

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE SCIENCE CHEMISTRY

F

Foundation Tier

End of Year 10 test 2018

Time allowed: 1 hour

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the periodic table.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

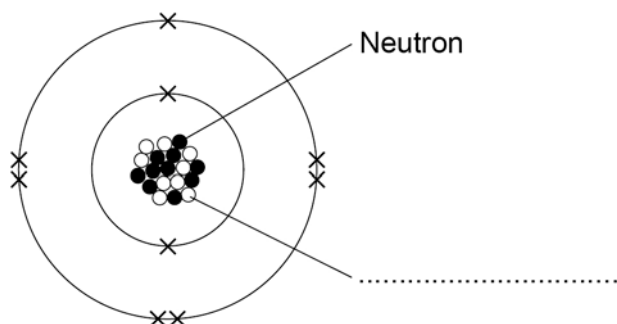
Information

- The maximum mark for this paper is 60.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

0 1 . 1 Figure 1 shows the atom of an element.

Figure 1



0 1 . 1 Label Figure 1.

Choose the answer from the box.

[1 mark]

Electron

Ion

Molecule

Proton

0 1 . 2 What is the relative charge of a neutron?

[1 mark]

Tick **one** box.

+1

0

-1

0 1 . 3 Complete the sentence.

Choose the answer from the box.

[1 mark]

compounds

isotopes

mixtures

polymers

Atoms of an element with different numbers of neutrons

are called _____.

0 1 . 4 What is the mass number of the atom in **Figure 1**?

[1 mark]

Tick **one** box.

9

10

19

28

0 1 . 5 Which group of the periodic table is the element in **Figure 1** in?

[1 mark]

Tick **one** box.

Group 0

Group 2

Group 5

Group 7

Question 1 continues on the next page

Turn over ►

0 1 . 6 The atom has a radius of 0.147 nm.

What is the radius of the atom in metres?

[1 mark]

Tick **one** box.

1.47×10^{-10} m

1.47×10^{-3} m

1.47×10^3 m

1.47×10^{10} m

0 1 . 7 The boiling point of the element is -188 °C.

What is the state of the element at room temperature (25 °C)?

[1 mark]

Tick **one** box.

gas

liquid

solid

7

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED**

Turn over ►

0 2

A student investigated the reaction of metal X with copper sulfate solution.

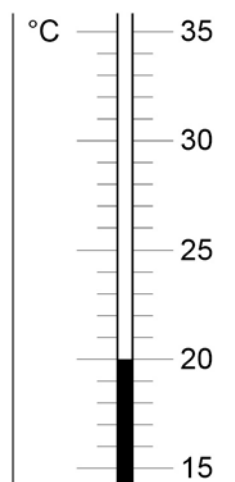
This is the method used.

1. Measure the temperature of 100 cm³ of copper sulfate solution.
2. Add 2 g of metal X.
3. Stir the solution.
4. Measure the highest temperature of the solution.

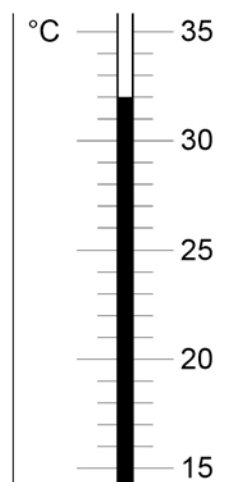
Figure 2 shows the temperature of the solution.

Figure 2

Before adding metal X



After adding metal X



0 2

. 1

Use **Figure 2** to complete **Table 1**.

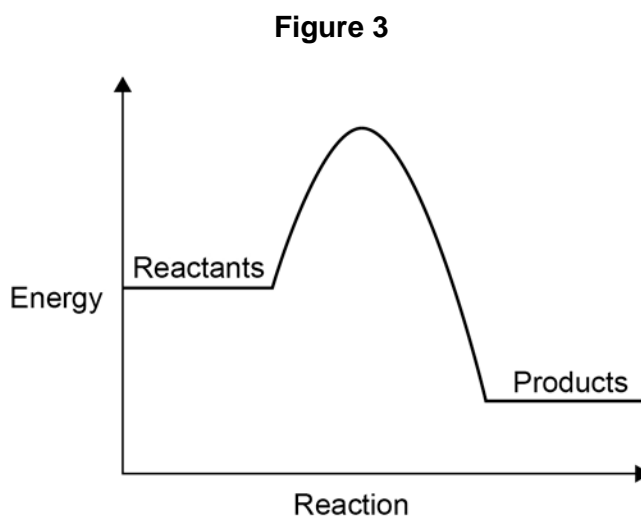
[2 marks]

Table 1

Temperature of the solution before adding metal X	20 °C
Temperature of the solution after adding metal X	____ °C
Change in temperature of the solution	____ °C

0 2 . 2

Figure 3 shows the reaction profile diagram for the reaction of metal **X** and copper sulfate.



