Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0214823474

PHYSICS **5054/41**

Paper 4 Alternative to Practical **October/November 2018**

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 **10** printed pages and **2** blank pages.

DC (KS/SG) 155627/4
© UCLES 2018

CAMBRIDGE International Examinations

[Turn over

1 A teacher demonstrates convection in a liquid. She uses a glass tube, as shown in Fig. 1.1.

The tube is filled with water and left to stand for ten minutes. A purple crystal is then placed in the mouth of the tube. This crystal dissolves and makes the water around it turn purple. The tube is then gently heated, as shown in Fig. 1.1.

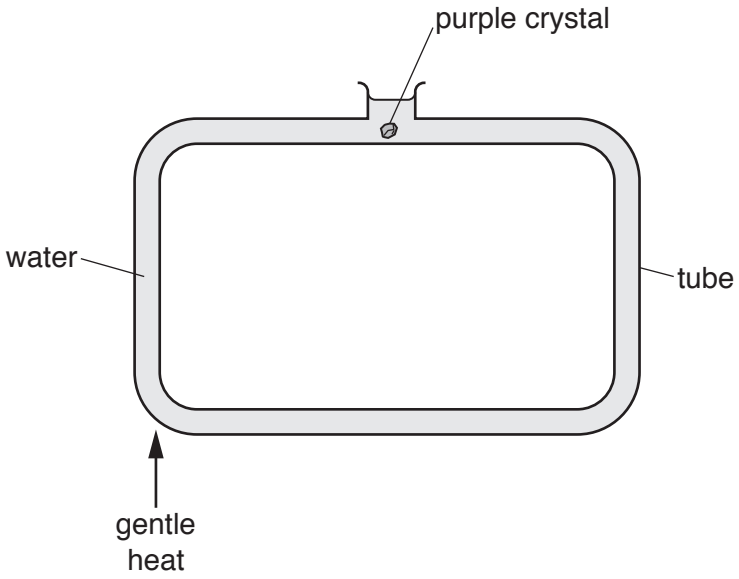


Fig. 1.1

(a) Suggest why the water is left to stand for ten minutes before placing the crystal in the tube.

.....

.....[1]

(b) When the water is heated, it is heated **gently**.

Suggest why.

.....

.....[1]

(c) On Fig. 1.1, draw an arrow to show the direction in which the purple colour moves through the water. [1]

(d) State **one** safety precaution the teacher should take in this demonstration.

.....

.....[1]

© UCLES 2018

2 A student conducts an experiment with a glass ball and a metal ball. Fig. 2.1 shows the apparatus he uses. The glass ball is placed on a cloth-covered bench at the bottom of a slope. The metal ball is then released from the top of the slope. It rolls down the slope and then hits the glass ball.

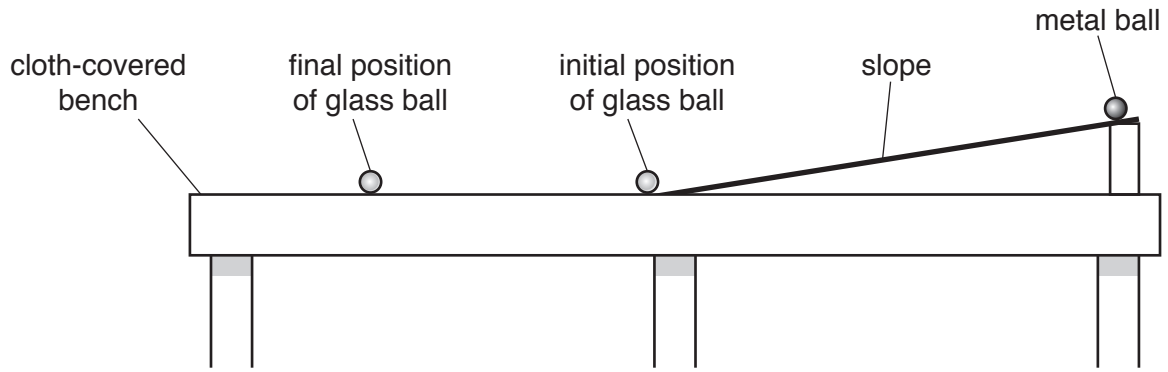


Fig. 2.1

(a) The metal ball is released from a vertical height *h* above the bench.

After the collision, the glass ball moves a distance *d* along the bench.

(i) On Fig. 2.1, show the height *h*. [1]

(ii) On Fig. 2.1, show the distance *d*. [1]

(iii) Suggest a piece of apparatus to measure these two lengths.

