Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

COMBINED SCIENCE **0653/61**

Paper 6 Alternative to Practical **May/June 2017**

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.

1 A student investigates the nutrient content of banana, chickpea and egg white.

- He divides some mashed banana between three test-tubes.
- He carries out Benedict's test on one portion, the biuret test on another and the iodine test on the third portion.
- He repeats the procedure with the chickpea and egg white.

(a) State in which of these tests a source of heat is required.

.....[1]

(b) The banana tests positive for reducing sugar and starch.

The chickpea tests positive for starch.

The egg white tests positive for protein.

All other results are negative.

Complete Table 1.1 to show the colours the student obtains in these tests.

Table 1.1

	Benedict's test for reducing sugar	biuret test for protein	iodine test for starch
banana			
chickpea			
egg white			

[3]

(c) Plan an investigation to **compare** the reducing sugar content of two different brands of clear apple juice.

In your answer you should include how you will determine which brand contains the most reducing sugar and how to make a fair comparison.

.....

.....

.....

.....

.....

.....[3]

(d) Describe how you can test for the presence of fat in egg white.

method .....

.....

.....

observation for positive result .....

.....

[3]

2 Solution **H** and solution **J** are each one of the following possible solutions.

ammonia solution
sodium hydroxide solution
hydrochloric acid
sulfuric acid
barium nitrate solution
silver nitrate solution

A student carries out some tests to identify solution **H** and solution **J**.

(a) She tests solutions **H** and **J** separately with both red and blue litmus papers.

She records her observations in Table 2.1.

Table 2.1

	solution **H**	solution **J**
red litmus paper	remains red	changes to blue
blue litmus paper	remains blue	remains blue

Using the observations in Table 2.1, choose from the list of possible solutions the **two** possible identities for each of solutions **H** and **J**.

solution **H** could be ..... or

.....

solution **J** could be ..... or

.....

[2]

(b) (i) The student reacts solid copper(II) oxide with dilute sulfuric acid to prepare a solution containing copper sulfate only.

Describe clearly a method for this preparation.

.....

.....

.....

.....

.....[3]

(ii) She places solution **H** in a test-tube.

She slowly adds copper sulfate solution until the test-tube is almost full. She filters this mixture to identify the colour of any precipitate (ppt.).

She repeats this process for solution **J**.

Her observations are shown in Table 2.2.

Table 2.2

	solution **H**	solution **J**
slowly add copper sulfate solution	white ppt.	dark blue solution at first then blue ppt. appears

Use the observations in Tables 2.1 and 2.2 to identify solutions **H** and **J**.

solution **H** is .....

solution **J** is .....
[2]

(c) Another student suggests that iron(III) sulfate solution may be used in **(b)(ii)** instead of copper sulfate solution to identify solutions **H** and **J**.

Explain in detail why the student is only partially correct.

.....

.....

.....

.....

.....[3]

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3 A student investigates how the resistance of a metal wire depends upon its length.

She sets up the circuit shown in Fig. 3.1.

