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**PHYSICS**

Paper 5 Practical Test

**0625/52**

**October/November 2014**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces at the top of the page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

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.

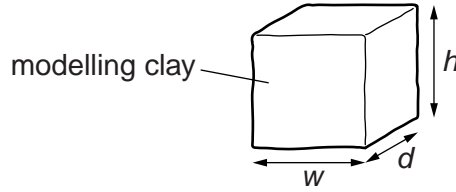
| For Examiner's Use |  |
|--------------------|--|
| 1                  |  |
| 2                  |  |
| 3                  |  |
| 4                  |  |
| <b>Total</b>       |  |

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

- 1 In this experiment, you will take measurements of a sample of modelling clay.

Carry out the following instructions referring to Fig. 1.1.



**Fig. 1.1**

- (a) You are provided with a piece of modelling clay. The shape of the piece of modelling clay is approximately a cube.

- (i) Measure the height  $h$ , width  $w$  and depth  $d$  of the piece of modelling clay.

$h = \dots\dots\dots$  cm

$w = \dots\dots\dots$  cm

$d = \dots\dots\dots$  cm

- (ii) Calculate the volume  $V_A$  of the modelling clay, using the equation  $V_A = hwd$ .

$V_A = \dots\dots\dots$  cm<sup>3</sup>

- (iii) Measure the mass  $m$  of the modelling clay, using the balance provided.

$m = \dots\dots\dots$  g

- (iv) Calculate the density  $\rho$  of the modelling clay, using the equation  $\rho = \frac{m}{V_A}$ .

$\rho = \dots\dots\dots$

[4]

- (b) (i) Mould the piece of modelling clay into an approximate sphere. Use the rule and the blocks of wood to measure the diameter  $d$  of the sphere of modelling clay.

$d = \dots\dots\dots$  [1]

- (ii) Draw a diagram to show how you used the blocks of wood and the rule to measure the diameter of the sphere of modelling clay.

[1]

- (c) (i) Pour approximately  $100\text{ cm}^3$  of water into the measuring cylinder. Record the volume of water  $V_1$  in the measuring cylinder.

$V_1 = \dots\dots\dots$

- (ii) Mould the modelling clay into a shape that will fit into the measuring cylinder.

Tie the thread round the modelling clay and lower it into the measuring cylinder until it is completely covered with water. Record the new volume  $V_2$ .

$V_2 = \dots\dots\dots$

- (iii) Calculate the volume  $V_B$  of the modelling clay using the equation  $V_B = (V_2 - V_1)$ .

$V_B = \dots\dots\dots$

[2]

- (d) A student suggests that the volume of the modelling clay should not change when the shape is changed.

Assuming that the experiment has been carried out with care, suggest two reasons why the values  $V_A$  and  $V_B$  may not be the same.

1. ....

.....

2. ....

.....

[2]

[Total: 10]

**[Turn over**



- 2 In this experiment, you will investigate the cooling of hot water as cold water is added.

You are provided with a supply of hot water and a supply of cold water. Carry out the following instructions, referring to Figs. 2.1 and 2.2.

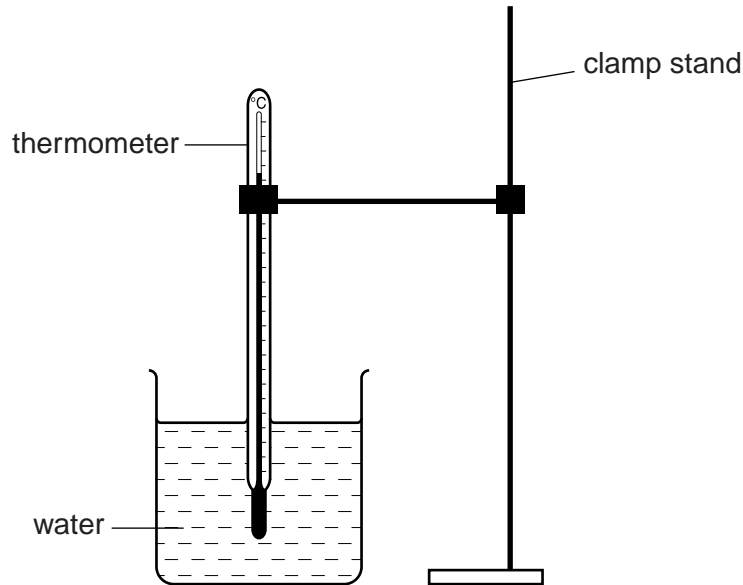


Fig. 2.1

- (a) Measure and record the temperature  $\theta_C$  of the cold water supplied.

