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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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1766500653

COMBINED SCIENCE **0653/61**

Paper 6 Alternative to Practical **October/November 2013**

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 a 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 **18** printed pages and **2** blank pages.

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1 Two experiments were set up as in Fig. 1.1. The apparatus is a model of the digesti absorption of starch in the alimentary canal.

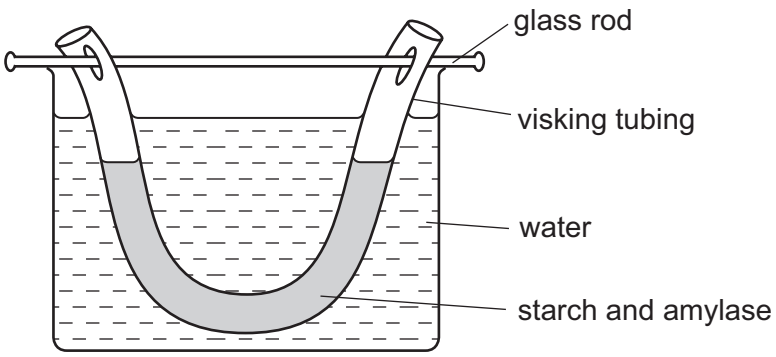

Fig. 1.1

The piece of "visking tubing" represents the alimentary canal. The visking tubing is a selectively permeable membrane, which allows smaller molecules to pass through it but not larger molecules.

In **experiment 1**, the liquid inside the visking tubing was starch solution.

In **experiment 2**, this liquid was a mixture of starch solution and amylase solution.

Both experiments were left for one hour. After this time, the liquid inside the visking tubing and the water in the beaker were each tested with iodine solution and with Benedict's solution.

The results are shown in Table 1.1.

Table 1.1

experiment	liquid tested	test	colour obtained	conclusion
1	inside visking tubing	iodine test		
		Benedict's test	blue	
	water in the beaker	iodine test	brown	
		Benedict's test	blue	
2	inside visking tubing	iodine test	brown	
		Benedict's test	red	
	water in the beaker	iodine test	brown	
		Benedict's test	red	

(a) (i) Fill in the colour that was obtained for the top row of the Table 1.1. [1]

(ii) In the top row of the last column of the table, state what can be concluded from this result. [1]

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(iii) Fill in the remainder of the last column of Table 1.1, stating in each case w
starch or sugar is present or absent.

(b) (i) Explain what the results from **experiment 2** tell you about the effect of amylase on starch molecules.

.....

..... [1]

(ii) What do the results from **experiment 2** tell you about the ability of sugar molecules to pass through the visking tubing?

Explain your answer.

.....

.....

.....

..... [2]

(c) For the experiment shown in Fig. 1.1,

(i) state which part of the alimentary canal is represented by the visking tubing,

..... [1]

(ii) state what the beaker of water represents.

..... [1]

(d) Using the results of these experiments, explain why starch needs to be digested in the alimentary canal.

.....

.....

..... [1]

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2 A student is doing an experiment with a converging lens. She is using the apparatus in Fig. 2.1.

A converging lens is thicker in the middle and refracts light so that an image of an object can be seen on a screen some distance away.

