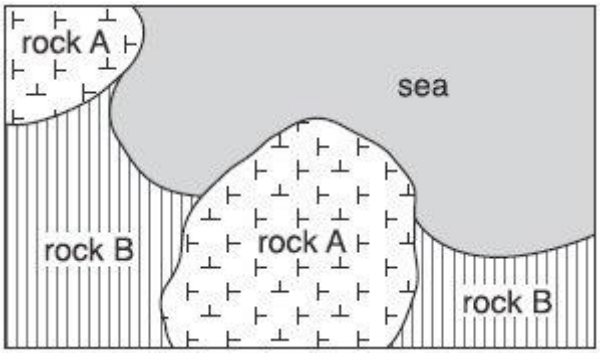
1 mark

(ii) Suggest why the **granite** did **not** change.

.....

1 mark

(b) A map of a coastline is drawn below. Waves crash against the rocks.



Which rock is chalk and which rock is granite?
Give the letters from the map.

chalk ..... granite .....

1 mark

(c) The photograph below shows the remains of an animal found in chalk rock.

(i) What are the remains of living things found in rock called?

.....

1 mark

(ii) Look carefully at the animal remains in the photograph.

Which animal could it be related to?

Tick the correct box.

snail	starfish	ladybird	slug
☐	☐	☐	☐

Give a reason for your answer.

.....

1 mark

(d) Granite is formed underground from very hot melted rock.

(i) Animal remains are **not** found in granite.
Give the reason for this.

.....

.....

1 mark

(ii) What is hot melted rock called when it is **underground**?
Tick the correct box.

sand	magma	lava	mud
☐	☐	☐	☐

1 mark
maximum 8 marks

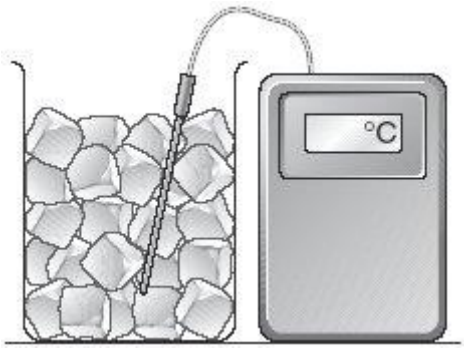
Q29.

(a) Draw a line from each change of state to the correct name.
Draw only **four** lines.

change of state	name
solid to liquid	evaporating
liquid to gas	melting
gas to liquid	condensing
liquid to solid	freezing

3 marks

(b) Kate made some ice cubes from pure water.
She used a sensor to measure the temperature of the ice.



What temperature will the sensor show when the ice is melting?

..... °C

1 mark

(c) Kate made some more ice cubes from salt solutions. She used a different amount of salt in each ice cube.

The table shows the temperature at which the ice cubes melted.

mass of salt in each ice cube (g)	temperature ice cube melted (°C)
5	−4
10	−8
15	−11
20	−15

Look at the table above.
As the mass of salt increased, what happened to the temperature at which the ice cube melted?

.....

1 mark

(d) In very cold weather a mixture of salt and sand is spread on roads.

Why are salt **and** sand used?
Tick the **two** correct boxes.

Salt makes the roads white.	☐	Sand dissolves in water.	☐
Salt makes water freeze.	☐	Sand increases friction between car tyres and the road.	☐
Salt makes ice melt.	☐	Sand makes water freeze.	☐