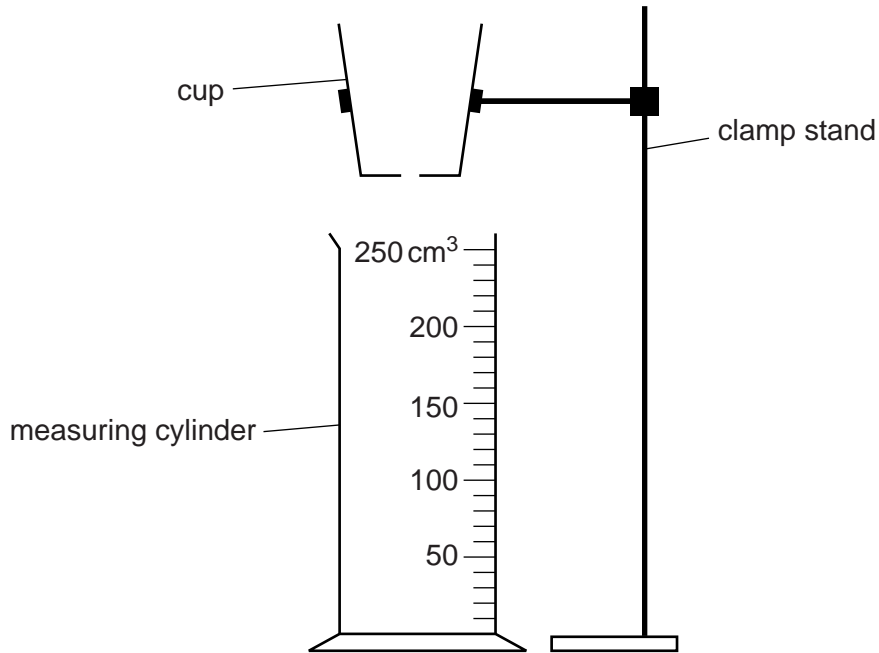
$\theta_C = \dots\dots\dots$  [1]

- (b) (i) Pour approximately  $150\text{cm}^3$  of the hot water supplied into the empty beaker. Without adding any cold water, place the thermometer in the beaker of hot water. When the thermometer reading stops rising, measure the temperature  $\theta$  of the water in the beaker. In Table 2.1, record  $\theta$  at  $V = 0\text{cm}^3$ .  $V$  is the total volume of cold water added.
- (ii) Add  $10\text{cm}^3$  of the cold water to the hot water in the beaker. Stir briefly. Measure, and record in the table, the temperature  $\theta$  of the water in the beaker and the total volume  $V$  of cold water added.
- (iii) Repeat step (ii) until you have added a total of  $50\text{cm}^3$  of cold water. Record the readings in the table.

Table 2.1

| $V/\text{cm}^3$ | $\theta/^\circ\text{C}$ |
|-----------------|-------------------------|
| 0               |                         |
|                 |                         |
|                 |                         |
|                 |                         |
|                 |                         |
|                 |                         |

- (c) You are provided with a drinks cup held above a measuring cylinder, as shown in Fig. 2.2. The cup has a small hole in its base.



**Fig. 2.2**

- (i) Place a finger over the hole in the cup, to prevent water coming out of the cup.
- (ii) Pour approximately  $150\text{ cm}^3$  of cold water into the cup.
- (iii) Check that the measuring cylinder is directly under the cup. Remove your finger from the hole and immediately start the stopclock.

Measure and record the time  $t_1$  taken for  $50\text{ cm}^3$  of water to fall into the measuring cylinder and immediately stop the flow of water with your finger.

$t_1 = \dots\dots\dots$

- (iv) Return the stopclock to its zero reading. Remove your finger from the hole and immediately start the stopclock.

Measure and record the time  $t_2$  taken for the next  $50\text{ cm}^3$  of water to fall into the measuring cylinder.

$t_2 = \dots\dots\dots$

- (v) Allow the cup to empty into the measuring cylinder without taking any further measurements.
- (vi) Calculate the average rate of flow of water  $R_1$  for the first  $50\text{ cm}^3$ , using the equation  $R_1 = \frac{k}{t_1}$ , where  $k = 50\text{ cm}^3$ .

$R_1 = \dots\dots\dots$

- (vii) Calculate the average rate of flow of water  $R_2$  for the next  $50\text{ cm}^3$ , using the equation  $R_2 = \frac{k}{t_2}$ , where  $k = 50\text{ cm}^3$ .

$$R_2 = \dots\dots\dots [3]$$

- (d) A student suggests that the experiment described in parts (a) and (b) would be improved by having a steady flow of cold water added to the hot water by the method described in part (c).

