



# Cambridge IGCSE™

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**PHYSICS**

**0625/62**

Paper 6 Alternative to Practical

**October/November 2021**

**1 hour**

You must answer on the question paper.

No additional materials are needed.

## INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

## INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

1 A student determines the density of a block of wood.

(a) Fig. 1.1 shows one face of the block of wood that the student uses.

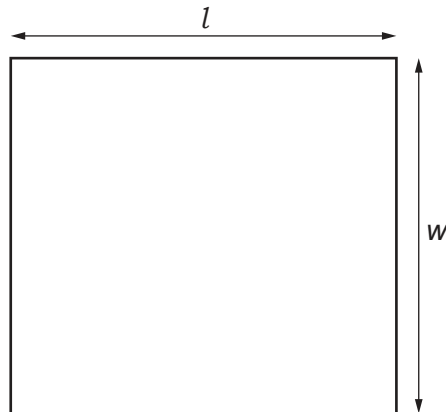


Fig. 1.1

(i) Measure the length  $l$  and width  $w$  of the block of wood. Fig. 1.1 is drawn actual size.

$l =$  ..... cm

$w =$  ..... cm  
[1]

(ii) The student measures the height  $h$  of the block of wood.

$h =$  ..... 4.0 ..... cm

Calculate the volume  $V$  of the block of wood using the equation  $V = l \times w \times h$ .

$V =$  ..... cm<sup>3</sup> [1]

(iii) The student measures the mass  $m$  of the block of wood on a balance.

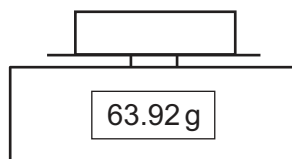


Fig. 1.2

Write down the mass  $m$  of the block as shown in Fig. 1.2. Give your answer to the nearest gram.

$m =$  ..... g [1]

- (iv) Calculate the density  $\rho$  of the wood using the equation  $\rho = \frac{m}{V}$ . Give your answer to a suitable number of significant figures for this experiment and include the unit.

$\rho = \dots\dots\dots$  [2]

- (b) The student places the block of wood carefully in water in a glass dish. The wood floats as shown in Fig. 1.3.

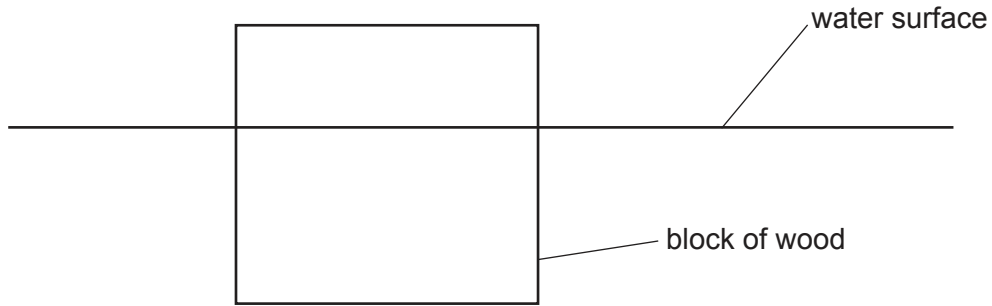


Fig. 1.3

- (i) Using Fig. 1.3, estimate, without taking a measurement, the volume  $V_1$  of wood that is below the water surface.

$V_1 = \dots\dots\dots \text{ cm}^3$  [1]

- (ii) Calculate  $m_W$ , the mass of water with volume  $V_1$ , using the equation  $m_W = \rho_W \times V_1$ , where  $\rho_W = 1.00$  in the same units as  $\rho$  in part (a)(iv).

$m_W = \dots\dots\dots$  [1]

- (c) A student suggests that the mass  $m$  of the block of wood should be equal to the mass  $m_W$  of the water with volume  $V_1$ .

- (i) Calculate the difference  $d$  between your values of  $m$  and  $m_W$ .

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

- (ii) Discuss whether the difference  $d$  is small enough to conclude that  $m = m_W$ .

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

(d) Another student wants to obtain a more accurate value for  $V_1$ . He uses the method of floating the block of wood in water as described in (b).

Suggest how the student could obtain a more accurate value by taking a measurement.