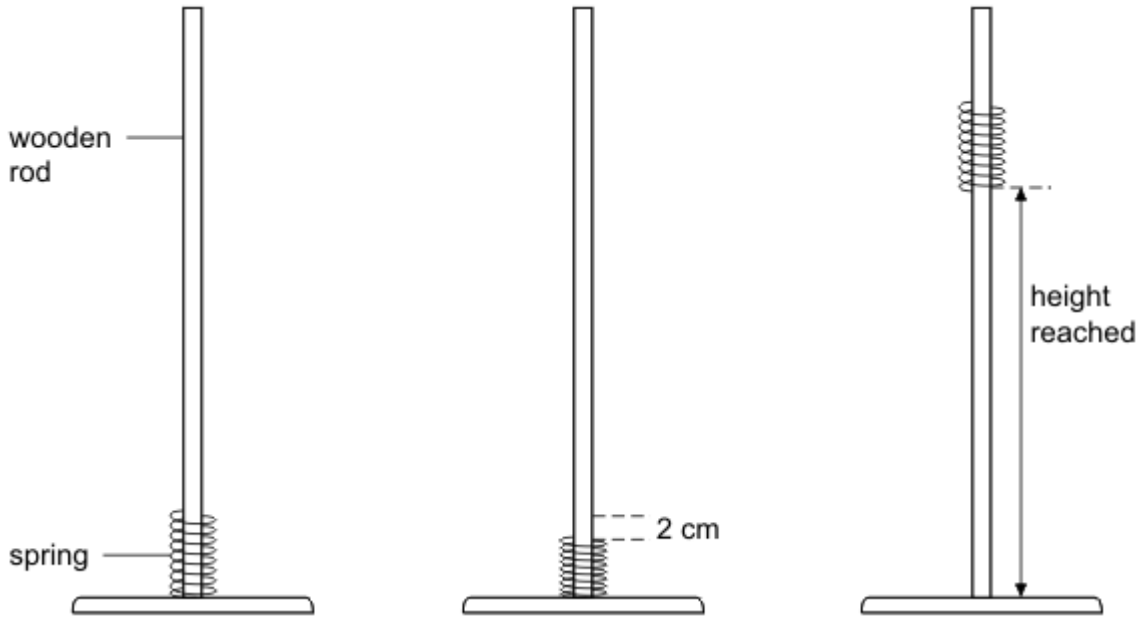
2 marks
maximum 7 marks

Q30.

Jenny put a spring over a wooden rod.

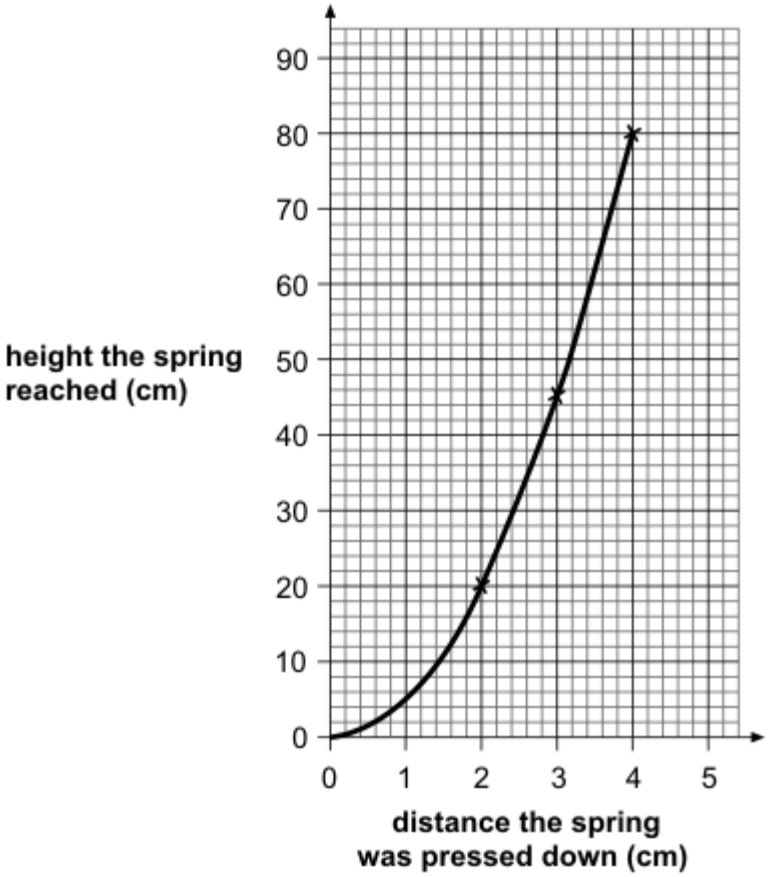
She pressed the spring down 2 cm.

