Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMBINED SCIENCE **0653/63**

Paper 6 Alternative to Practical **May/June 2016**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **19** printed pages and **1** blank page.

CAMBRIDGE International Examinations

[Turn over

1 **(a)** Fig. 1.1 shows a set of human teeth.

Complete the two labels on Fig. 1.1 to name two different types of teeth. [2]

.....

.....

Fig. 1.1

(b) If teeth are not brushed regularly bacteria can multiply on the surface of the teeth and cause a layer called plaque to form.

A scientist takes a plaque sample from a student who has recently eaten a sugary food and tests its pH.

(i) Describe how the scientist can measure the pH of the plaque.

.....

.....

.....[2]

(ii) Suggest a value that the scientist obtained when testing the plaque.

.....[1]

(iii) Explain your answer to **(b)(ii)**.

.....[1]

(c) Disclosing tablets, when chewed, stain plaque a red colour.

Plan an investigation that a group of students can carry out to see if brushing teeth three times a day instead of twice a day reduces the amount of plaque on teeth.

You should include in your answer:

- what you would do
- what you would control
- what you would measure
- how you would use the results to make a conclusion.

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.....

.....

.....[4]

2 Solid **A** is a mixture of two salts, **B** and **C**.

Salt **B** is soluble in water.

Salt **C** is insoluble in water.

(a) A student separated the two salts by adding water to solid **A**, stirring well and filtering the mixture. The apparatus he used for filtering is shown in Fig. 2.1.

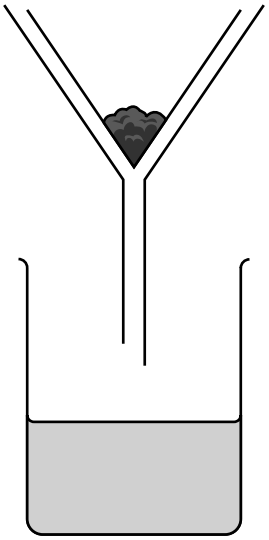

Fig. 2.1

(i) Add labels to Fig. 2.1 to show the positions of salt **B** and salt **C** after filtration. [1]

(ii) Add labels to Fig. 2.1 to show the filtrate and the residue. [1]

(b) The student carries out the tests shown in Table 2.1 on separate samples of the liquid from **(a)**.

The observations he makes are shown in Table 2.1.

(i) Complete Table 2.1 by writing appropriate conclusions. [3]

Table 2.1

test	observation	conclusion
add dilute hydrochloric acid	no visible reaction	
add hydrochloric acid, followed by barium chloride solution	white ppt.	
add sodium hydroxide solution	light blue ppt.	

(ii) State the **name** of the salt in the liquid.

.....[1]

(c) The student reacts the solid from **(a)** with dilute hydrochloric acid.

A colourless solution and bubbles of a colourless gas are produced.

(i) Name the test the student carries out and state the observations he makes to show that the colourless gas is carbon dioxide.

.....

.....[1]

(ii) The student slowly adds an excess of ammonia solution to the colourless solution from **(c)(i)**.

From his observations he concludes that the residue is a zinc salt.

Describe the observations he makes.

.....

.....

.....[2]

(iii) Using information from **(c)(i)** and **(c)(ii)**, deduce the **formula** of the salt in the solid.

formula of salt ..... [1]

[Turn over

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3 A student investigates how the resistance of a metal wire **PQ** depends upon its length l. He sets up the circuit shown in Fig. 3.1.

