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0625/62

October/November 2019

1 hour

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

You may lose marks if you do not show your working or if you do not use appropriate units.

The number of marks is given in brackets [] at the end of each question or part question.

This syllabus is regulated 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 A student investigates a pendulum. Fig. 1.1 and Fig. 1.2 show some of the apparatus used.

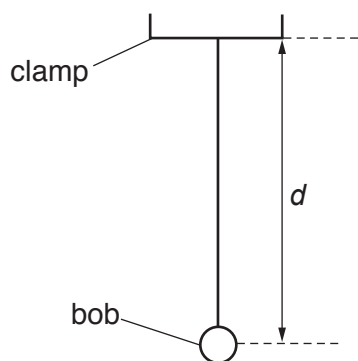


Fig. 1.1

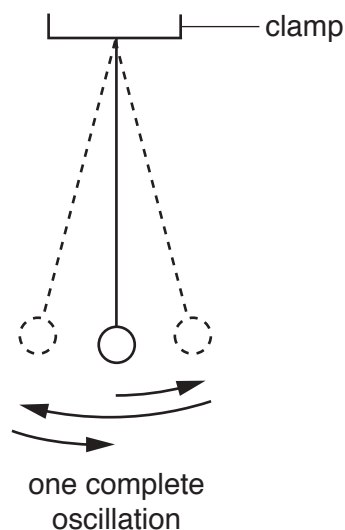


Fig. 1.2

- (a) The student adjusts the length of the pendulum until the distance d , measured to the centre of the bob, is 50.0 cm. State one precaution that you would take to obtain the length of 50.0 cm as accurately as possible.

.....
 [1]

- (b) The student displaces the bob slightly and releases it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

- (i) He measures the time t for 20 complete oscillations. The time t is shown on the stopwatch in Fig. 1.3.



Fig. 1.3

In the first row of Table 1.1, record the time t shown in Fig. 1.3. [1]

- (ii) Calculate, and record in Table 1.1, the period T of the pendulum. The period is the time for one complete oscillation. [1]

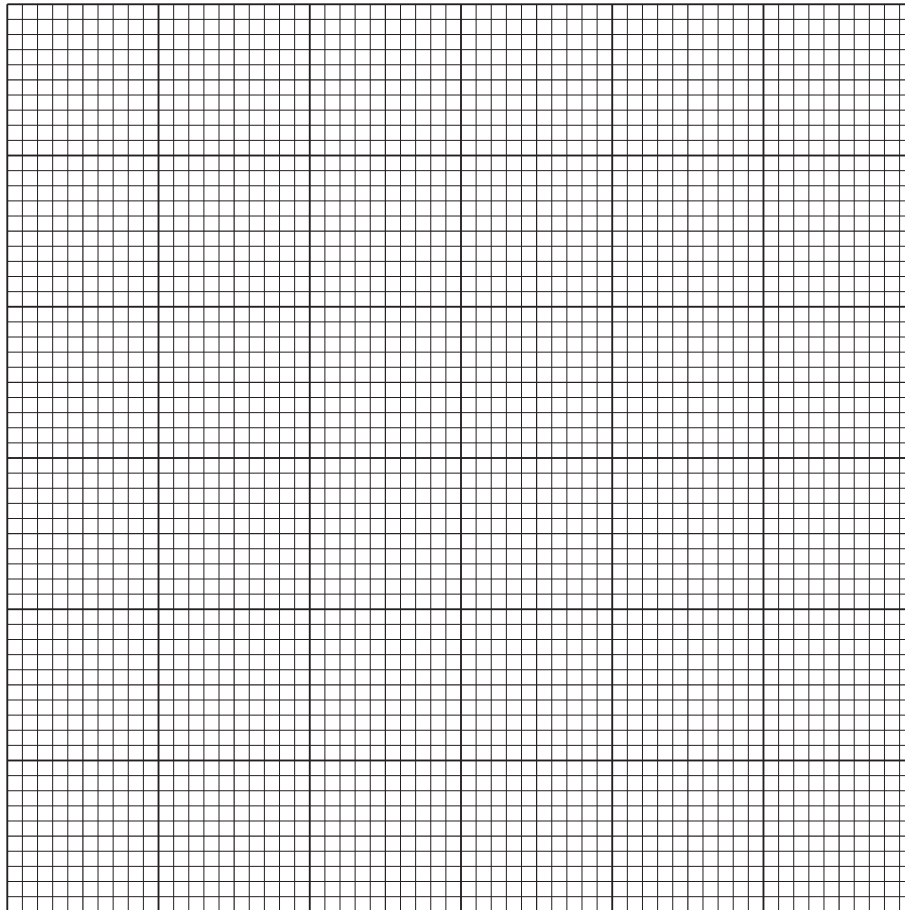
- (iii) Calculate T^2 . Record its value in Table 1.1. [1]

- (c) The student repeats the procedure in (b) using $d = 60.0\text{ cm}$, 70.0 cm , 80.0 cm and 100.0 cm . The readings are shown in Table 1.1.