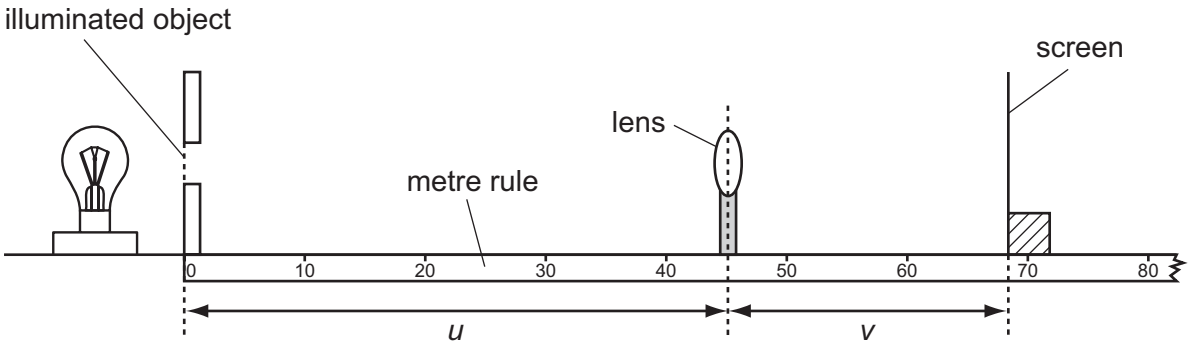

Fig. 2.1

When the lens is in the correct position between the illuminated object and the screen, a sharp image is formed on the screen.

The student is investigating the relationship between u, the distance between the object and the lens and v, the distance between the image on the screen and the lens.

- She places the lens so that u, the distance between the object and the lens, is 45.0 cm.
- She adjusts the position of the screen until a sharp image of the illuminated object is formed on the screen.
- She records, in Table 2.1, the position of the screen on the rule.
- She uses the position of the screen and u to calculate v.
- She calculates the ratio v / u.
- She repeats the procedure for the other values of u shown in Table 2.1, on page 6.

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The positions of the screen when the values of u are 45.0 cm and 25.0 cm are shown in Fig

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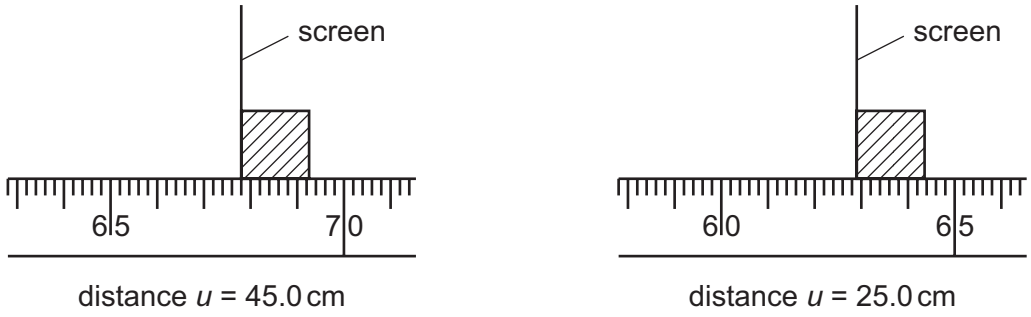

Fig. 2.2

(a) (i) Read the position of the screen for the missing values and record them in Table 2.1. [2]

(ii) Calculate the values of v, when the distances of u are 45.0 cm and 25.0 cm. Record these values in Table 2.1.

[2]

(iii) Calculate the missing values of the ratio v/u. Record them in Table 2.1. [2]

Table 2.1

distance u / cm	position of screen / cm	distance v / cm	ratio v/u
45			
35	61.4	26.4	0.75
30	59.8	29.8	0.99
25			
20	80.2	60.2	3.01