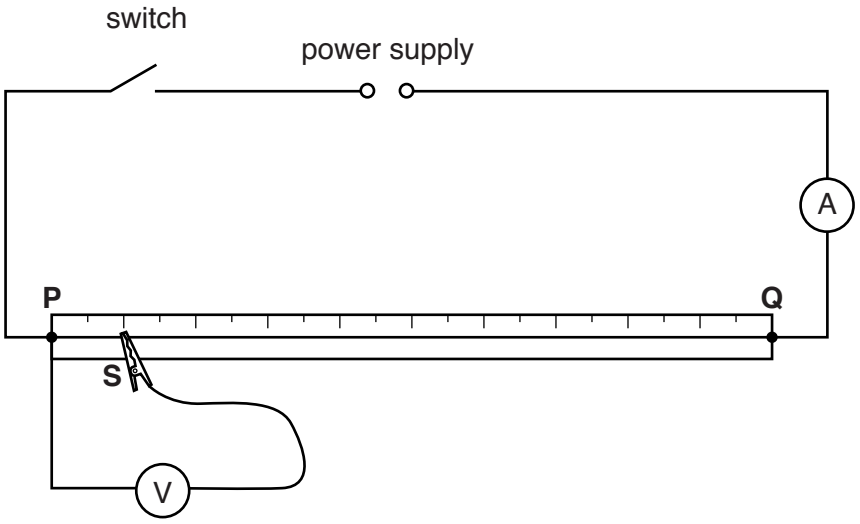


Fig. 3.1

- He places the sliding contact **S** on the wire **PQ** at a distance of $l = 10.0\,\text{cm}$ from end **P**.
- He switches on and measures the potential difference V across the wire between **P** and **S**.

Part of the scale of the voltmeter is shown in Fig. 3.2.

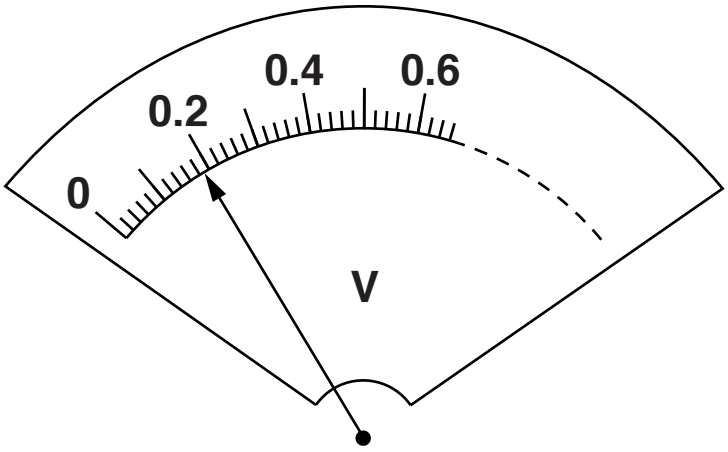


Fig. 3.2

(a) Read the scale in Fig. 3.2, on page 7, and record the value in Table 3.1. [1]

Table 3.1

l/cm	V/V	R/Ω
10.0		
20.0	0.37	1.54
30.0	0.58	
50.0	0.96	
80.0	1.48	6.17

He measures the current I in the wire. The value of I is 0.24 A. This current **does not change** during the investigation.

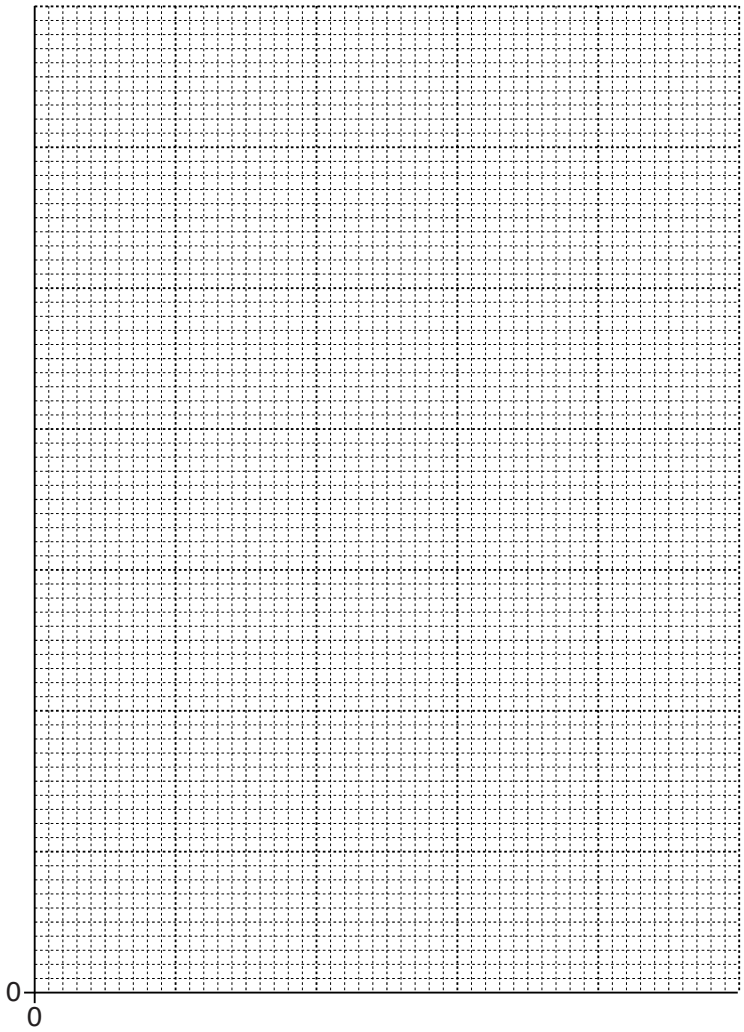
He repeats this procedure for different values of l. His readings are shown in Table 3.1.

