Length & Time

Question Paper 1

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	General Physics
Sub-Topic	Length & Time
Paper Type	Alternative to Practical
Booklet	Question Paper 1

Time Allowed: **59 minutes**

Score: **/49**

Percentage: **/100**

1 A student is heating water in a beaker using an electrical heater.

(a) He measures the potential difference V across the heater and the current I in the heater.

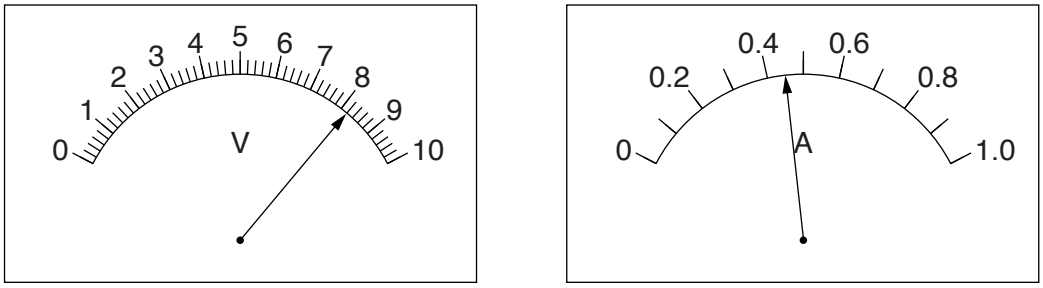


Fig. 2.1

Write down the readings shown on the meters in Fig. 2.1.

V = ...

I = ...

[3]

(b) He measures the temperature of the water before heating.

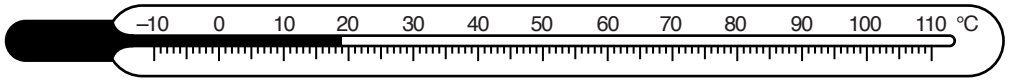
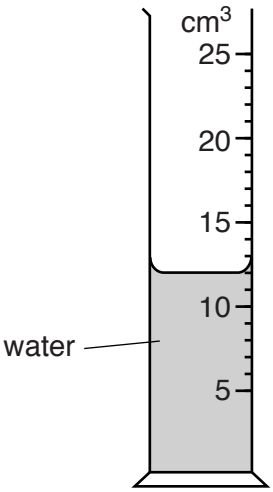


Fig. 2.2

Write down the temperature reading θ shown in Fig. 2.2.

θ = ... [1]

(c) On Fig. 2.3, draw a line and an eye to show clearly the line of sight required to read the volume of water in the measuring cylinder.



[1]

Fig. 2.3

[Total: 5]

2 The class is investigating the oscillations of a pendulum.

Figs. 5.1 and 5.2 show the apparatus.

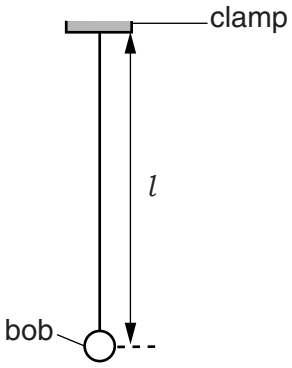


Fig. 5.1

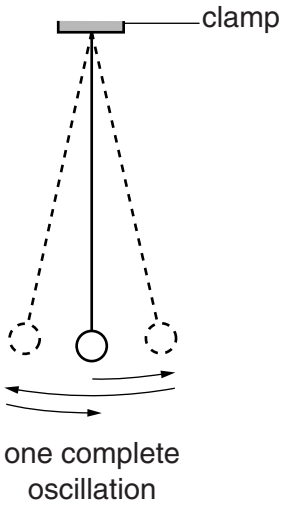


Fig. 5.2

A student measures the length l of the pendulum and takes readings of the time t for 20 complete oscillations. She calculates the period T of the pendulum. T is the time taken for one complete oscillation. She repeats the procedure for a range of lengths.

She plots a graph of T^2/s^2 against l/m. Fig. 5.3 shows the graph.