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

[Total: 11]

- 2 A student investigates the resistances of a resistor and a lamp.

Fig. 2.1 shows the first circuit arrangement.

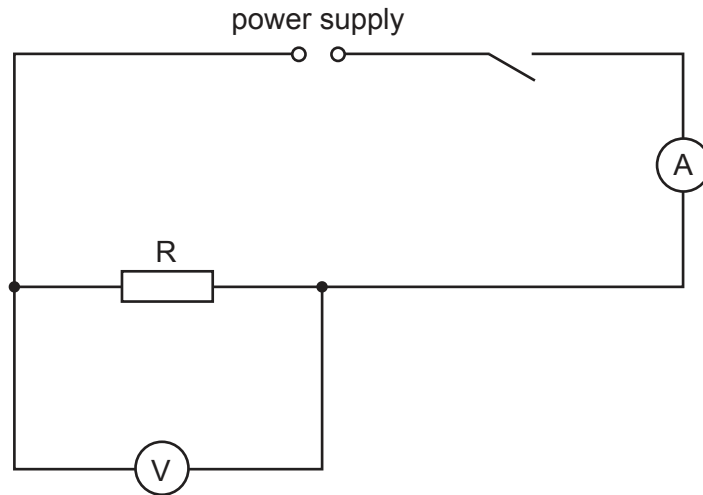


Fig. 2.1

- (a) She records  $V_S$ , the potential difference (p.d.) across the resistor R, and the current  $I_S$  in the circuit. The meters are shown in Fig. 2.2 and Fig. 2.3.
- (i) Write down the readings. Include the units for potential difference, current or resistance where appropriate in all parts of the question.

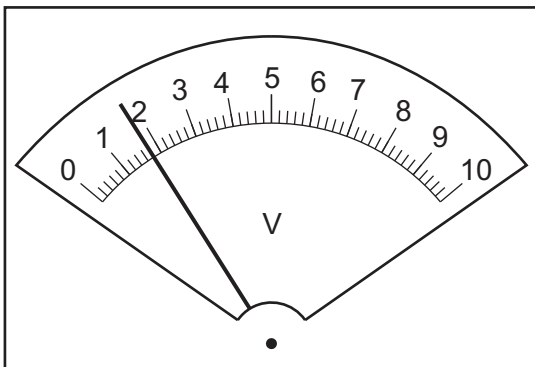


Fig. 2.2

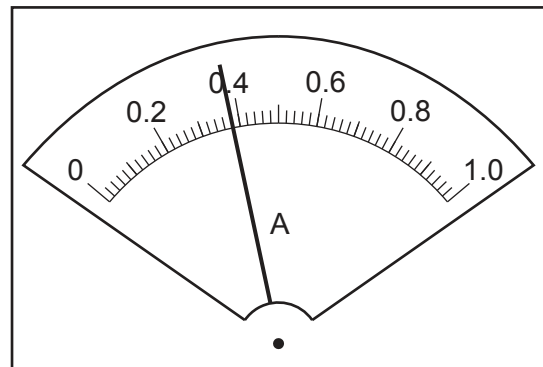


Fig. 2.3

$$V_S = \dots\dots\dots$$

$$I_S = \dots\dots\dots [2]$$

- (ii) Calculate  $R_S$ , the resistance of resistor R, using the equation  $R_S = \frac{V_S}{I_S}$ .

$$R_S = \dots\dots\dots [2]$$

- (b) The student replaces the resistor with the lamp. She records  $V_L$  the potential difference across the lamp and the current  $I_L$  in the circuit.

$$V_L = \dots\dots\dots 1.7 \dots\dots\dots$$

$$I_L = \dots\dots\dots 0.35 \dots\dots\dots$$

Calculate  $R_L$ , the resistance of the lamp, using the equation  $R_L = \frac{V_L}{I_L}$ .

$$R_L = \dots\dots\dots [2]$$

- (c) The student connects the resistor R in series with the lamp. She connects the voltmeter to record  $V_C$ , the potential difference across the series combination of the resistor and the lamp. Draw the circuit diagram for this arrangement.