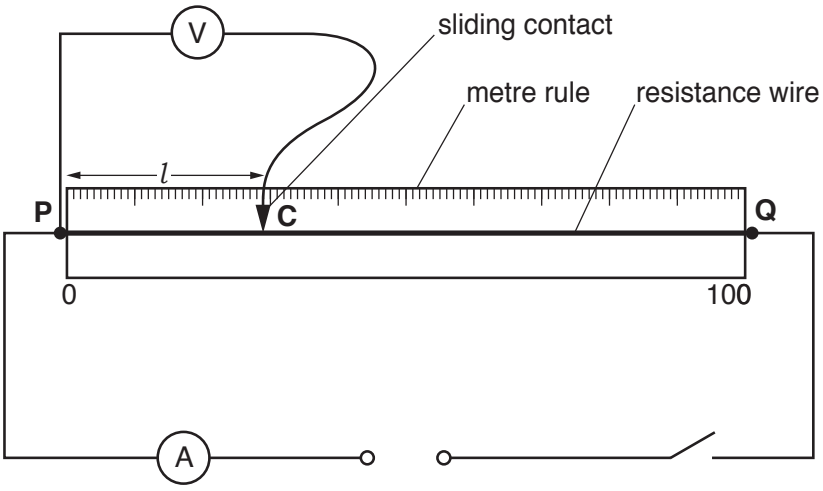


Fig. 3.1

- She connects the sliding contact **C** to the resistance wire at a length l = 20.0 cm from end **P**.
- She closes the switch.
- She measures the current I flowing through the wire and the potential difference V between **P** and **C**.
- She opens the switch.

(a) Part of the scale of the voltmeter is shown in Fig. 3.2.

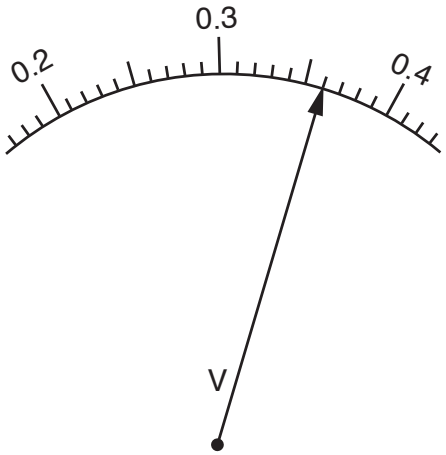


Fig. 3.2

Read the scale and record the value in Table 3.1. [1]

Table 3.1

length l/cm	current I/A	potential difference V/V	resistance R/Ω
20.0	0.18		
35.0	0.18	0.58	3.22
50.0	0.18	0.79	4.39
65.0	0.18	1.00	5.56
80.0	0.18	1.22	
95.0	0.18	1.43	7.94

(b) She measures the current I in the wire and records its value in Table 3.1.

She repeats this process for values of l = 35.0 cm, 50.0 cm, 65.0 cm, 80.0 cm and 95.0 cm.

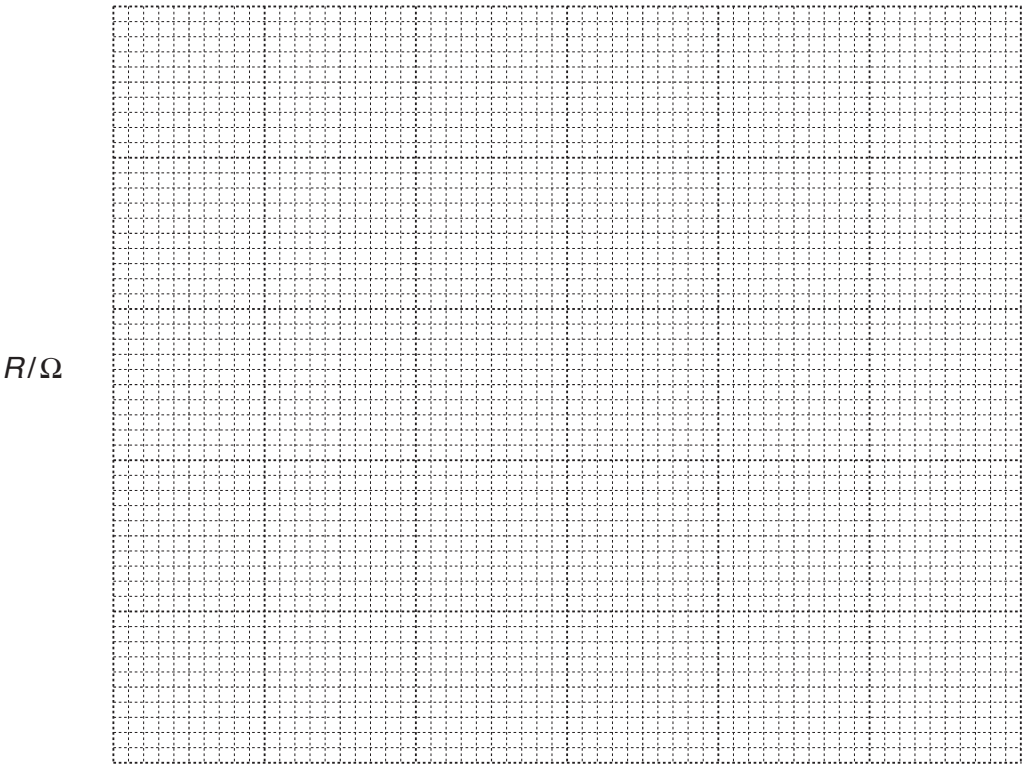
She records in Table 3.1 her values for I and V.