(b) Calculate the resistance R of each length of wire. Use the equation shown.

$$R = \frac{V}{I}$$

Record your values of R in Table 3.1. [2]

(c) On the grid provided, use the information from Table 3.1 to plot a graph of *R* (vertical axis) against *l*. Start your graph from the origin (0, 0). Draw the best-fit straight line. [4]



(d) State the relationship between the length of the wire and its resistance. Refer to your graph to support your answer.

relationship .....

justification .....

.....

[2]

(e) When a wire carries a current it experiences a heating effect. This heating effect changes the resistance of the wire.

Suggest what the student should do to minimise the heating effect when carrying out this experiment.

.....

.....[1]

[Turn over

4 A scientist uses a microscope to view and measure some cells.

She observes the cells in Fig. 4.1.

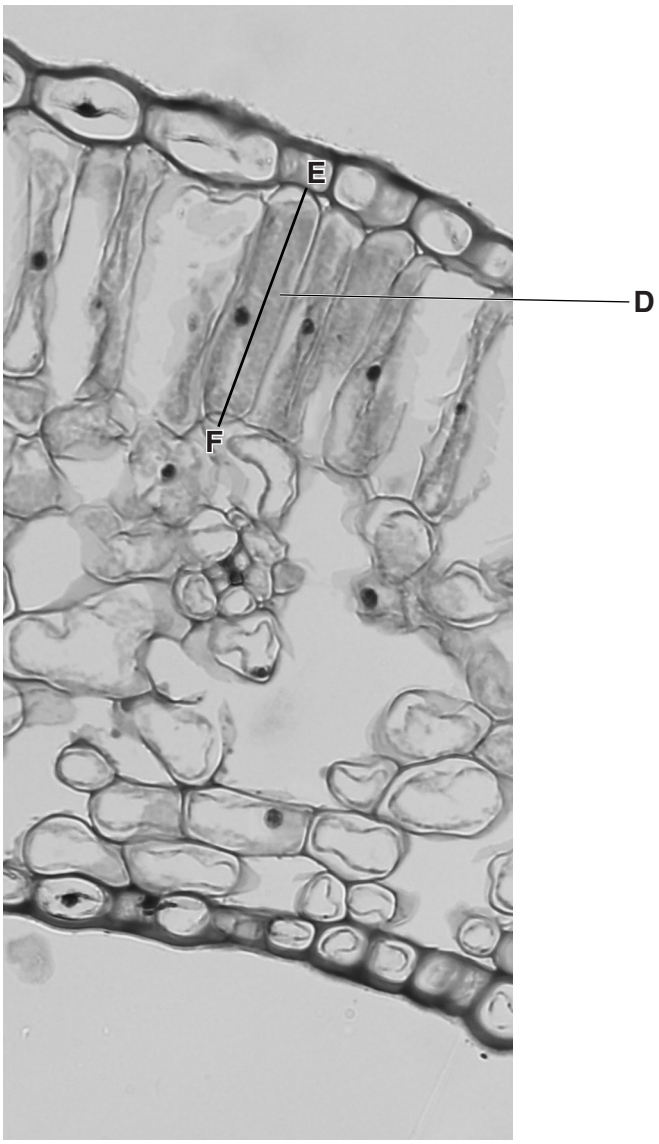


Fig. 4.1

(a) Make a **large** pencil drawing in the box below of the cell labelled **D** in Fig. 4.1. [2]

(b) (i) Measure the length of the line **E**–**F** on Fig. 4.1 Record its length in millimetres.

length = ... mm [1]

(ii) Draw the line, **E**–**F**, on your cell drawing. Measure and record the length of this line in millimetres.

length = ... mm [1]

(iii) Use your measurements to calculate the magnification of your drawing. Show your working in the space below.

magnification = ... [1]

(c) The scientist then looks at the cells under a higher magnification, as shown in Fig. 4.2.