Table 1.1

d/cm	t/s	T/s	T^2/s^2
50.0			
60.0	30.00	1.50	2.25
70.0	33.20	1.66	2.76
80.0	35.80	1.79	3.20
100.0	39.80	1.99	3.96

Plot a graph of T^2/s^2 (y-axis) against d/cm (x-axis). You do **not** need to start your axes at the origin (0,0).



[4]

- (d) Determine the gradient G of the line. Show clearly on the graph how you obtained the necessary information.

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

- (e) Calculate the acceleration of free fall g in m/s^2 using the equation $g = \frac{0.395}{G}$, where G is your gradient from (d).

Write down the value of g to a suitable number of significant figures for this experiment.

$g = \dots\dots\dots \text{m/s}^2$ [2]

[Total: 12]

- 2 A student determines the resistance of a resistance wire.

She uses the circuit shown in Fig. 2.1.

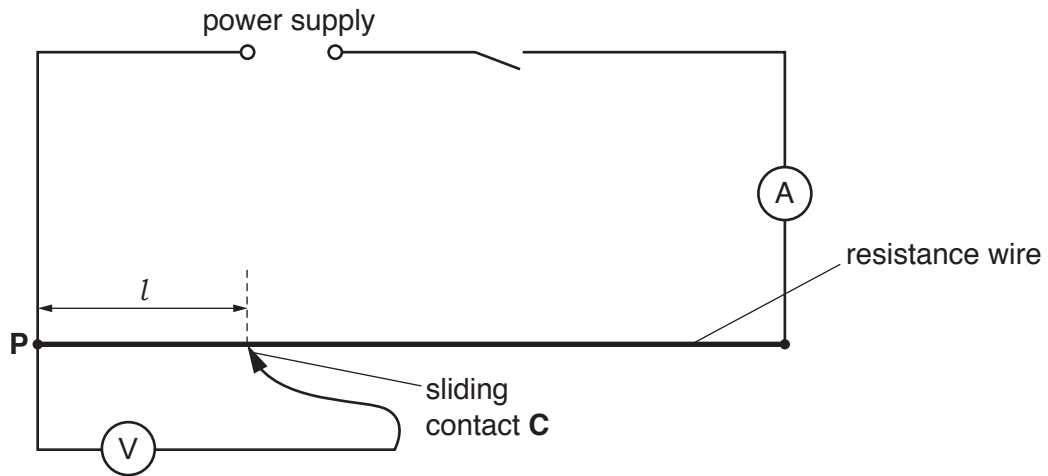


Fig. 2.1

- (a) She measures the current I in the circuit. Write down the current reading shown in Fig. 2.2.

$I = \dots\dots\dots$ [2]

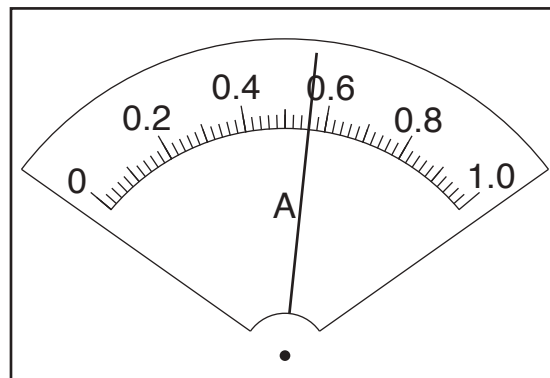


Fig. 2.2

- (b) She places the sliding contact **C** at a distance $l = 20.0$ cm from **P**.

She records the potential difference V across the length l of the resistance wire.

She repeats the procedure using l values of 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm.

The readings are shown in Table 2.1.

Table 2.1

l/cm	$V/$	$R/$
20.0	0.60	
40.0	1.10	1.96
60.0	1.71	3.05
80.0	2.30	4.11
100.0	2.78	4.96

- (i) Calculate, and record in Table 2.1, the resistance R of 20.0 cm of the resistance wire.
Use the equation $R = \frac{V}{I}$.

[2]

- (ii) Complete the column headings in Table 2.1.

[1]

(c) Look carefully at the values of l and R in Table 2.1.

(i) Tick **one** box to show your conclusion from the results.

☐

R is constant within the limits of experimental accuracy.