(i) Calculate the resistance R for lengths of wire 20.0 cm and 80.0 cm, using the equation shown.

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

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

(ii) Use the results in Table 3.1 to plot a graph of R against l. Start your graph at (0, 0). Draw the best-fit straight line.



[3]

(c) **(i)** Extend your line to predict the value of resistance R at length l = 10.0 cm.

R = ... Ω [1]

(ii) Suggest the relationship between the length of the wire and its resistance.

.....

.....[1]

(d) Give **one** possible source of inaccuracy in this experiment and the precaution you would take to minimise it.

source of inaccuracy .....

precaution .....

.....
[2]

4 A nurse takes a blood sample from a patient.

(a) Describe a safety precaution the nurse should take when obtaining the blood sample from the patient.

.....

.....[1]

(b) Fig. 4.1 shows a photograph of some of this blood as seen under a microscope.

A white blood cell has been labelled.

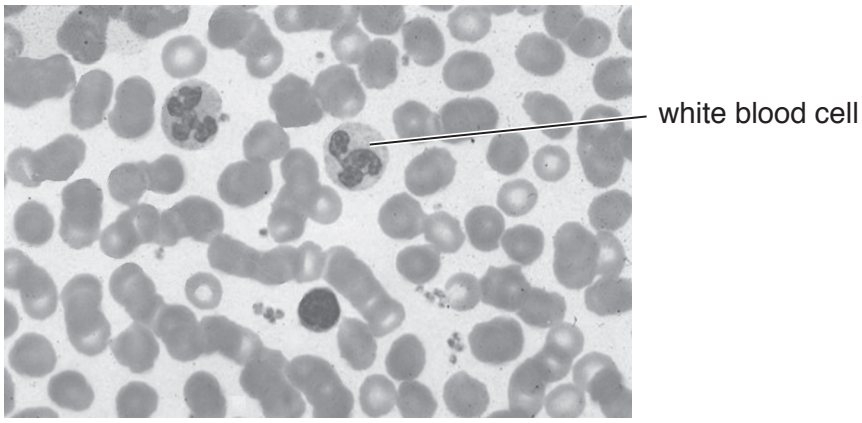


Fig. 4.1

(i) On Fig. 4.1 draw label lines and label **one** red blood cell and **one** platelet. [2]

(ii) In the box make a large pencil drawing of the labelled white blood cell.

Label the visible components.

[4]

(c) (i) Measure to the nearest 0.5 mm the diameter of the labelled white blood cell in Fig. 4.1.

diameter = ... mm [1]

(ii) Measure to the nearest 0.5 mm the diameter of this cell in your drawing.

diameter = ... mm [1]

(iii) Use these measurements to calculate the magnification of your drawing to the nearest whole number.

magnification = ...[1]

[Turn over

5 A student investigates the effect of changing acid concentration on the rate of the reaction between hydrochloric acid and calcium carbonate.

In each experiment, he uses the same volume of hydrochloric acid and the same mass of powdered calcium carbonate.