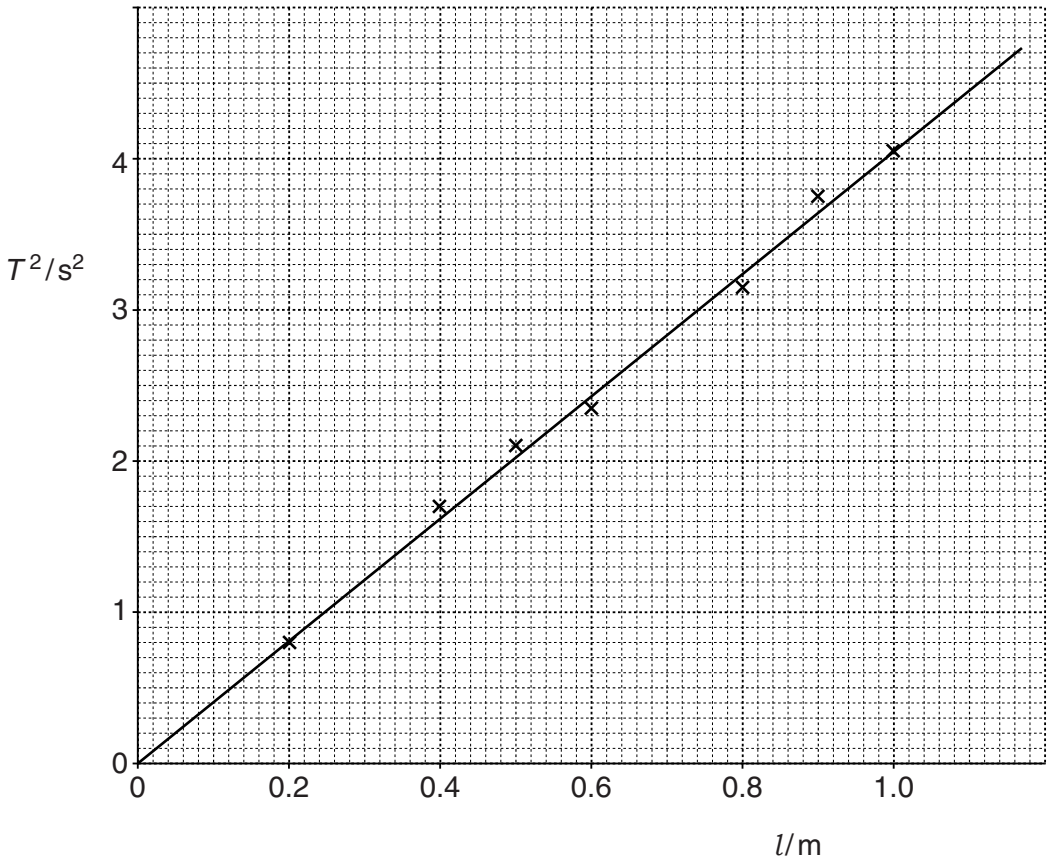


Fig. 5.3

(a) Using the graph, determine the length l of a pendulum that has a period T = 2.0 s. Show clearly on the graph how you obtained the necessary information.

l = ...[3]

(b) Explain why measuring the time for 20 swings, rather than for 1 swing, gives a more accurate value for T.

.....

.....[1]

(c) Another student investigates the effect that changing the mass m of the pendulum bob has on the period T of the pendulum.

(i) Suggest how many different masses the student should use for this laboratory experiment.

number of different masses = ...

(ii) Suggest a range of suitable values for the masses.

suitable range of masses = ...
[2]

[Total: 6]

3 The class is investigating a pendulum.

Figs. 1.1 and 1.2 show the pendulum.

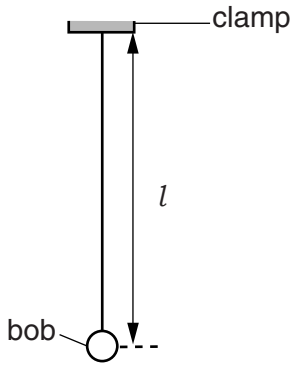


Fig. 1.1

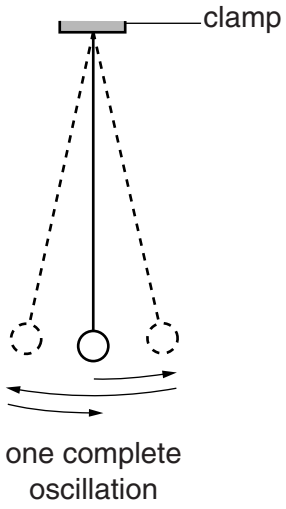


Fig. 1.2

(a) A student adjusts the pendulum until its length $l = 50.0\,\text{cm}$.