.....[1]

(iv) The experiment is repeated. The glass ball travels the following distances:

23.5 cm 20.8 cm 22.3 cm

Calculate the average distance d_{av} travelled.

d_{av} =.....[1]

(v) The initial gravitational potential energy *E* of the metal ball at the top of the slope is given by

$$E = mgh,$$

where *g* is 10 N/kg and *m* is the mass of the metal ball.

The metal ball has a mass *m* of 0.0081 kg. The height *h* of the ramp is 0.120 m.

Calculate *E*, giving your answer to 2 significant figures.

E =.....[2]

© UCLES 2018

(b) The student extends the experiment by using metal balls of different masses. The glass ball does not change and *h* remains constant. The results are shown in the table of Fig. 2.2.

mass of metal ball / kg	*E* / J	d_{av} / cm
0.0030	0.0036	7.0
0.0049	0.0059	12.0
0.0081		
0.0120	0.0144	35.0
0.0139	0.0167	44.6
0.0170	0.0204	57.0
0.0190	0.0228	70.5

Fig. 2.2

(i) Complete the table for the metal ball of mass 0.0081 kg using your answers to **(a)(iv)** and **(a)(v)**.

(ii) On Fig. 2.3, plot the graph of d_{av} / cm on the *y*-axis against *E* / J on the *x*-axis.
Start both axes from the origin (0,0).

Draw the smooth curve of best fit.

(c) Suggest a reason why the student covers the bench with a cloth.

.....

.....[1]