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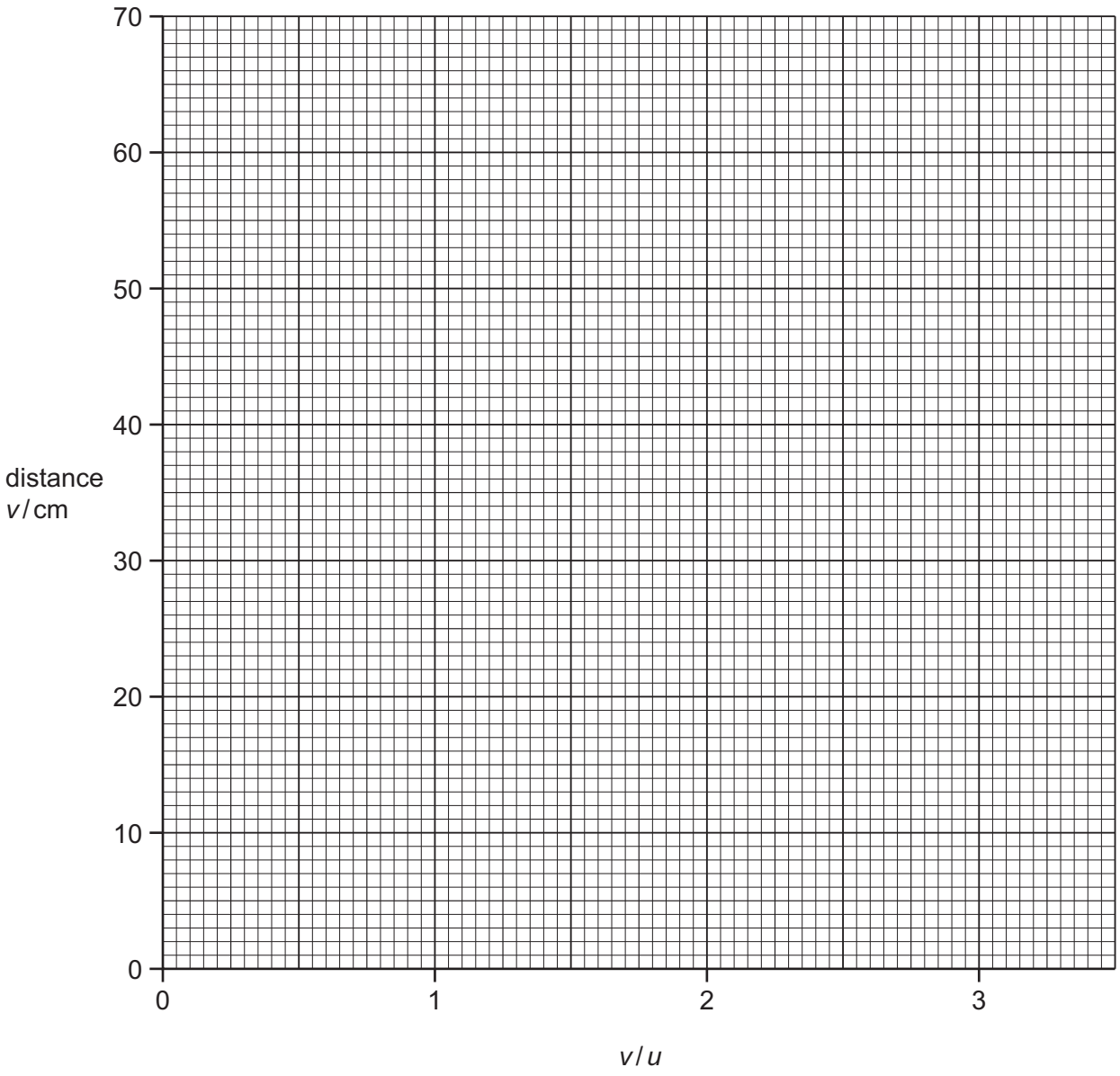
(b) (i) On the graph grid provided, plot a graph of distance v against the ratio v/u.

Draw the best straight line. The line will not pass through the point (0,0). [2]



(ii) The gradient of the line is a useful number that indicates how much a lens can magnify an image.

Find the gradient of the straight line you have drawn.

Show on your graph the values you use to calculate the gradient.

gradient = ... [2]

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3 A student has been given solid **X**, a green powder. She carries out tests on solid **X** she can identify it.

(a) Test 1

She heats solid **X** as shown in Fig. 3.1.

