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0625/62

October/November 2017

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.

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 **12** printed pages.

- 1 A student is comparing the oscillations of two pendulums. Fig. 1.1 shows the first pendulum.

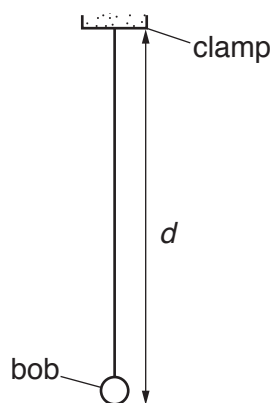


Fig. 1.1

- (a) (i) On Fig. 1.1, measure the distance d , from the bottom of the clamp to the bottom of the bob.

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

- (ii) Fig. 1.1 is drawn $1/10^{\text{th}}$ actual size. Calculate the actual distance D from the bottom of the clamp to the bottom of the bob.

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

- (iii) Explain briefly how to use a set-square to avoid a parallax (line-of-sight) error when measuring the length of this pendulum. You may draw a diagram.

.....
[1]

- (b) The student displaces the bob slightly and releases it so that it swings. She measures the time t for 20 complete oscillations. The time t is shown on the stopwatch in Fig. 1.2.



Fig. 1.2

- (i) Write down the time t shown in Fig. 1.2.

$t = \dots\dots\dots$ [1]

- (ii) Calculate the period T_1 of the pendulum. The period is the time for one complete oscillation.

$T_1 = \dots\dots\dots$ [2]

- (c) The student repeats the procedure using another pendulum as shown in Fig. 1.3. This has a long, thin pendulum bob. The distance D from the bottom of the clamp to the bottom of the pendulum bob is the same as for the first pendulum.

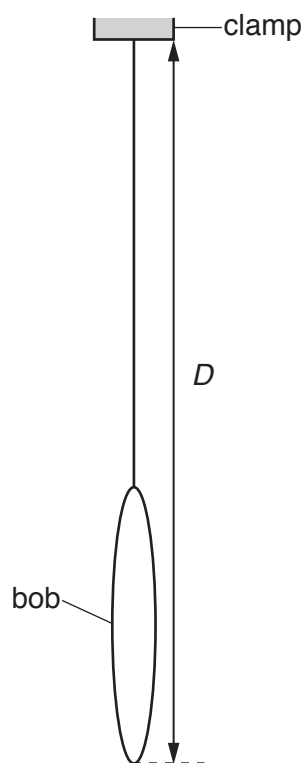


Fig. 1.3

She determines the period T_2 of this pendulum.

$$T_2 = \dots\dots\dots 1.37 \text{ s}$$

In this experiment, both pendulum bobs have the same mass. A student suggests that since both pendulums have the same overall length D and mass, the periods T_1 and T_2 should be equal. State whether the results support this suggestion. Justify your answer by reference to the results.

statement

justification

.....

.....[2]

- (d) The period T of a pendulum can be determined by measuring the time t for 20 complete oscillations and then calculating the period. Some students are asked to explain the reason for this method being more accurate than measuring the time taken for a single oscillation.

Tick the box next to the sentence that gives the best explanation.

- | | |
|--------------------------|---|
| ☐ | The method eliminates errors from the measurements. |
| ☐ | The method is more accurate because the experiment is repeated. |
| ☐ | The method includes more readings so there is less chance for errors. |
| ☐ | The method reduces the effect of errors when starting and stopping the stopwatch. |
- [1]

- (e) A student plans to carry out more pendulum experiments. He considers possible variables and precautions to improve accuracy.

In the following list, mark the possible variables with the letter **V** and the precautions with the letter **P**.

- | | |
|--------------------------|--|
| ☐ | amplitude of swing |
| ☐ | length of pendulum |
| ☐ | mass of pendulum bob |
| ☐ | shape of pendulum bob |
| ☐ | use of a reference point to aid counting |
| ☐ | viewing the rule at right-angles when measuring the length |
- [2]

[Total: 11]

2 A student is investigating the cooling of water.

- (a) The thermometer in Fig. 2.1 shows room temperature θ_R at the beginning of the experiment. Record θ_R .

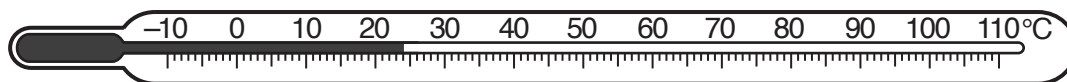


Fig. 2.1

$$\theta_R = \dots\dots\dots\text{ }^{\circ}\text{C} \quad [1]$$

- (b) The student pours 50 cm^3 of hot water into a beaker.

He measures the temperature θ_H of the hot water.

$$\theta_H = \dots\dots\dots 86^{\circ}\text{C} \dots\dots\dots$$

He adds 50 cm^3 of cold water to the beaker. He stirs the water briefly.