© UCLES 2018

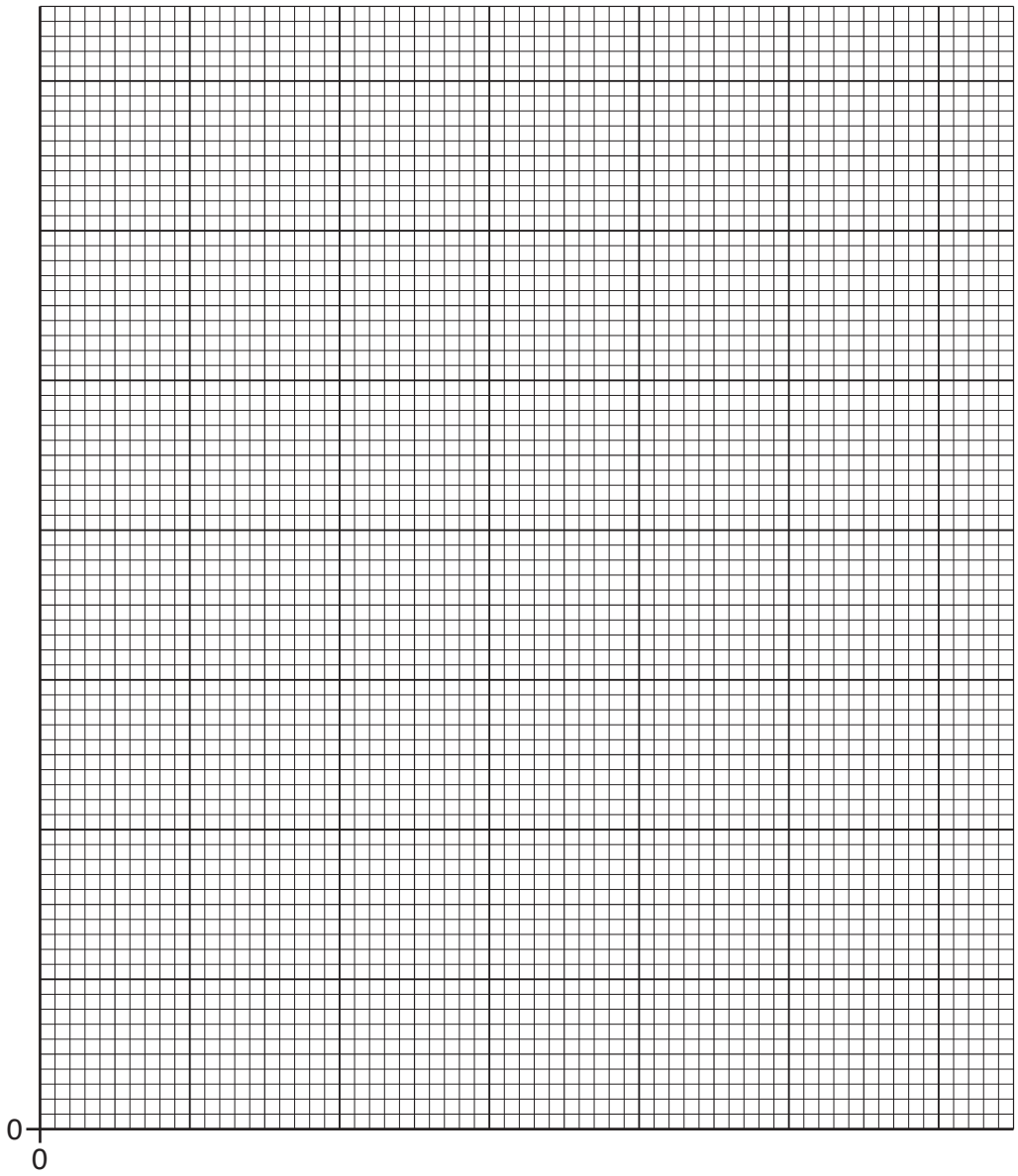


Fig. 2.3

[4]

3 A student is given a quantity of liquid in a beaker and asked to determine the density of the liquid.

Density is found using the equation

$$\text{density} = \frac{\text{mass}}{\text{volume}}.$$

He pours the liquid into a measuring cylinder. Fig. 3.1 shows the measuring cylinder after the liquid is added.

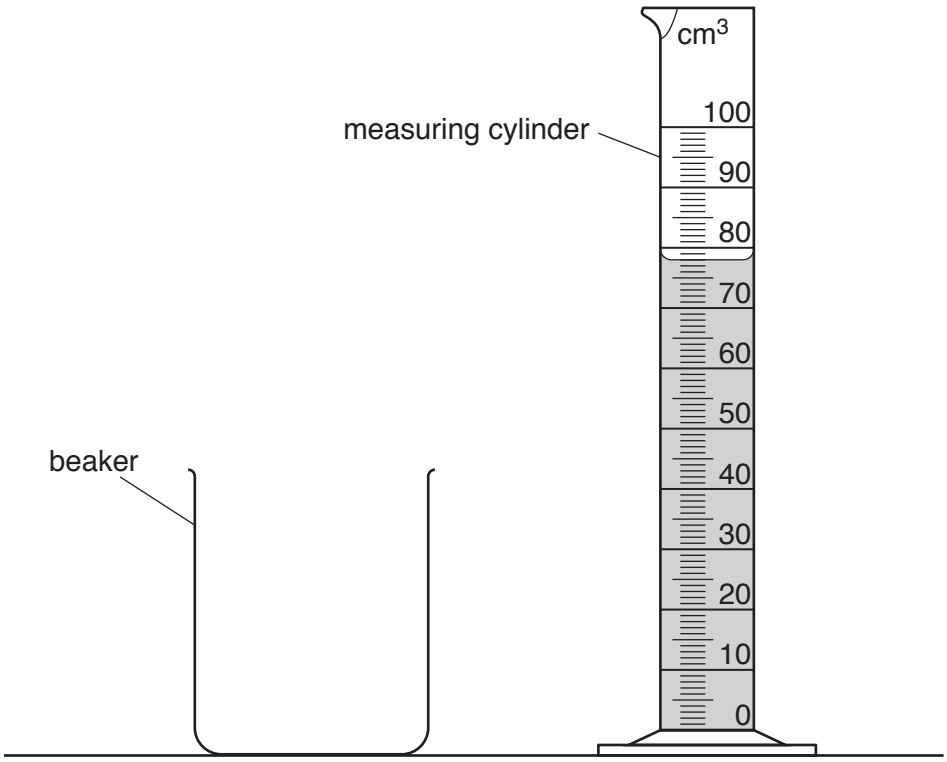


Fig. 3.1

(a) (i) On Fig. 3.1, mark the position of the student's eye when he is reading the measuring cylinder. [1]

(ii) Explain why this position of the eye reduces error when taking the reading.

.....

.....[1]

(iii) State the volume of liquid in the measuring cylinder.

volume =.....[1]

© UCLES 2018

(b) (i) State the name of another piece of apparatus the student needs in order to find the density of the liquid.

.....[1]

(ii) Explain how he uses this apparatus in this experiment.

.....

.....

.....

.....

.....

.....[2]

(c) The student's eye is at the correct position when taking the reading. He calculates the density from his results. His teacher says that the value he obtains is different from the actual value.

Suggest a reason for this.

.....

.....

.....