Method

- He measures the volume of hydrochloric acid of concentration 0.2 mol / dm^3 and puts it into a conical flask.
- He measures the mass of the calcium carbonate with a balance and adds it to the acid.
- He measures the volume of gas produced after 2 minutes.
- He repeats the experiment for this concentration of acid.
- He repeats this procedure for concentrations of acid of 0.5, 1.0, 2.0 and 2.5 mol / dm^3.
- He records in Table 5.1 the volume of gas produced in each experiment.

(a) Complete the diagram in Fig. 5.1 to show how he can collect and measure the volume of gas produced. Remember to label the diagram. [2]

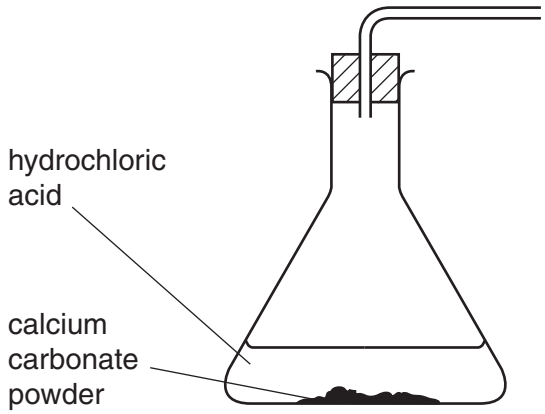


Fig. 5.1

(b) Calculate the average (mean) volume of gas produced for each concentration of acid and record these values in Table 5.1.

[1]

Table 5.1

concentration of hydrochloric acid in mol / dm^3	volume of gas produced in 2 minutes / cm^3		
	experiment **1**	experiment **2**	average
0.2	5	7	
0.5	13	14	
1.0	29	27	
2.0	53	56	
2.5	66	64	

(c) State which concentration of hydrochloric acid produced the fastest rate of reaction.

Use the data in Table 5.1 to justify your answer.

concentration .....

justification .....

.....

[1]

(d) **(i)** There is a piece of equipment not mentioned in the method, but which is needed to carry out a rate of reaction experiment.

State the name of this piece of equipment.

.....[1]

(ii) The student measures the volume of hydrochloric acid using a measuring cylinder.

State the name of a different piece of apparatus which could be used to measure the volume more accurately.

.....[1]

(e) **(i)** Suggest **one** factor not mentioned in the method which must be kept constant throughout the investigation.

.....[1]

(ii) Explain why the experiment was repeated for each concentration of hydrochloric acid.

.....[1]

(f) One of the products of the reaction is a gas.

State the name of the gas and describe a test which can be used to confirm its identity. Remember to include the result of the test in your answer.

gas .....

test .....

.....

[2]

6 A student investigates the air temperature at different heights, *h*, above a lamp as shown in Fig. 6.1.

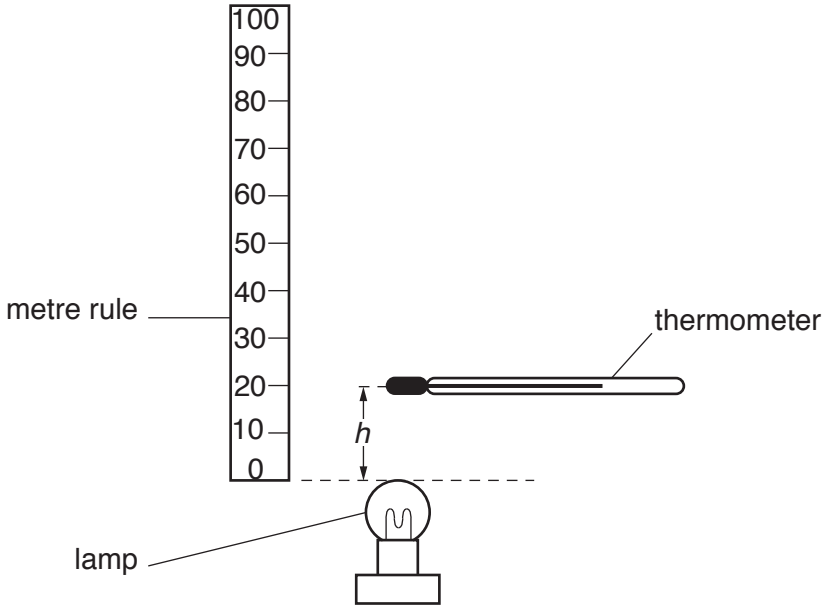


Fig. 6.1

(a) Name the apparatus that she should use to keep the thermometer at a fixed height above the lamp.