Suggest one possible disadvantage of using the method described in part (c) to produce such a flow of water.

.....  
 ..... [1]

- (e) The experiment described in parts (a) and (b) could be repeated to check the results.

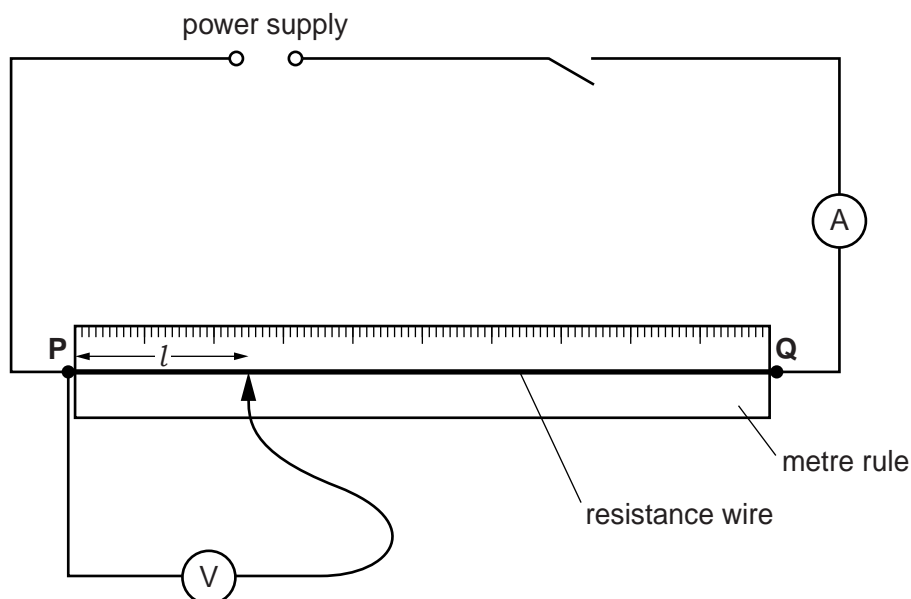
Suggest two conditions that should be kept constant in order to provide a reliable check.

1. ....  
 2. .... [2]

[Total: 10]

3 In this experiment, you will investigate the resistance of a wire.

Carry out the following instructions, referring to Fig. 3.1.



**Fig. 3.1**

- (a) (i) Switch on. Measure and record in Table 3.1 the current  $I$  in the circuit and the potential difference  $V$  across a length  $l = 0.250\text{ m}$  of the resistance wire connected between **P** and **Q**, as shown in Fig. 3.1. Switch off.
- (ii) Calculate the resistance  $R$  of the length  $l = 0.250\text{ m}$  of wire using the equation  $R = \frac{V}{I}$ .

Record this value of  $R$  in the table.

- (iii) Repeat steps (i) and (ii) using  $l$  values of 0.350 m, 0.450 m, 0.550 m, 0.650 m and 0.750 m.
- (iv) Complete the heading for each column of the table.