He measures the new temperature θ_M of the water in the beaker.

$$\theta_M = \dots\dots\dots 52^{\circ}\text{C} \dots\dots\dots$$

Calculate the temperature fall θ_F using the equation $\theta_F = (\theta_H - \theta_M)$.

$$\theta_F = \dots\dots\dots [1]$$

- (c) He repeats the procedure in (b) using 100 cm^3 of hot water and 100 cm^3 of cold water.

$$\theta_H = \dots\dots\dots 84^{\circ}\text{C} \dots\dots\dots$$

$$\theta_M = \dots\dots\dots 54^{\circ}\text{C} \dots\dots\dots$$

Calculate the temperature fall θ_F using the equation $\theta_F = (\theta_H - \theta_M)$.

$$\theta_F = \dots\dots\dots [1]$$

- (d) Suggest **one** reason for stirring the water before reading θ_M .

.....
 [1]

- (e) A student states that the temperature fall θ_F should be the same each time because the proportions of hot and cold water are the same.

Suggest **one** reason why θ_F could be significantly different in (b) and (c).

.....

 [1]

- (f) Suggest an improvement to the apparatus to make it more likely that θ_F would be the same each time.

.....

.....

.....[1]

- (g) Suggest a condition, not included in your answer to (f), that you would control to make it more likely that θ_F would be the same each time.

.....

.....

.....[1]

- (h) The student uses a measuring cylinder to measure the volume of water he uses. Draw a measuring cylinder about half-full of water. Show clearly on your diagram the line-of-sight required for obtaining a correct reading for the volume of water.

[3]

[Total: 10]

- 3 A student is determining the focal length f of a lens.

Fig. 3.1 shows the apparatus used.