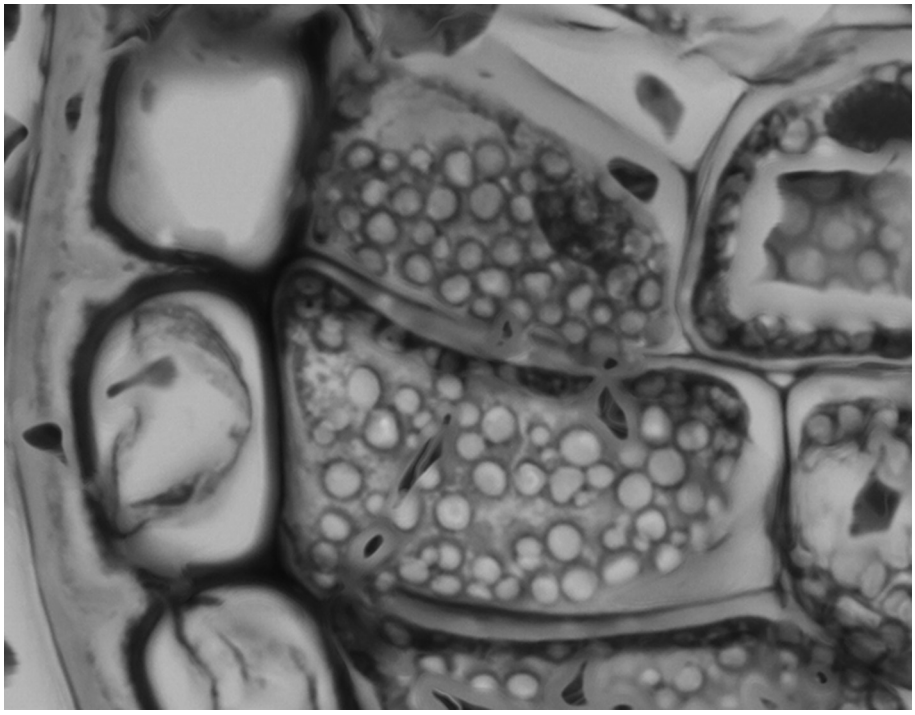


Fig. 4.2

(i) Use label lines to identify and name **three** visible features. [3]

(ii) The scientist identifies the cells as plant cells.

State whether you agree or disagree with the scientist. Give **two** reasons to support your answer.

statement .....

reason 1 .....

.....

reason 2 .....

.....

[2]

Please turn over for Question 5.

5 **(a)** A student investigates the reaction between iron and chlorine.

The apparatus is set up as shown in Fig. 5.1.

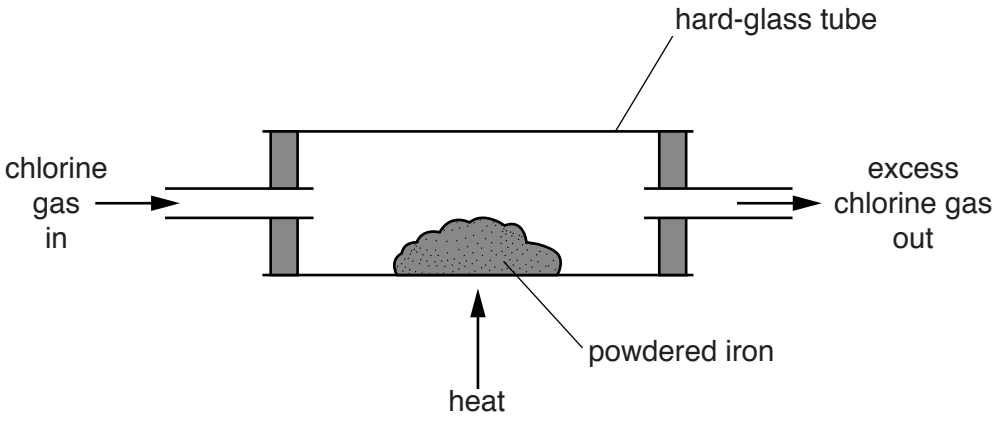
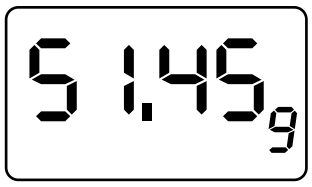


Fig. 5.1

- He measures the mass of the apparatus before adding the powdered iron.
- He adds the powdered iron to the apparatus.
- He measures the new mass of the apparatus.
- He heats the apparatus for several minutes.
- He measures the mass again after the apparatus has cooled.