☐

R is directly proportional to l within the limits of experimental accuracy.

☐

R decreases as l increases.

☐

There is no simple relationship between R and l .

[1]

(ii) Justify your conclusion by reference to the results.

.....

 [1]

(d) (i) Use the values in Table 2.1 to estimate the potential difference V_e across 50.0 cm of the resistance wire.

$V_e =$ [1]

(ii) Calculate the resistance of 50.0 cm of the resistance wire using the equation $R = \frac{V_e}{I}$.

Use the value of current I from part (a). Give your answer to a suitable number of significant figures for this experiment and include the unit.

$R =$ [2]

(e) In this type of experiment, it is sensible to keep the temperature of the resistance wire as close to room temperature as possible. Suggest **one** simple way to minimise the rise in temperature of the resistance wire.

.....
 [1]

[Total: 11]

3 A student determines the focal length f of a lens.

Fig. 3.1 shows the set-up.

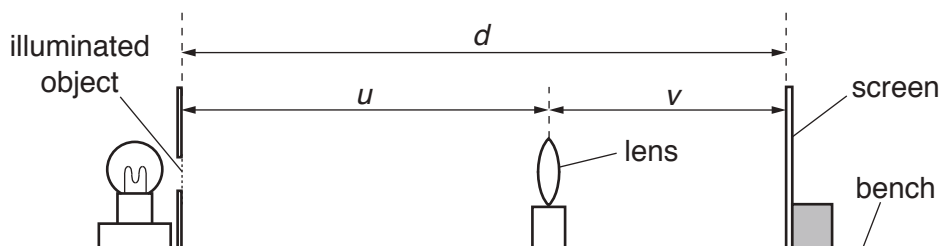


Fig. 3.1

- (a) • He places the screen at a fixed distance from the illuminated object.
- He places the lens between the object and the screen so that the lens is very close to the screen.
 - He moves the lens slowly away from the screen until a clearly focused image is formed on the screen.
 - He measures the distance u between the object and the centre of the lens and the distance v between the centre of the lens and the screen. The readings are shown in Table 3.1.

- (i) On Fig. 3.1, measure the distance d between the illuminated object and the screen.

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

- (ii) Fig. 3.1 is drawn 1/10th actual size. Calculate the actual distance D between the illuminated object and the screen.

$$D = \dots\dots\dots [1]$$

- (b) Calculate, and record in Table 3.1, the focal length f of the lens using the equation $f = \frac{uv}{D}$. [1]

- (c) • The student keeps the screen at the same fixed distance D from the illuminated object.
- He moves the lens slowly away from the screen. The image goes out of focus.
 - He continues to move the lens slowly away from the screen until another clearly focused image is formed on the screen.
 - He records the new readings of u and v in Table 3.1.

- (i) Calculate, and record in Table 3.1 the new value for the focal length f of the lens using the equation $f = \frac{uv}{D}$. [1]

Table 3.1

u/cm	v/cm	f/cm
59.8	20.4	
19.8	60.0	

- (ii) Calculate the average value f_A of the focal length of the lens. Give your answer to a suitable number of significant figures for this experiment.

$$f_A = \dots\dots\dots \text{ cm [2]}$$

- (d) State **one** precaution that you would take to obtain accurate readings in this experiment.

.....
 [1]

- (e) Another student wants to obtain more measurements for u and for v to check the value for the focal length f of the lens. The student moves the screen a distance of 40.0 cm to the right.

- (i) Calculate the new value for the distance D between the illuminated object and the screen.

$$D = \dots\dots\dots \text{ cm [1]}$$

- (ii) The student moves the lens to a new position which is a distance from the object $u = 22.2 \text{ cm}$. He observes the image on the screen and says it is clearly focussed at a distance $v = 97.9 \text{ cm}$.

Calculate the new value of the focal length f of the lens using $f = \frac{uv}{D}$.

$$f = \dots\dots\dots \text{ cm [1]}$$

- (iii) State and explain briefly whether the values for f_A and f in (e)(ii) are the same within the limits of experimental accuracy.

.....

 [1]

[Total: 10]

- 4 A student investigates the time taken for ice cubes in a container to melt using different insulating materials on the container.

The following apparatus is available:

- a copper container
- a variety of insulating materials that can be wrapped round the copper container
- a thermometer
- a stopwatch
- a supply of ice cubes

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

Plan an experiment to investigate the time taken for ice cubes to melt using different insulating materials.

In your plan, you should:

- draw a diagram of the apparatus used
- explain briefly how you would carry out the investigation
- state the key variables that you would control
- 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 your readings to reach a conclusion.

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[Total: 7]

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