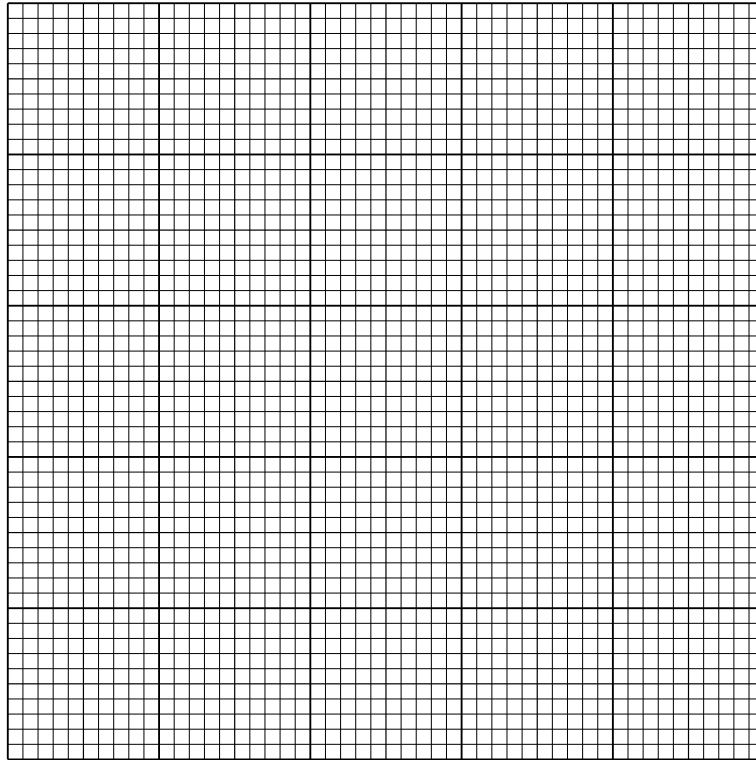
**Table 3.1**

| $l/$  | $V/$ | $I/$ | $R/$ |
|-------|------|------|------|
| 0.250 |      |      |      |
| 0.350 |      |      |      |
| 0.450 |      |      |      |
| 0.550 |      |      |      |
| 0.650 |      |      |      |
| 0.750 |      |      |      |

[2]



(b) Plot a graph of  $R/\Omega$  (y-axis) against  $l/m$  (x-axis).



[4]

(c) Determine the gradient  $G$  of the graph. Show clearly on the graph how you obtained the necessary information.

$G = \dots\dots\dots$  [2]

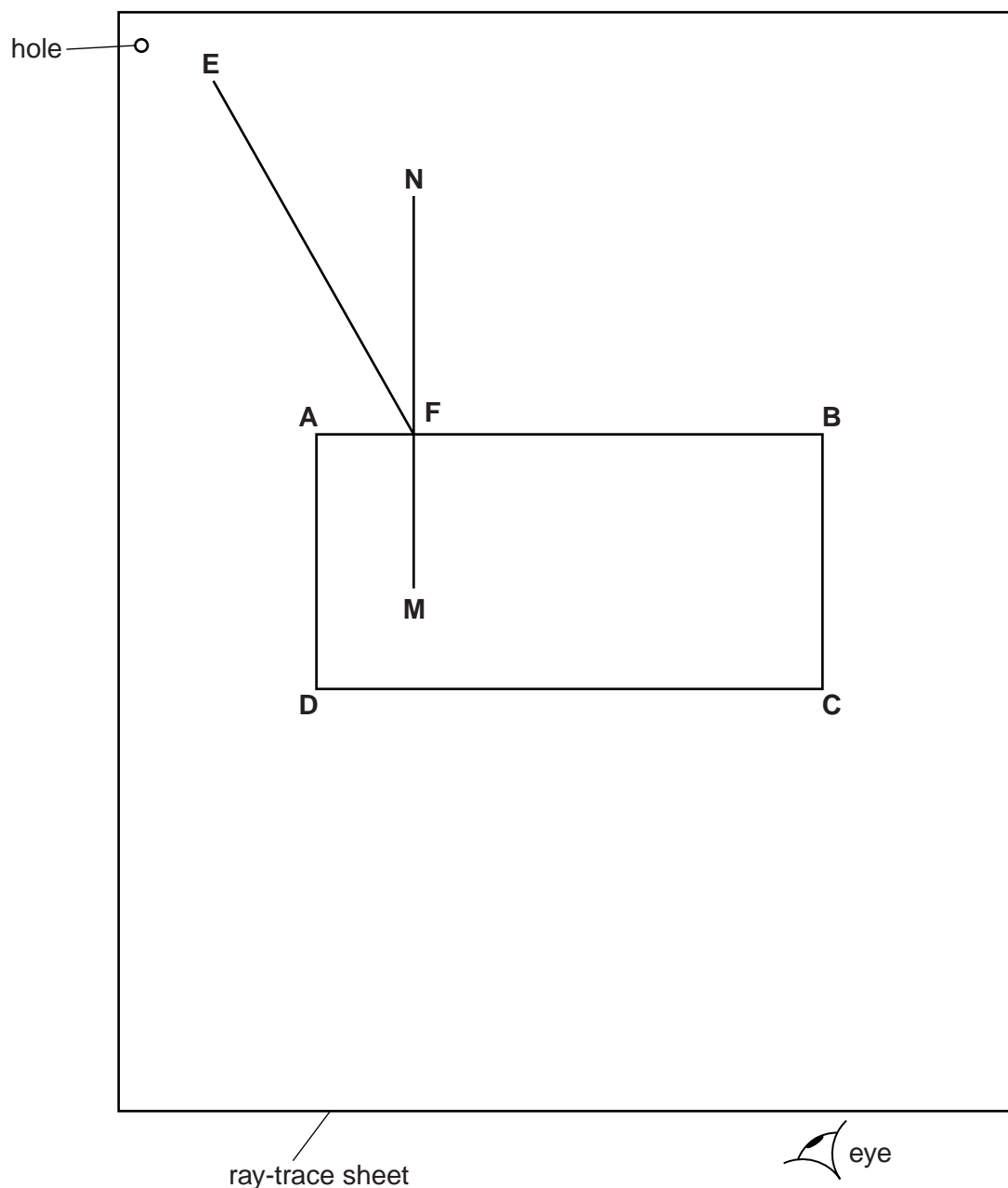
(d) Predict the value of the resistance  $R_1$  of 1.00m of the resistance wire connected between **P** and **Q**. Give your answer to a number of significant figures that is suitable for this experiment.