The student concluded the reaction was exothermic.

Give **two** reasons why the student's conclusion is correct.

Refer to **Figure 2** and to **Figure 3** in your answers.

[2 marks]

1

2

Question 2 continues on the next page

Turn over ►

0 2 . 3 The student repeated the experiment with metals **Y** and **Z**.

Table 2 shows the results.

Table 2

Metal	Change in temperature of the solution in °C
Y	3
Z	8

Write metals **X**, **Y** and **Z** in order of reactivity.

Use the results from **Table 1** and **Table 2**.

[1 mark]

Most reactive _____

Least reactive _____

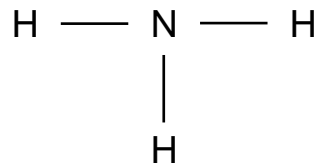
5

0 3

This question is about ammonia and compounds of ammonia.

Figure 4 represents an ammonia molecule.

Figure 4



0 3

. 1

What is the formula of ammonia?

[1 mark]

Tick **one** box.

NH₃

N₃H

N₃H

3NH

0 3

. 2

What type of substance is ammonia?

[1 mark]

Tick **one** box.

Fullerene

Giant covalent structure

Polymer

Small molecule

Question 3 continues on the next page

Turn over ►

0 3 . **3** Ammonia dissolves in water to produce ammonia solution.

Ammonia solution is alkaline.

What value represents the pH of ammonia solution?

[1 mark]

Tick **one** box.

1

3

7

11

0 3 . **4** Ammonia solution reacts with an acid to produce the salt ammonium sulfate.

Name the acid that ammonia reacts with to produce ammonium sulfate.

[1 mark]

0 3 .

5

The formula of ammonium sulfate is $(\text{NH}_4)_2\text{SO}_4$

Calculate the percentage of sulfur in ammonium sulfate.

Use the equation

$$\text{percentage (\% of element)} = \frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$$

Give your answer to 3 significant figures.

[2 marks]Relative atomic masses (A_r): H = 1 N = 14 O = 16 S = 32Relative formula mass (M_r) of ammonium sulfate = 132

Percentage of sulfur = _____ %

6**Turn over for the next question****Turn over ►**

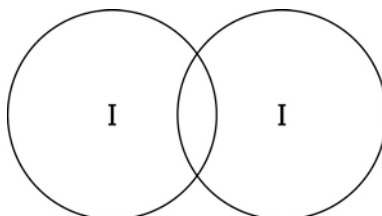
0 4

This question is about bonding.

0 4

. 1

An iodine atom has 7 electrons in its outer shell.

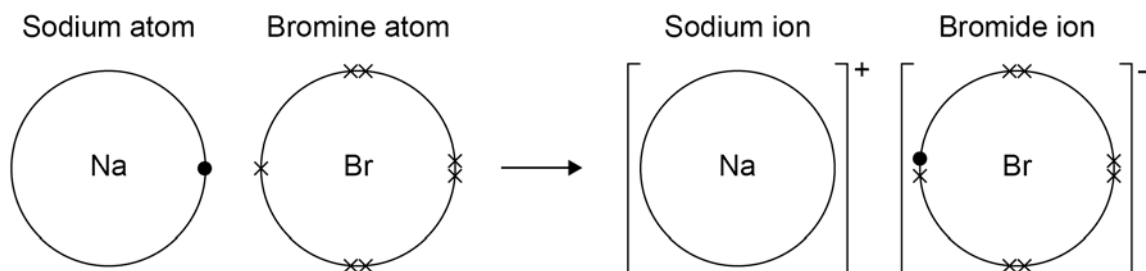
Figure 5 shows the outer electron shells in an iodine molecule (I_2).**Figure 5**

Complete the dot and cross diagram in **Figure 5** to show the bonding in the iodine molecule.

Show only the electrons in the outer shell.