[2]

- (d) The student records  $V_C$  the potential difference across the resistor and the lamp in series and the current  $I_C$  in the circuit.

$$V_C = \dots\dots\dots 1.7 \dots\dots\dots$$

$$I_C = \dots\dots\dots 0.21 \dots\dots\dots$$

Calculate  $R_C$ , the combined resistance of the resistor and the lamp connected in series, using the equation  $R_C = \frac{V_C}{I_C}$ .

$$R_C = \dots\dots\dots [1]$$

- (e) State and explain briefly whether the results show that  $R_S + R_L = R_C$  within the limits of experimental accuracy.

statement .....

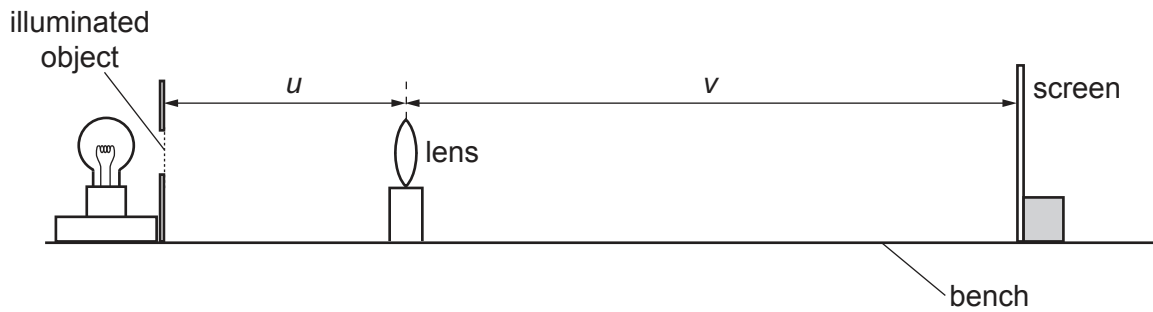
explanation .....

..... [2]

[Total: 11]

3 A student investigates the image produced by a lens.

Fig. 3.1 shows the apparatus.



**Fig. 3.1**

- (a)
- The student places the lens a distance  $u = 20.0$  cm from the illuminated object.
  - He moves the screen until a clearly focused image is formed on the screen.
  - He measures the distance  $v$  between the centre of the lens and the screen.
  - Calculate, and record in the first row of Table 3.1,  $\frac{u}{v}$ .
  - He repeats the procedure for  $u = 25.0$  cm,  $u = 30.0$  cm,  $u = 35.0$  cm and  $u = 40.0$  cm. The readings and results are shown in Table 3.1.