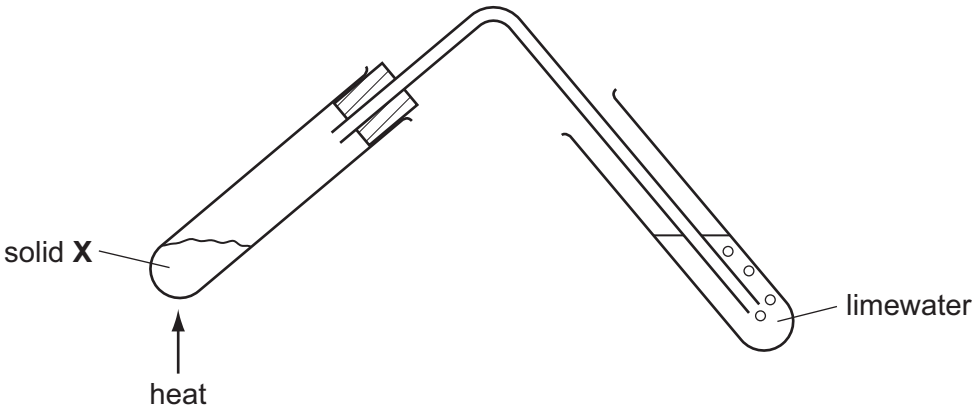

Fig. 3.1

When solid **X** is heated, a gas bubbles into the limewater. The appearance of the limewater changes. A black powder is left in the heated test-tube.

(i) Describe the change in the appearance of the limewater.

.....

..... [1]

(ii) Name the gas that bubbles into the limewater.

..... [1]

(iii) As a result of this test, what can the student conclude about solid **X**?

..... [1]

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(b) Test 2

The student allows the black powder left in the test-tube to cool. Then she adds dilu nitric acid and shakes the mixture. The black powder dissolves and a blue solution is made. She filters the mixture to obtain a blue filtrate.

Draw a labelled diagram to show how she filters the mixture.

[2]

(c) Test 3

She divides the blue filtrate into two parts. To the first part, she adds a few drops of ammonia solution. A blue precipitate is formed.

(i) The student thinks that there are copper ions in the blue solution.

Name the blue precipitate.

..... [1]

(ii) The student adds more ammonia solution until the ammonia is in excess. The appearance of the mixture changes.

State how the appearance of the mixture has changed.

..... [1]

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(d) Test 4

To the second part of the blue filtrate from **(b)**, the student adds some iron filings. She shakes the mixture. The tube becomes warm and the appearance of the mixture changes.

Assuming that the blue filtrate does contain copper(II) ions, describe

(i) how the appearance of the solution changes,

..... [1]

(ii) how the appearance of the iron filings changes.

..... [1]

(e) Use the results of **Tests 1** – **4** to state the name and formula of solid **X**.

name .....

formula ..... [1]

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4 A student was investigating the structure of plants.

The student had a bean seedling. It is shown in Fig. 4.1.

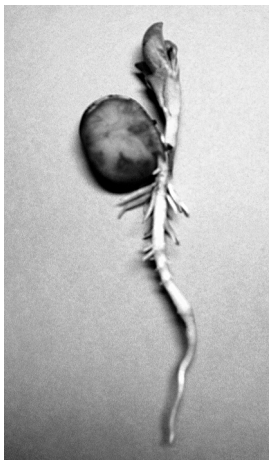

Fig. 4.1

(a) (i) Make a large drawing of the seedling in the space provided.

[2]

(ii) Measure to the nearest millimetre the complete length of the seedling in the photograph in Fig. 4.1.

length = ... mm [1]

(iii) Measure to the nearest millimetre the complete length of the seedling in your drawing.

length of drawing = ... mm [1]

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(iv) Calculate the magnification of your drawing.

magnification = ... [1]

(b) The student then prepared a slide of a transverse section of the root of the bean seedling. Fig. 4.2 shows the distribution of the different tissues in this root using a microscope.

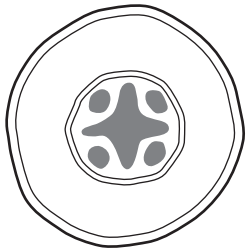

Fig. 4.2

(i) Draw a clear straight line on **your** diagram in **(a)(i)** to represent the transverse section that the student made. [1]

(ii) Label the xylem tissue on Fig. 4.2. [1]

(c) Outline a method the student could use to find where the xylem tissue is distributed in the stem of the bean seedling.

.....

.....

.....

.....

.....

..... [3]

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5 The science class is making a display to show the elements in Period 3 of the P Table, as in Fig. 5.1.

A sample of each element is placed next to a card giving its symbol and atomic number.