$R_1 = \dots\dots\dots$  [2]

[Total: 10]

- 4 In this experiment, you will investigate refraction of light through a transparent block.

Carry out the following instructions, referring to Fig. 4.1.



**Fig. 4.1**

- (a) Place the transparent block, largest face down, on the blank ray-trace sheet supplied. The block should be approximately in the middle of the paper. Draw and label the outline of the block **ABCD**.
- (b) Remove the block and draw the normal **NM** to side **AB** so that the normal is 2.0 cm from **A**. Label the point **F** where **NM** crosses **AB**.
- (c) Draw the line **EF** at an angle  $i = 30^\circ$  to the normal as shown in Fig. 4.1.
- (d) Place the paper on the pin board.
- (e) Place two pins  $P_1$  and  $P_2$  on line **EF** at a suitable distance apart for this experiment.

- (f) Replace the block and observe the images of  $P_1$  and  $P_2$  through side **CD** of the block so that the images of  $P_1$  and  $P_2$  appear one behind the other.

Place two pins  $P_3$  and  $P_4$  between your eye and the block so that  $P_3$ ,  $P_4$  and the images of  $P_1$  and  $P_2$ , seen through the block, appear one behind the other.

Label the positions of  $P_1$ ,  $P_2$ ,  $P_3$  and  $P_4$ . Remove the block and the pins.

- (g) Draw a line joining the positions of  $P_3$  and  $P_4$ . Continue the line until it meets side **CD** of the block. Label the point **G** where the line meets side **CD**. Draw the line **FG**.

- (h) Measure and record the angle  $r$  between the normal and line **FG.**

$r = \dots\dots\dots$  [1]

- (i) Turn the ray-trace sheet over. Place the transparent block, largest face down, on the ray-trace sheet but at right angles to the previous position. Label the outline **ABCD** as shown in Fig. 4.2.

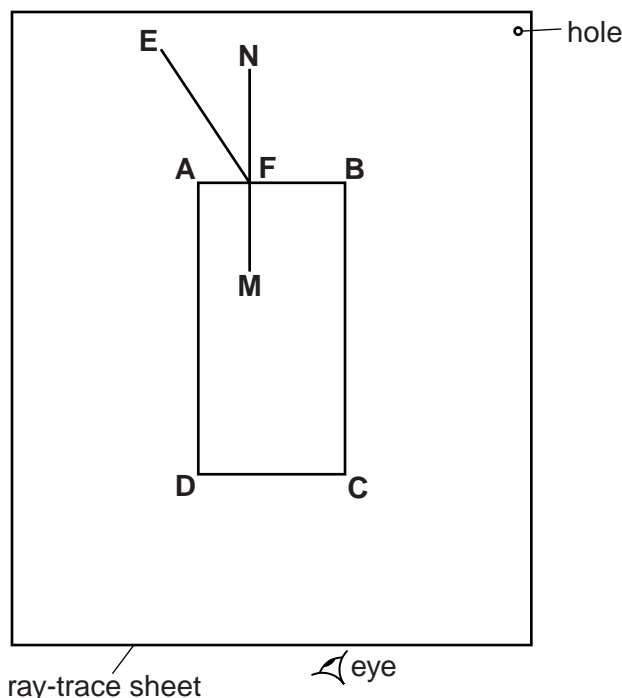


Fig. 4.2

- (j) Repeat steps (b) to (h).

$r = \dots\dots\dots$  [1]

- (k) A student suggests that the value of  $r$  should be the same in both experiments because the material of the block has not changed.

State whether your results support this suggestion. Justify your answer by reference to your results.

statement .....

justification .....

.....

[1]

(l) State two precautions that you should take in this experiment to obtain reliable results.

- 1. ....  
.....
  - 2. ....  
.....
- [2]

**Tie your ray-trace sheet into this Booklet between pages 10 and 11.** [5]

[Total: 10]

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