[2 marks]**Figure 6** shows how bromine reacts with sodium to produce sodium bromide.

Only the outer shell electrons are shown.

Figure 6

0 4 . 2 How does a sodium atom change into a sodium ion?

[1 mark]

Tick **one** box.

By gaining an electron

By losing an electron

By sharing an electron

0 4 . 3 Describe how the ions in sodium bromide are held together.

[2 marks]

0 4 . 4 Sodium bromide is an ionic compound.

What are two properties of sodium bromide?

[2 marks]

Tick **two** boxes.

Conducts electricity when molten

Does not dissolve in water

Has a high melting point

Has a low boiling point

Has weak bonds

Turn over for the next question

7

Turn over ►

0 5

A student investigated the reaction of magnesium with air.

The equation for the reaction is:

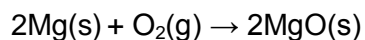
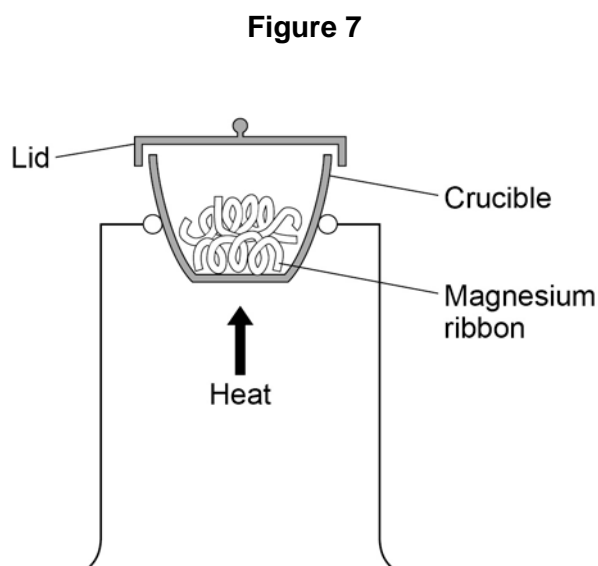


Figure 7 shows the apparatus the student used.



This is the method used.

1. Measure the mass of a crucible and lid.
2. Add magnesium ribbon to the crucible.
3. Measure the mass of the crucible, lid and magnesium ribbon.
4. Heat the crucible and magnesium ribbon for 10 minutes.
5. Lift the lid of the crucible every few minutes.
6. Weigh the crucible, lid and product (magnesium oxide) after heating.

Table 3 shows the student's results.

Table 3

Mass of crucible and lid	52.34 g
Mass of crucible, lid and magnesium ribbon	52.52 g
Mass of crucible, lid and product after heating for 10 minutes	52.63 g

0 5 . **1** Calculate the percentage by mass of magnesium in the product.

You should first determine:

- the mass of magnesium
- the mass of the product.

[3 marks]

Mass of magnesium = _____ g

Mass of product = _____ g

Percentage of magnesium = _____ %

0 5 . **2** Explain why the reaction appears to involve a change in mass.

[2 marks]

Question 5 continues on the next page

Turn over ►

0 5 . 3 What improvement could the student make to obtain a more accurate result?

[1 mark]

Tick **one** box.

Add more magnesium to the crucible.

Heat the crucible, lid and product until the mass is constant.

Use a balance measuring to one decimal place.

Use a clock instead of a stopwatch.

0 5 . 4 The student repeated the investigation.

The student used:

- the same crucible and lid
- the same mass of magnesium.

The student did **not** lift the lid of the crucible during heating.

The student obtained a much lower value for the mass of crucible, lid and product in the second investigation.

Suggest **one** reason why.

[1 mark]

7

Turn over for the next question

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Turn over ►

0 6**Table 4** shows information about some metals.**Table 4**

Metal	Date of discovery and extraction	Percentage (%) of metal in ore	Percentage (%) of Earth's crust containing metal	Annual production in kg
Aluminium	1825	28.0	8.0	5.76×10^{10}
Gold	approximately 3000 BC	Occurs as metal	0.004	3.1×10^6
Iron	approximately 3000 BC	29.0	5.0	1.15×10^{12}

0 6**1**

Why is gold found in the Earth as the pure metal?

[1 mark]

0 6**2**

Aluminium is the most common metal in the Earth's crust.

Suggest why iron was able to be extracted much earlier than aluminium.

[2 marks]

0 6 . 3 Determine the ratio for the annual production of aluminium to iron.