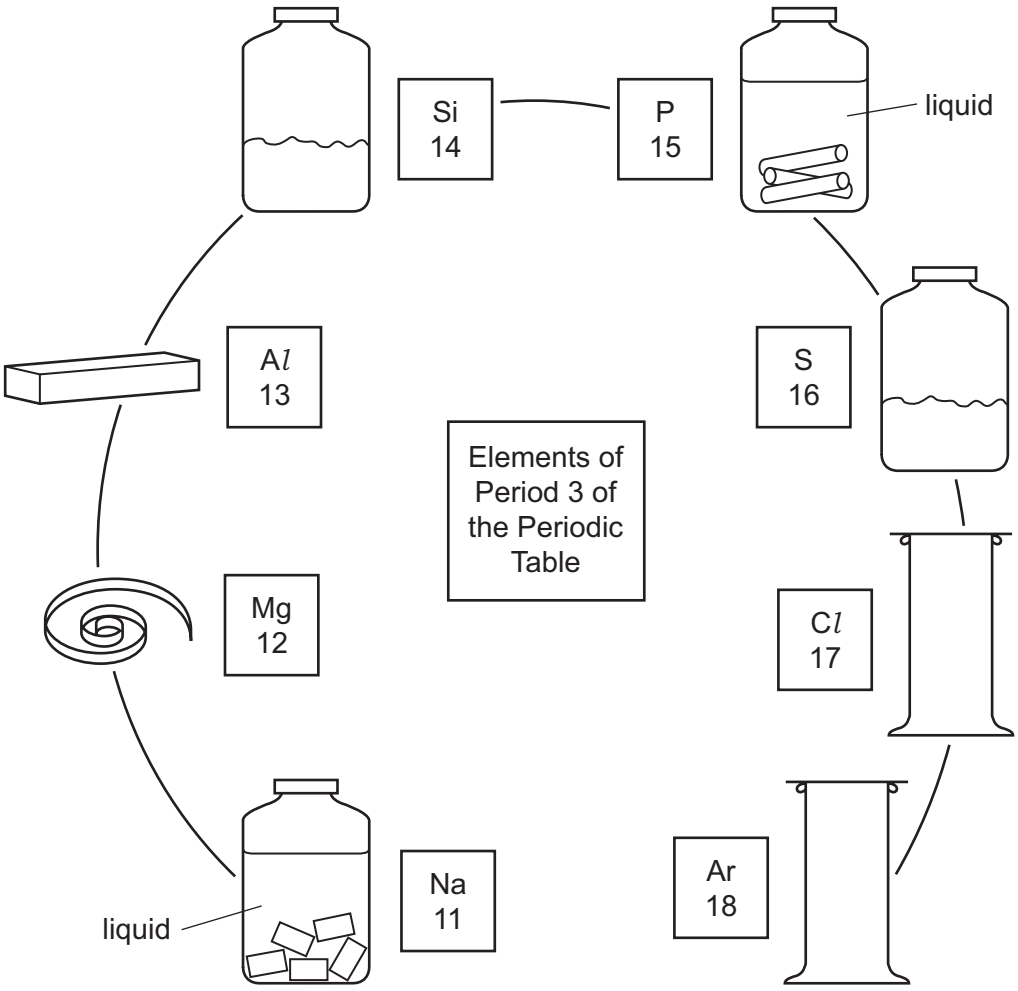

Fig. 5.1

(a) Write the names of element number 12 and element number 14.

12 ..... 14 ..... [2]

(b) Elements 11 and 15 are contained in bottles and covered with a liquid to prevent the element reacting with air.

One element is covered by water and the other one by oil.

Complete the sentences.

The name of the element covered by water is ..... .

The name of the element covered by oil is ..... . [1]

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(c) The two gas-jars holding samples of elements 17 and 18 have lost their labels.

How can a student tell from the appearance of the gases which gas-jar contain element number 17?

.....

[1]

(d) Describe an experiment that a student can do to show that element number 13 is a metal.

State the observation that the student will make.

You may draw a diagram to help you.

.....

.....

.....