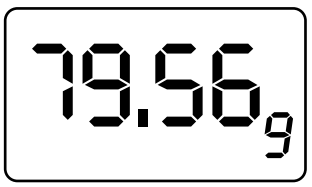
Fig. 5.2 shows the balance readings.

(i) Read the masses to the nearest 0.1 g and record the values in Table 5.1. [2]



mass of apparatus without powdered iron

mass of apparatus with powdered iron before heating



mass of apparatus with product after heating

Fig. 5.2

Table 5.1

	mass / g
apparatus without powdered iron	51.5
apparatus with powdered iron before heating	
apparatus with product after heating	

(ii) Use the information in Table 5.1 to calculate

the mass of powdered iron used,

mass of iron = ... g

the mass of product formed.

mass of product = ... g
[2]

(iii) The maximum expected mass of product formed from this mass of powdered iron is 58.9 g.

Calculate the percentage yield, **Y**, of this reaction using the formula shown.

$$\mathbf{Y} = \frac{\text{mass of product formed}}{\text{expected mass of product}} \times 100\,\%$$

Y = ... % [1]

(iv) Suggest **one** reason why the mass of product formed in the experiment is less than the maximum expected mass.

.....

.....[1]

(b) Explain why the student should carry out the experiment in a fume cupboard.

.....

.....[1]

[Turn over

(c) Iron forms two chlorides, iron(II) chloride and iron(III) chloride.

Describe an experiment to show which chloride was formed in this experiment.

.....

.....

.....

..... [3]

6 **(a)** A student investigates heat loss from two metal containers labelled **X** and **Y**.

Container **X** has no insulation.

Container **Y** has a layer of wool around it.

The apparatus she uses is shown in Fig. 6.1.

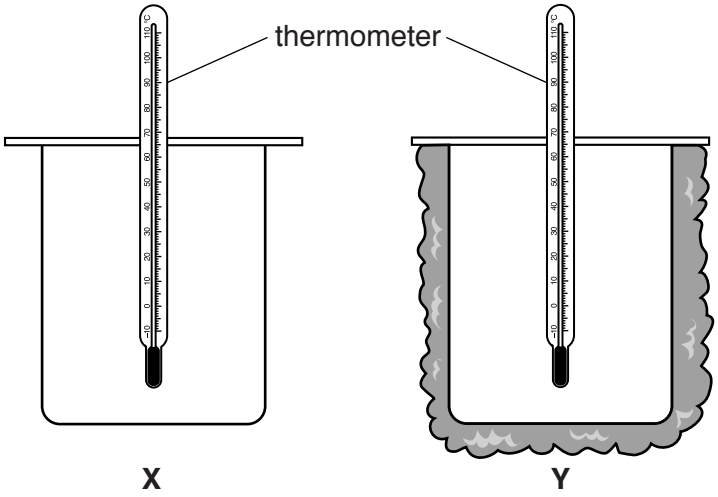


Fig. 6.1

She places some hot water into a measuring cylinder and measures the volume.

(i) Read the volume in Fig. 6.2 and record the value in the space below.

volume = ... cm^3 [1]

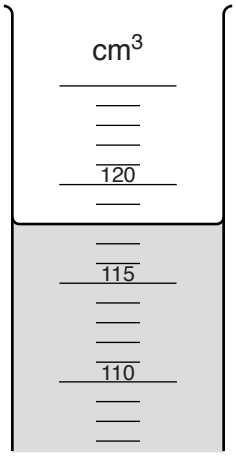


Fig. 6.2

(ii) She reads the temperature of the water in the measuring cylinder.

This is the temperature at time 0 mins for **X** and **Y**.

Read the thermometer in Fig. 6.3 and record the value to the nearest degree in the correct spaces in Table 6.1. [1]

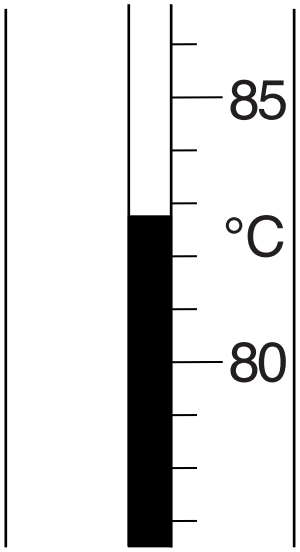


Fig. 6.3

Table 6.1

time / min	temperature **X** / °C	temperature **Y** / °C
0		
2	61	67
4	49	55
6	40	46
8	34	83
10	32	36

She quickly pours about half the water into container **X** and the rest into container **Y**.