Use **Table 4**.

[2 marks]

Ratio of aluminium : iron = 1: _____

0 6 . 4 Suggest **two** reasons for the difference in annual production between aluminium and iron.

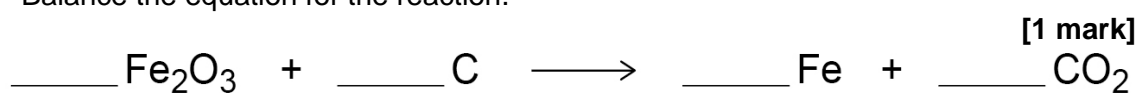
[2 marks]

1 _____

2 _____

0 6 . 5 Iron is extracted by heating a mixture of iron oxide and carbon in a blast furnace.

Balance the equation for the reaction.



0 6 . 6 Name the type of reaction that produces iron from iron oxide.

[1 mark]

Question 6 continues on the next page

Turn over ►

0 6 . 7

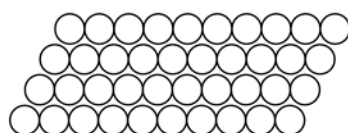
Iron from the blast furnace is called cast iron.

Cast iron contains approximately 4% carbon.

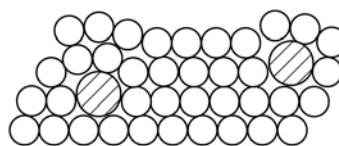
Cast iron is harder than pure iron.

Figure 8 shows the arrangement of atoms in pure iron and cast iron.

Figure 8



Pure iron



Cast iron

Explain why cast iron is harder than pure iron.

[3 marks]

0 7

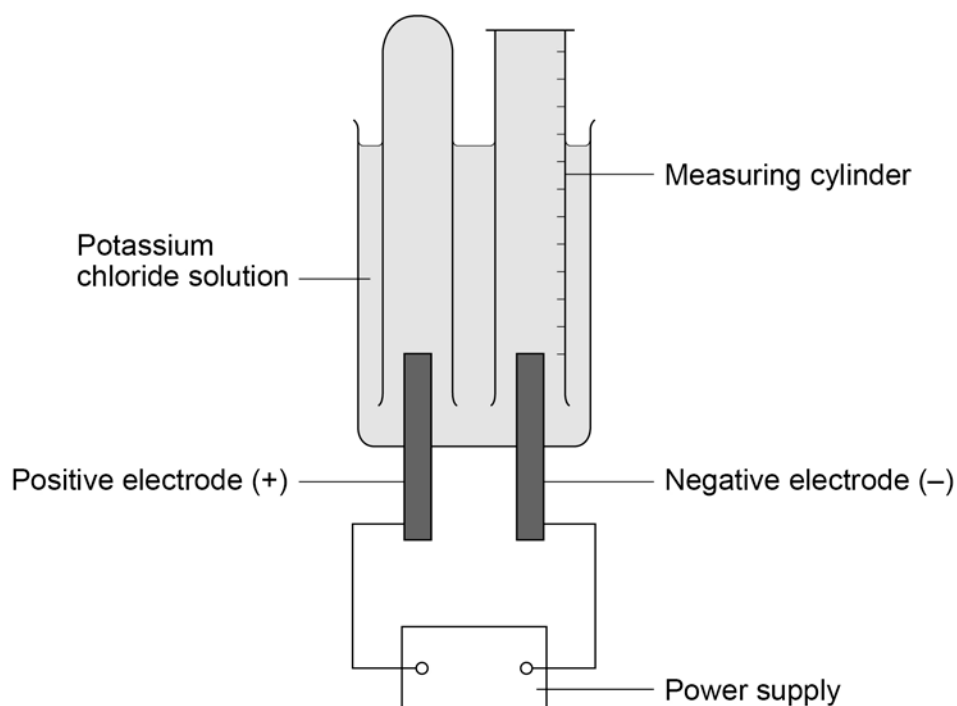
A student investigated the electrolysis of potassium chloride solution.

This is the method used.

1. Dissolve 20 g of potassium chloride in water.
2. Add more water until the total volume of the solution is 1 dm³
3. Put the solution in an electrolysis cell.
4. Switch the power supply on and start timing.
5. Record the volume of hydrogen gas produced in 10 minutes.
6. Repeat steps 1–5 with different masses of potassium chloride.