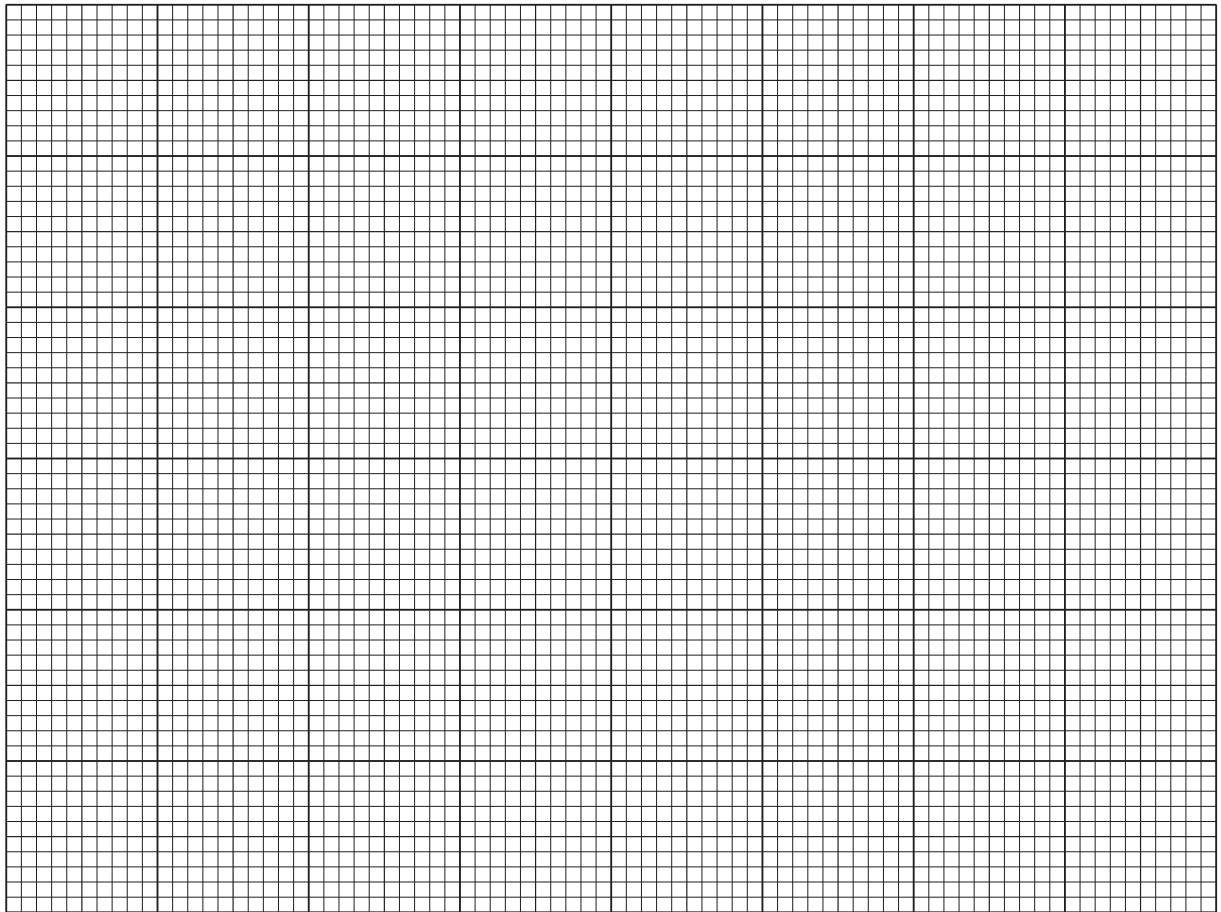
**Table 3.1**

$u/\text{cm}$	$v/\text{cm}$	$\frac{u}{v}$
20.0	79.5	
25.0	44.5	0.56
30.0	35.0	0.86
35.0	30.0	1.17
40.0	27.0	1.48

[1]



(b) Plot a graph of  $u/\text{cm}$  ( $y$ -axis) against  $\frac{u}{v}$  ( $x$ -axis). Start the  $y$ -axis at  $u = 15.0\text{ cm}$ .



[4]

(c) Use your graph to find  $u_1$ , the value of  $u$  when  $\frac{u}{v} = 1.0$ . Show clearly on the graph how you obtained the necessary information.

$u_1 = \dots\dots\dots$  [2]

(d) Calculate the focal length  $f$  of the lens using the equation  $f = \frac{u_1}{2}$ . Give your answer to a suitable number of significant figures for this experiment.

$f = \dots\dots\dots$  cm [2]

(e) Suggest **one** practical difficulty with this experiment. Explain briefly how you would try to overcome this difficulty in order to obtain accurate results.

suggestion .....

.....

explanation .....

.....

.....

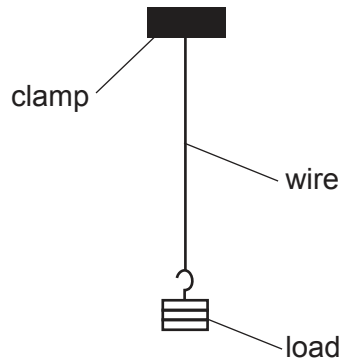
[2]

[Total: 11]

**[Turn over**

- 4 A student investigates the strengths of wires made from different metals by measuring the force required to break the wires.

The apparatus is shown in Fig. 4.1. A wire is held by a clamp at one end and a load is suspended from the other end. The load is increased until the wire breaks. The student takes all the necessary safety precautions.



**Fig. 4.1**

Plan an experiment to investigate the force required to break wires made from different metals.

The following apparatus is available:

- clamps and stands
- a selection of masses with a suitable hanger
- metre rule
- a selection of wires made from different metals.

You can also use other apparatus and materials that are usually available in a school laboratory.

In your plan, you should:

- write a list of suitable metals for the wires you would investigate
- explain briefly how you would do the investigation
- state the key variables that you would keep constant
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use the results to reach a conclusion.



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