She covers each container with a lid and starts a stopclock.

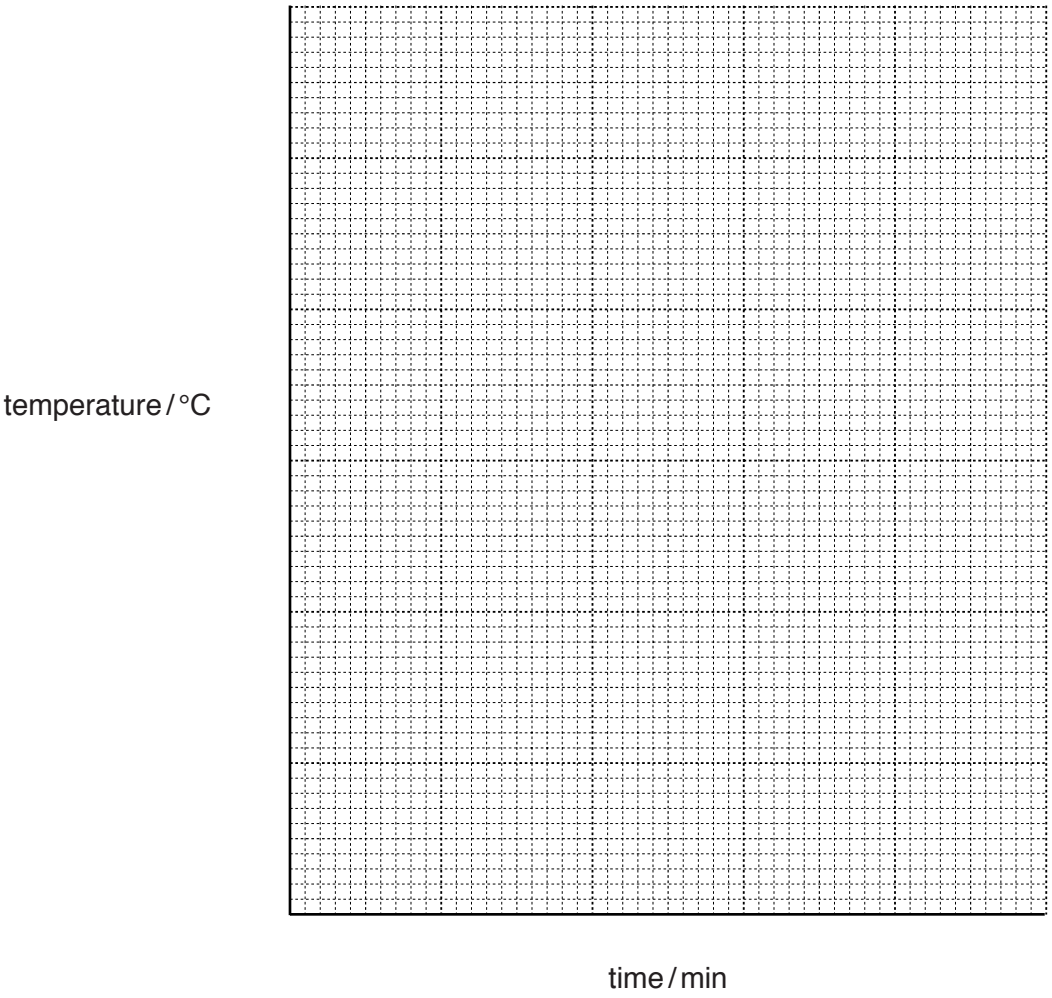
She reads the temperature of both containers every two minutes for ten minutes.

The results are shown in Table 6.1.

(iii) On the grid provided plot a graph of temperature against time for both containers.

Use as much of the grid as possible.

Draw best-fit smooth curves and label each line. [4]



(iv) Describe **one** way in which the curves you have drawn for container **X** and container **Y** are

similar, ...

.....

different. .....

.....

[2]

(b) The teacher states that the experiment with the wool insulation should be repeated.

Suggest a reason why.

.....

.....[1]

(c) The teacher says that the results from this experiment are unreliable.

Suggest how the method could be changed to increase the reliability of the results.

.....

.....[1]