Figure 9 shows the electrolysis cell used.

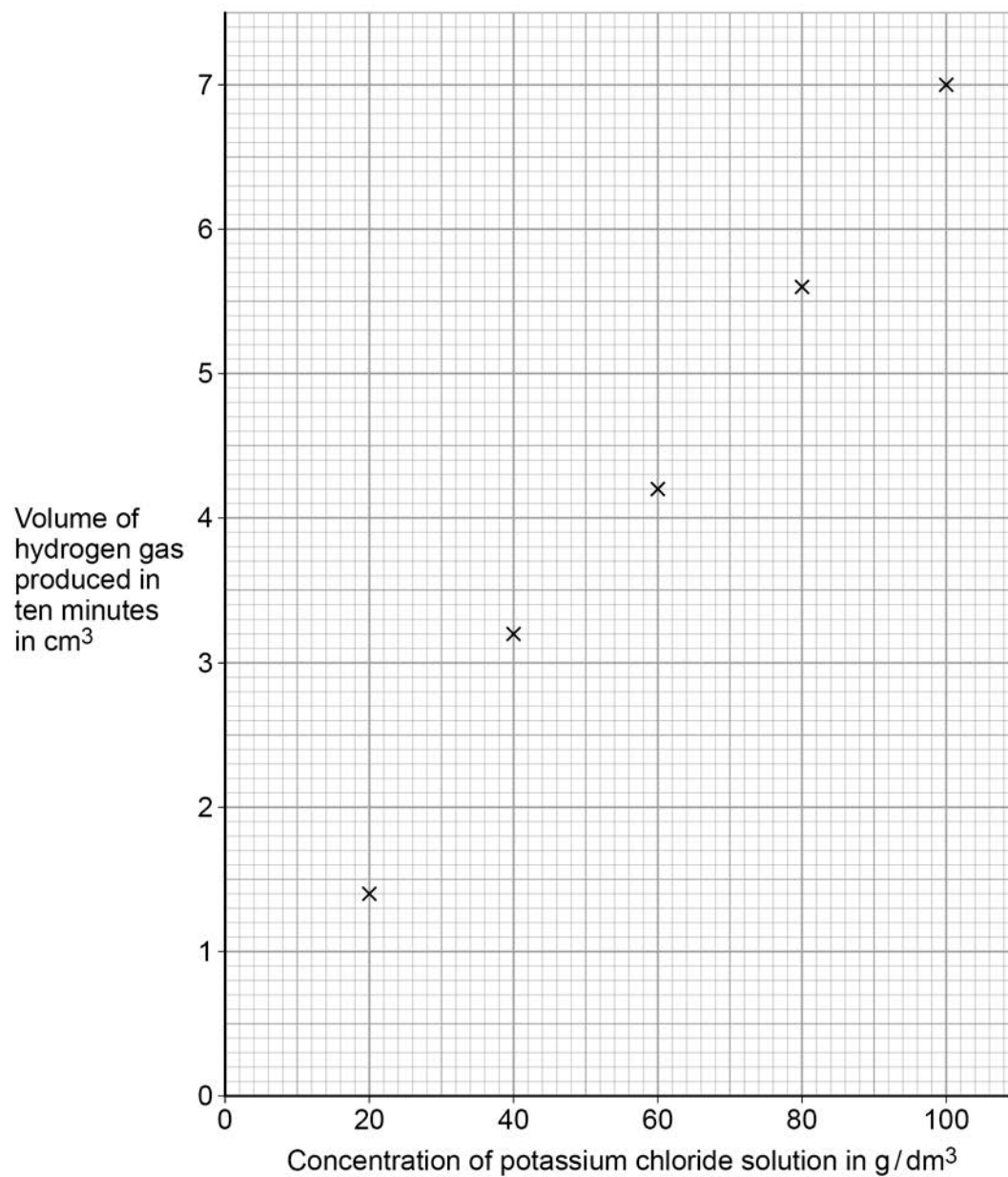
Figure 9



Turn over ►

Figure 10 shows the student's results.

Figure 10



0 7 . 1 The result at a concentration of 40 g/dm^3 is anomalous.

What could be the cause of the anomalous result?

[1 mark]

Tick **one** box.

Decreased voltage from the power supply

Potassium chloride is not fully dissolved

Some gas has escaped

The timing was started too early

0 7 . 2 What is the interval of the independent variable?