.....[1]

(b) Suggest **one** safety precaution the student should take while doing this experiment.

..... [1]

(c) She records in Table 6.1 the temperature at different heights above the lamp.

Table 6.1

h / cm	2	4	6	8	10	12	14	16	18	20
temperature / °C	50	49	47	44	39	38	27	23	22	22

She plots her results on a graph as shown in Fig. 6.2.

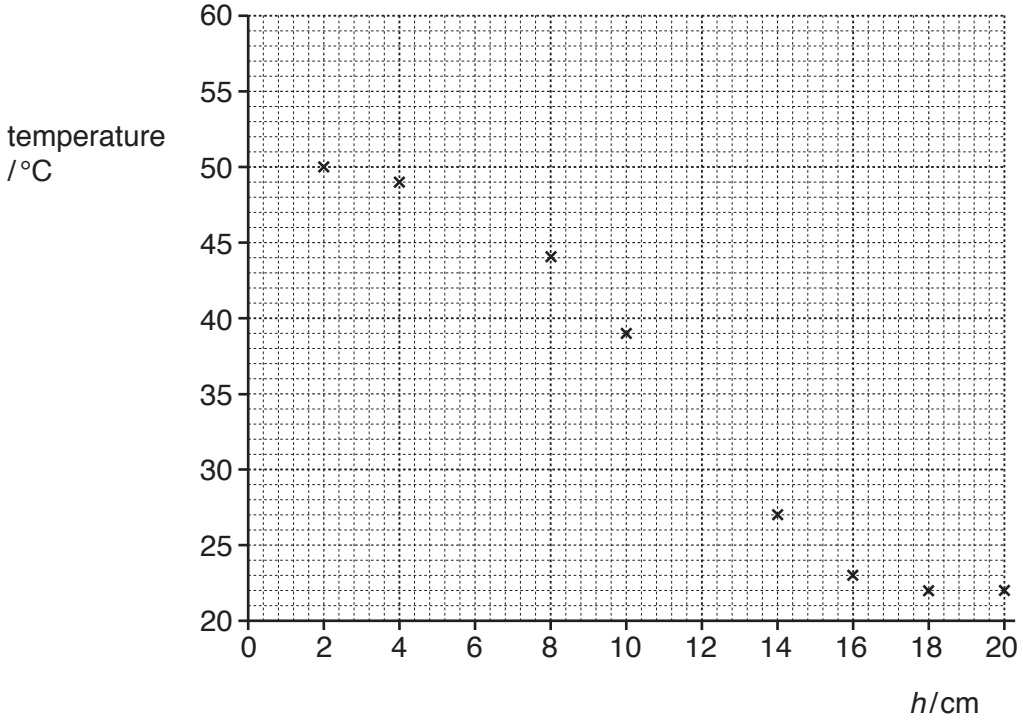


Fig. 6.2

(i) Plot the **two** missing points on the graph. [1]

(ii) Draw the curve of best-fit. [2]

(iii) Use the graph to estimate the temperature 15 cm above the lamp.

Show clearly on the graph how this temperature is determined.

temperature = ...°C [2]

(iv) Use the graph to describe the relationship between the height, *h*, of the thermometer above the lamp and the temperature.

.....

.....[2]

(v) Suggest why she stopped taking temperature measurements at 20 cm above the lamp.

.....

.....[1]

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