[2]

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Another student is doing an experiment to show the burning of element number oxygen. This is shown in Fig. 5.2.

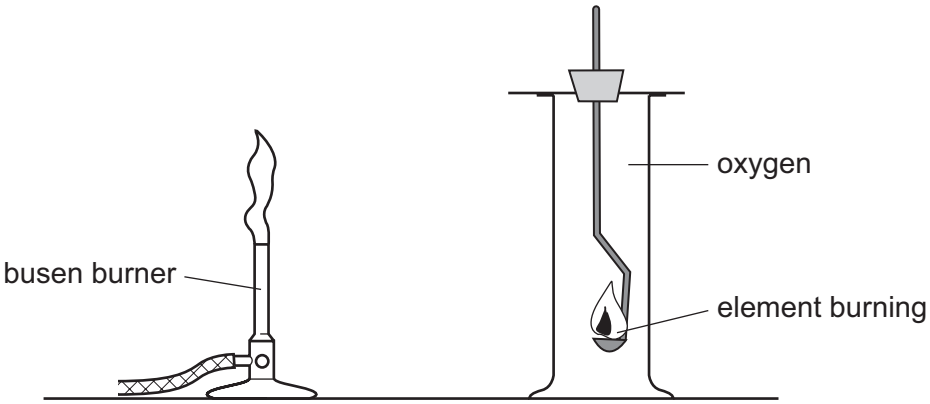

Fig. 5.2

He places some of the powder in a spoon and heats it in a Bunsen flame. When the element ignites, he holds the spoon in the gas-jar of oxygen. After the powder finishes burning, he adds water to the gas-jar, places the lid on and shakes the jar. Then he adds Universal Indicator (full-range indicator) solution.

(e) (i) State the flame colour of the burning element number 16.

..... [1]

(ii) Suggest why the student adds water to the gas-jar.

..... [1]

(iii) State the colour of the Universal Indicator (full-range indicator) in the gas-jar.

..... [1]

(iv) The student does the same experiment with a piece of element number 12.

Suggest the colour of the Universal Indicator in this gas-jar.

..... [1]

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Please turn over for Question 6.

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6 A student is finding the accurate value for the electrical resistance of a piece of resi wire of length 1 metre. He uses the circuit shown in Fig. 6.1.

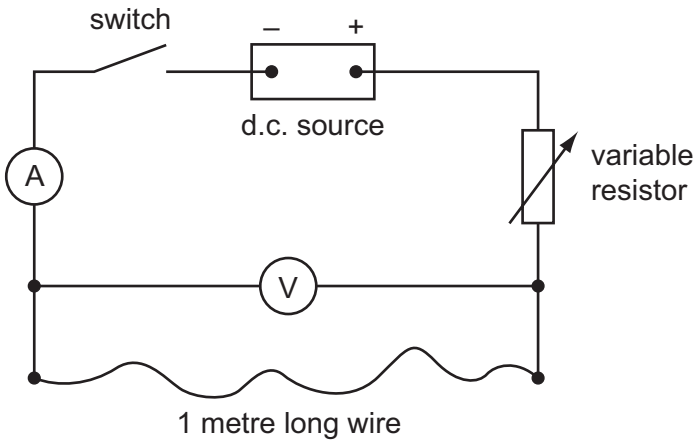

Fig. 6.1

- The student sets the variable resistance at a high value.
- He closes the switch.
- He reads the ammeter to the nearest 0.01 A and the voltmeter to the nearest 0.05 V. He records the values in Table 6.1, reading number **1**.
- He opens the switch and decreases the variable resistance.
- He closes the switch and records the new values for current and voltage, reading number **2**.
- He repeats this procedure until he has five sets of readings.

Table 6.1

reading number	**1**	**2**	**3**	**4**	**5**
current / A	0.16	0.20			0.34
voltage / V	0.90	1.15			2.00
resistance of wire / ohms	5.6	5.7			5.9

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(a) The ammeter and voltmeter dials for the missing readings are shown in Fig. 6.2.

Record in Table 6.1 the values of current and voltage to the nearest 0.01 A and 0.05 V.