.....[1]

© UCLES 2018

[Turn over

BLANK PAGE

© UCLES 2018

4 A student investigates the resistance of equal lengths of different wires. The wires are made from the same material but have different diameters. Resistance can be found using the equation

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

The student uses the circuit shown in Fig. 4.1.

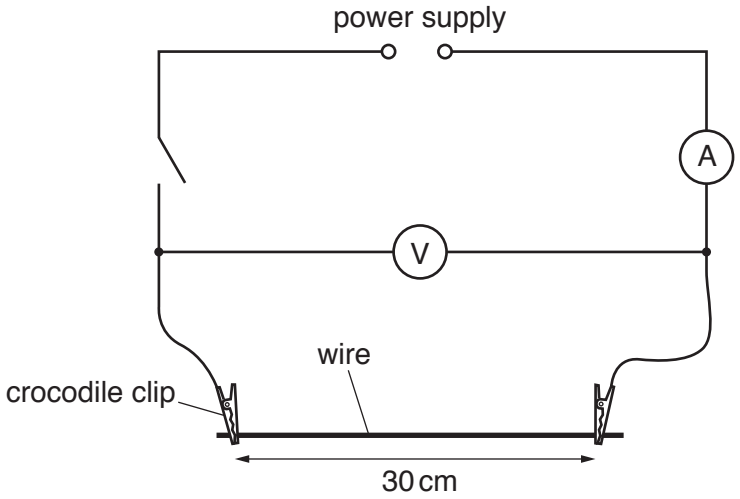


Fig. 4.1

(a) State the name of a piece of apparatus that the student can use to measure accurately the diameter of a wire.

.....[1]

(b) **(i)** The student takes readings of voltage and current immediately after he switches on the circuit.

Suggest a reason for taking the readings immediately.

.....[1]

© UCLES 2018

[Turn over

(ii) Fig. 4.2 shows the ammeter and voltmeter when a wire with a diameter of 0.15 mm is used.

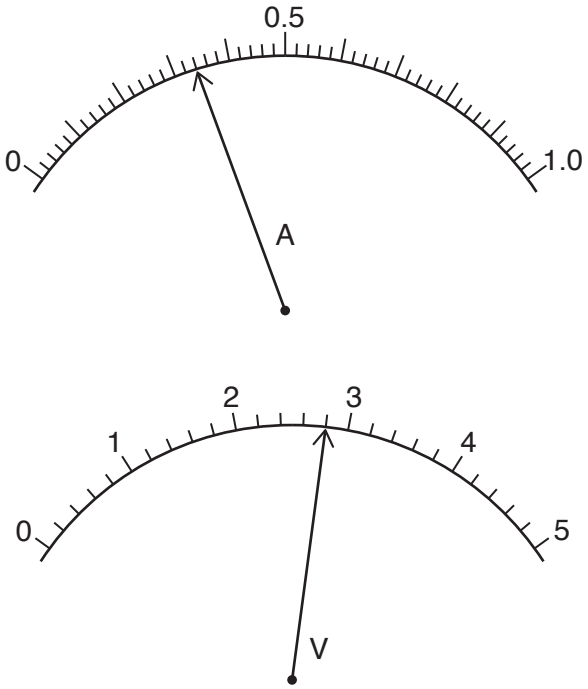


Fig. 4.2

State the readings of current and voltage for this wire.

current = ...

voltage = ...
[2]

(c) The student repeats the experiment using a wire of diameter 0.24 mm. The voltmeter reading does not change. Fig. 4.3 shows the new ammeter reading.

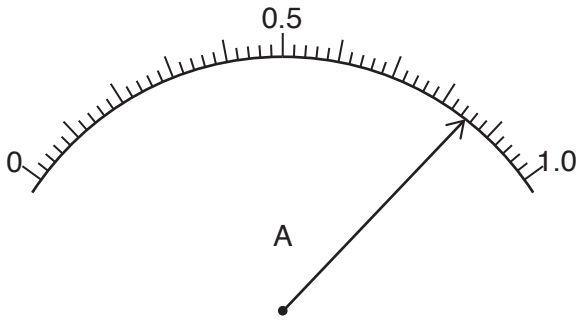


Fig. 4.3

© UCLES 2018

(i) Complete the results table of Fig. 4.4 for the experiment for the two wires.

diameter / ….	voltage / …	current / …	resistance / …

Fig. 4.4

[3]

(ii) Use your results to suggest the relationship between the diameter of a wire and its resistance.

.....

.....

.....[1]

© UCLES 2018

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2018