[1 mark]

0 7 . 3 Describe the mathematical relationship shown by the results.

Use **Figure 10**.

[1 mark]

Question 7 continues on the next page

Turn over ►

0 7 . 4 Why is hydrogen produced at the negative electrode and not potassium?

[1 mark]

Tick **one** box.

Hydrogen ions travel faster than potassium ions

Hydrogen is a gas

Hydrogen is a non-metal

Hydrogen is less reactive than potassium

0 7 . 5 Predict:

- what you would observe at the positive electrode
- the substance that will be produced at the positive electrode.

[2 marks]

Observation _____

Substance produced _____

6

Turn over for the next question

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Turn over ►

0 8

This question is about the salt potassium nitrate.

Look at **Table 5**.

Table 5

Maximum mass of potassium nitrate in g that dissolves in 100 cm³ of water	Temperature in °C
13	0
33	20
65	40
106	60
167	80
240	100

0 8 . 1 Complete **Figure 11**.

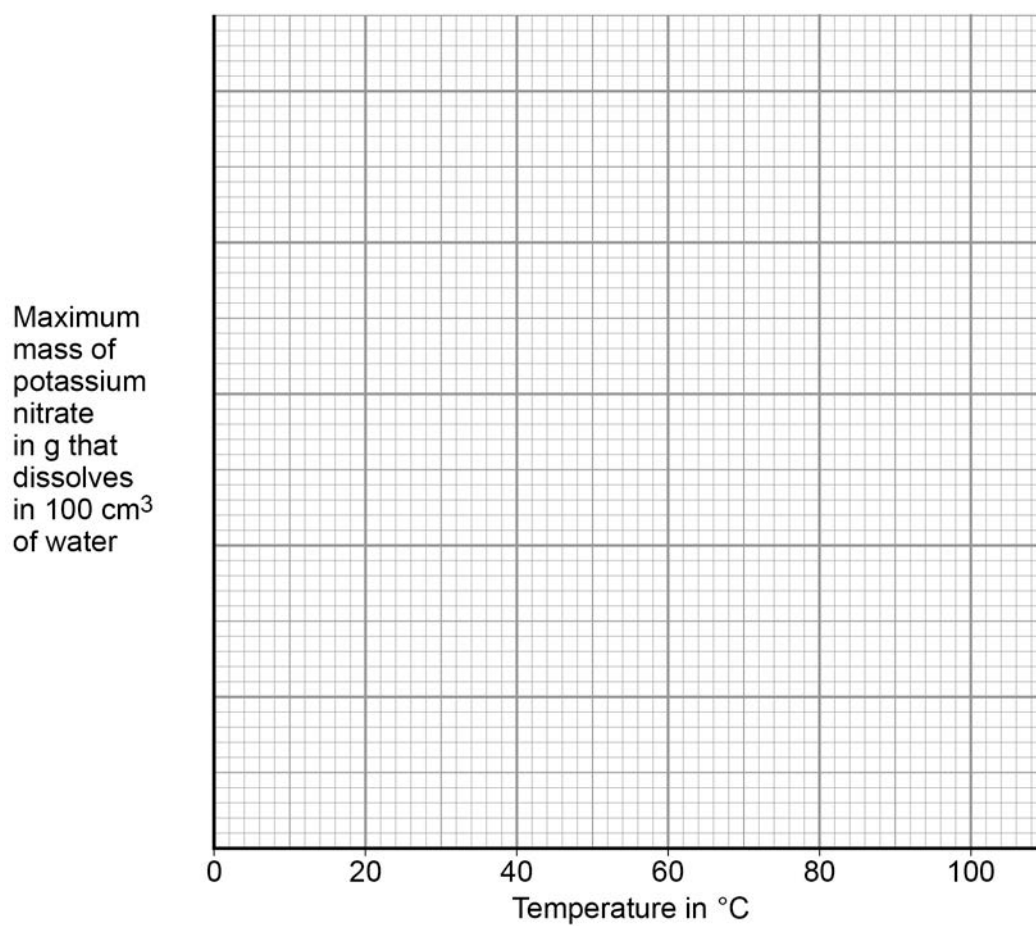
Use the data in **Table 5**.

You should:

- complete the scale on the *y*-axis
- plot the results
- draw a line of best fit.

[4 marks]

Figure 11



Question 8 continues on the next page

Turn over ►

There are no questions printed on this page

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