[4]

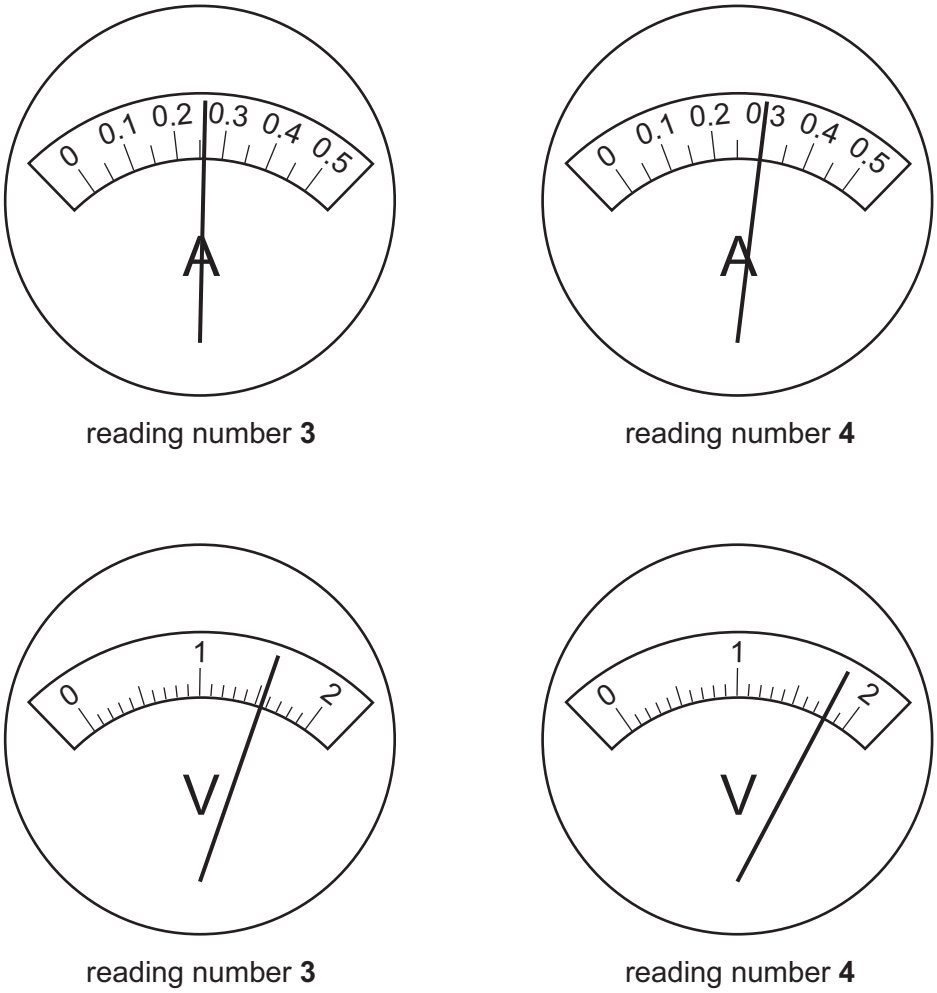

Fig. 6.2

(b) **(i)** Find the resistance of the wire using the values for readings numbers **3** and **4** and record the answers in Table 6.1.

Calculate the resistance in ohms to one decimal place.

Use the formula

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

[2]

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(ii) The values of the resistance of the wire obtained from the five readings are the same.

Study the experimental details again.

Suggest a reason why the calculated values of the resistance are not all the same.

.....

..... [1]

(iii) The student decides that reading number **5** gave the best value for the resistance of the wire.

Suggest a better way of using the results to find the resistance of the wire.
(You do not have to find the value for the resistance.)

.....

..... [1]

(c) A current travels through the resistance wire each time that the student closes the switch. The teacher says that when the current is flowing, particles are passed from atom to atom along the wire.

(i) Name these particles. ..... [1]

(ii) **On Fig. 6.1**, draw an arrow to show the direction of movement of these particles along the resistance wire. [1]

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