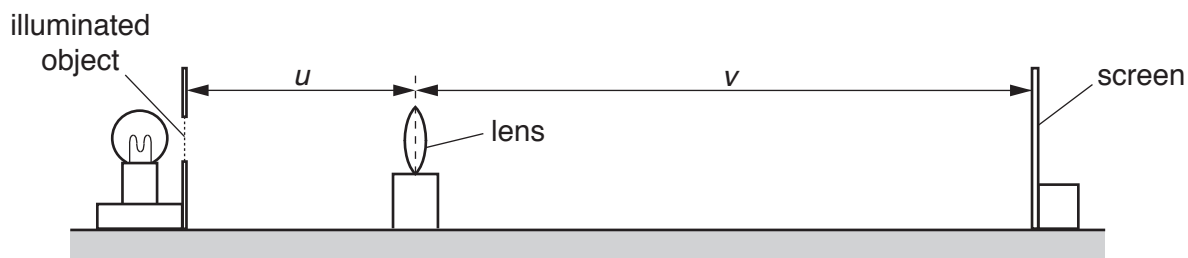


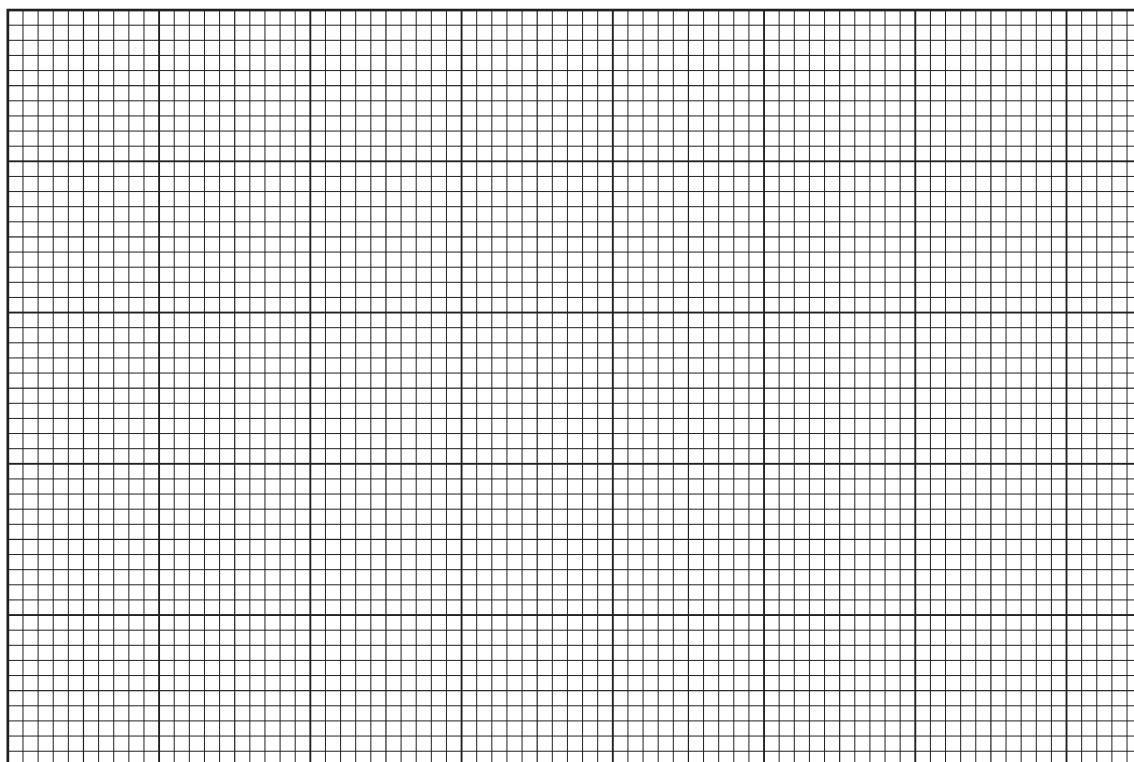
Fig. 3.1

- (a)
- The student places the screen about 100 cm from the illuminated object.
 - She places the lens between the object and the screen so that the centre of the lens is at a distance $u = 20.0$ cm from the object.
 - She adjusts the position of the screen until a clearly focused image is formed on the screen.
 - She measures the distance v between the centre of the lens and the screen.
 - She repeats the procedure using values for u of 22.0 cm, 25.0 cm, 30.0 cm and 35.0 cm.
 - The readings are shown in Table 3.1.

Table 3.1

u/cm	v/cm
20.0	60.0
22.0	47.1
25.0	37.5
30.0	29.8
35.0	26.3

Plot a graph of v/cm (y -axis) against u/cm (x -axis). You do not need to start your axes at the origin (0, 0). Draw the best-fit curve.



[4]

- (b) (i) • Mark, with a cross, the point on the graph grid where $u = 25.0\text{ cm}$ and $v = 25.0\text{ cm}$.
 • Mark with a cross, the point on the graph grid where $u = 35.0\text{ cm}$ and $v = 35.0\text{ cm}$.
 • Join these two points with a straight line. [1]

- (ii) • Record u_1 , the value of u at the point where the straight line crosses your graph line.

$u_1 = \dots\dots\dots\text{ cm}$

- Record v_1 , the value of v at the point where the straight line crosses your graph line.

$v_1 = \dots\dots\dots\text{ cm}$
[1]

- (iii) Calculate the focal length f of the lens using the equation $f = \frac{(u_1 + v_1)}{4}$.

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

- (c) Suggest **two** differences that you would expect to see between the appearance of the illuminated object and the image on the screen.

1.

2.

[2]

- (d) Suggest **two** precautions that you would take in order to obtain reliable readings in this experiment.

1.

2.

[2]

[Total: 12]

- 4 A student has a selection of rubber bands of different widths. He is investigating the extension produced by adding loads. Fig. 4.1 shows the set-up used.

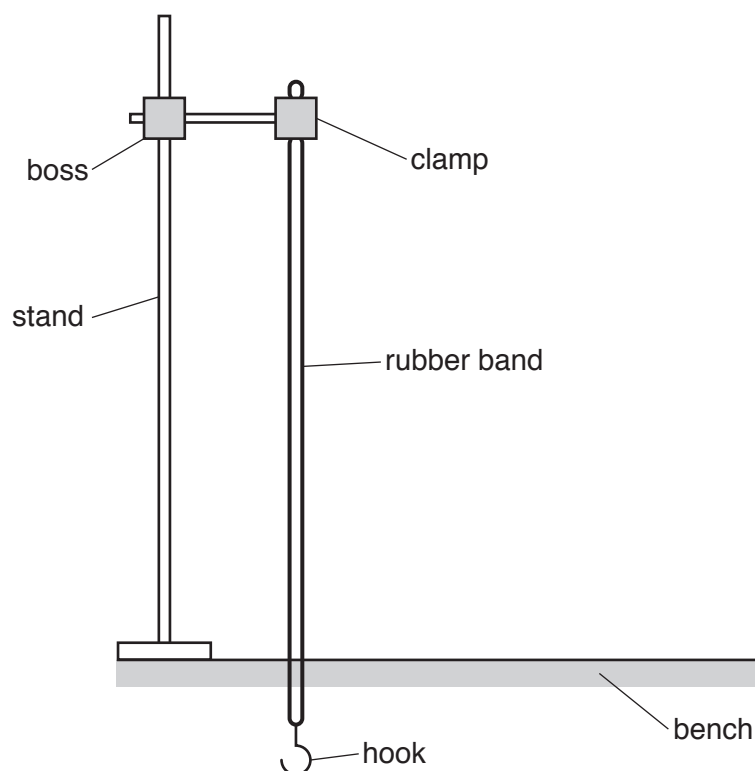


Fig. 4.1

In addition to the apparatus shown in Fig. 4.1, the following apparatus is available to the student:

- A metre rule
- A selection of different rubber bands
- A selection of loads.

Plan an experiment to investigate how strips of rubber of different widths stretch when loaded.

You should

- 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 briefly how you would use your readings to reach a conclusion.

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