She let go of the spring and measured the height it reached.



not to scale

Jenny repeated her experiment. She pressed the spring down more each time.
Her results are shown in the graph below.



(a) Use Jenny's graph to complete the table below.

distance the spring was pressed down (cm)	height the spring reached (cm)
2	
3	
4	

1 mark

(b) Jenny said, 'If I double the distance I press the spring down, the height it reaches will also double'.

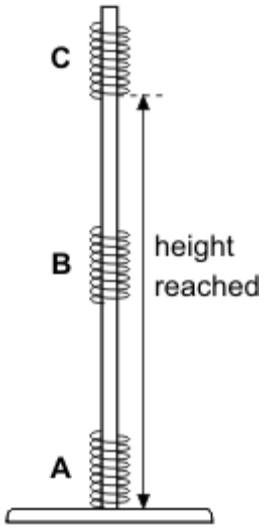
How do the results show she was wrong?

.....

.....

1 mark

(c) This diagram shows the moving spring in three different positions.



Complete the sentences below by choosing words from the box.
You can use each word more than once.

most	some	least

(i) When the spring is moving at **B** it has kinetic energy and

..... gravitational potential energy.

1 mark

(ii) When the spring reaches **C** it has ..... gravitational potential energy and ..... kinetic energy.

1 mark

(iii) When the spring stops at **A** it has ..... kinetic energy and

..... gravitational potential energy.

1 mark
maximum 5 marks

Q31.

Paul had four substances:

citric acid	copper sulphate	indigestion tablet	sugar

He dissolved 1 g of each substance in 20 cm^3 of distilled water.
He used universal indicator to find the pH of each solution.

(a) (i) Sugar solution does **not** change the colour of green universal indicator.

What does this tell you about sugar solution?
Tick the correct box.

It is an acid. ☐ It is an alkali. ☐

It is neutral. ☐ It is sweet. ☐

1 mark

(ii) Suggest the pH of citric acid.

.....

1 mark

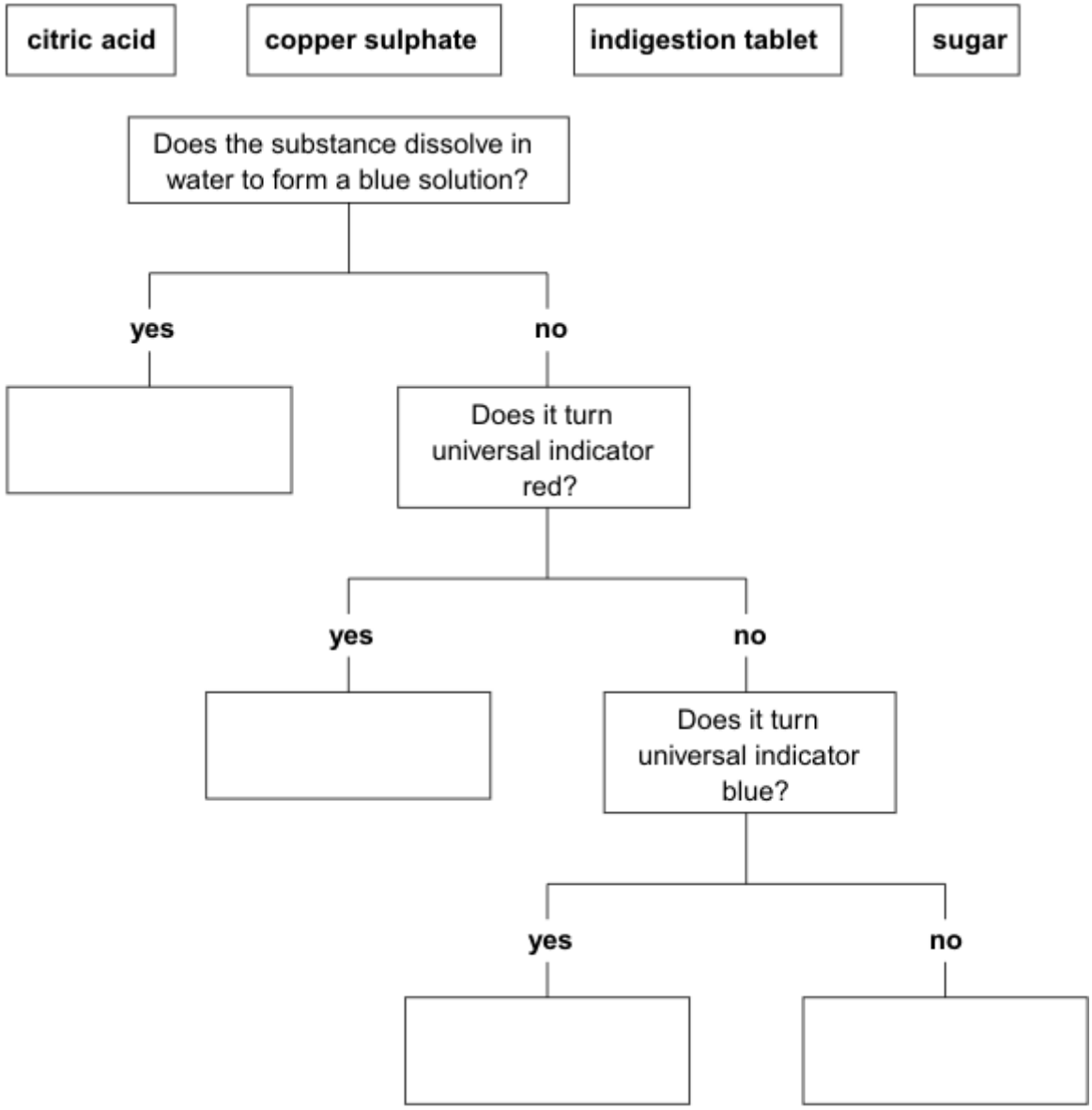
(iii) Indigestion tablets neutralise acid in the stomach.

What does this tell you about indigestion tablets?

.....

1 mark

(b) Complete the flow chart below with the names of the substances in the boxes.



3 marks
maximum 6 marks

Q32.

The drawing below shows a gemstone set in a gold ring.

Crystals of gemstones are found in different rocks.

(a) There are three groups of rocks:

igneous	**metamorphic**	**sedimentary**

(i) Crystals can be found in rocks that have been changed into different rocks by high temperature and high pressure.

Which group of rocks is formed in this way?

.....

1 mark

(ii) Crystals can be found in rocks formed by the cooling of hot magma.

Which group of rocks is formed in this way?

.....

1 mark

(b) How does the rate at which magma cools affect the size of the crystals formed?

.....

.....

1 mark

(c) Gemstones called rubies are made from an aluminium compound with the formula Al_2O_3.

The chemical symbol for aluminium is Al.

(i) Give the name of the element that is combined with aluminium in this compound.

.....

1 mark

(ii) Suggest the name of the compound with the formula Al_2O_3.

.....

1 mark

(iii) How many atoms are there in the formula Al_2O_3?

.....

1 mark

(d) (i) The gemstone in the drawing is set into a gold ring.
Gold is an element that is found in rocks.

Gold is never found combined with other elements.

Part of the reactivity series of metals is shown below.

more reactive	aluminium
	zinc
	lead
less reactive	copper

Where should gold be placed in this reactivity series?

.....

1 mark

(ii) The more reactive metals react with acids.

Complete the word equation for the reaction of zinc with hydrochloric acid.

zinc + hydrochloric acid ⟶ ..... + ...

2 marks

maximum 9 marks