State one precaution that you would take to measure the length l as accurately as possible. You may draw a diagram.

.....

.....[1]

(b) The student displaces the pendulum bob slightly and releases it so that it swings. She measures the time t for 20 complete oscillations of the pendulum (see Fig. 1.2).

(i) Record the time t, in s, shown on the stopwatch in Fig. 1.3.

Fig. 1.3

t = ... s [1]

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

T = ...[1]

(iii) Explain why measuring the time for 20 oscillations, rather than 1 oscillation, gives a more accurate value for T.

.....

.....[1]

(c) The student adjusts the length of the pendulum until its length l = 100.0 cm. She repeats the procedure and obtains a value for the period T.

T = ...2.06 s.....

Another student suggests that doubling the length l of the pendulum should double the period T.

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

statement .....

justification .....

.....

[2]

(d) To continue the investigation of the relationship between the length l of the pendulum and the period T, it is necessary to use a range of values of length l.

List additional l values that you would plan to use in the laboratory.

.....[2]

[Total: 8]

4 The class is investigating two different types of pendulum.

Figs. 1.1 and 1.2 show the apparatus used.

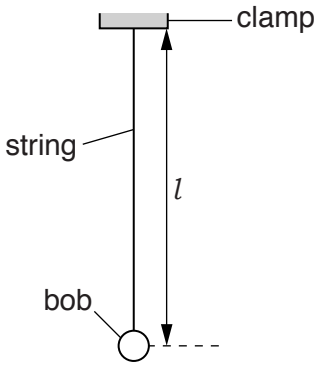


Fig. 1.1

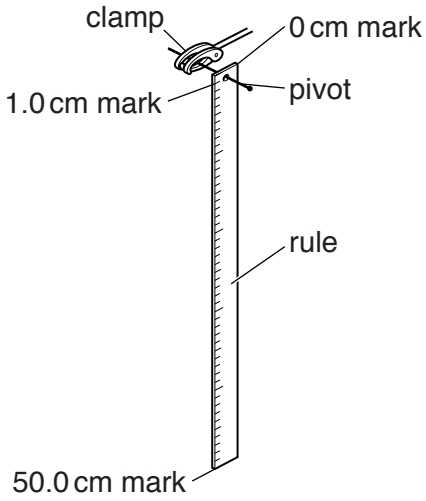


Fig. 1.2

(a) **(i)** On Fig. 1.1, measure the length l of the pendulum.

l = ...[1]

(ii) Explain briefly how you would measure the length l of a pendulum, of the type shown in Fig. 1.1, as accurately as possible.

.....

.....[1]

(b) A student adjusts the length l of the pendulum shown in Fig. 1.1 to be exactly 50.0 cm. She displaces the pendulum bob slightly and releases it so that it swings. She measures the time t_S for 20 complete oscillations of the pendulum.

(i) Record the time t_S as shown in Fig. 1.3.

Fig. 1.3

t_S = ...[1]

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

T_S = ...[1]

(iii) Explain why measuring the time for 20 oscillations, rather than for 1 oscillation, gives a more accurate value for T_S.

.....

.....

.....[1]

(c) The pendulum shown in Fig. 1.2 is a 50.0 cm rule. The student displaces this pendulum slightly and releases it so that it swings. She measures the time t_C for 20 complete oscillations of the pendulum.

t_C = 23.2 s

(i) State a precaution that you would take to ensure that the measurement of time t_C is reliable.

.....

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

T_C = ...
[1]

(d) A student suggests that T_C should be equal to T_S.

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

statement .....

justification .....

.....

.....
[2]

(e) Assume that the length l of the first pendulum has been measured accurately at 50.0 cm and that the length of the strip that forms the second pendulum is exactly 50.0 cm long.

Suggest why it may not be correct to state that both pendulums have the same length l = 50.0 cm.

.....

.....[1]

[Total: 9]

5 The class is investigating the motion of a small steel ball when it is dropped on to a tray full of sand. Fig. 5.1 shows the apparatus.

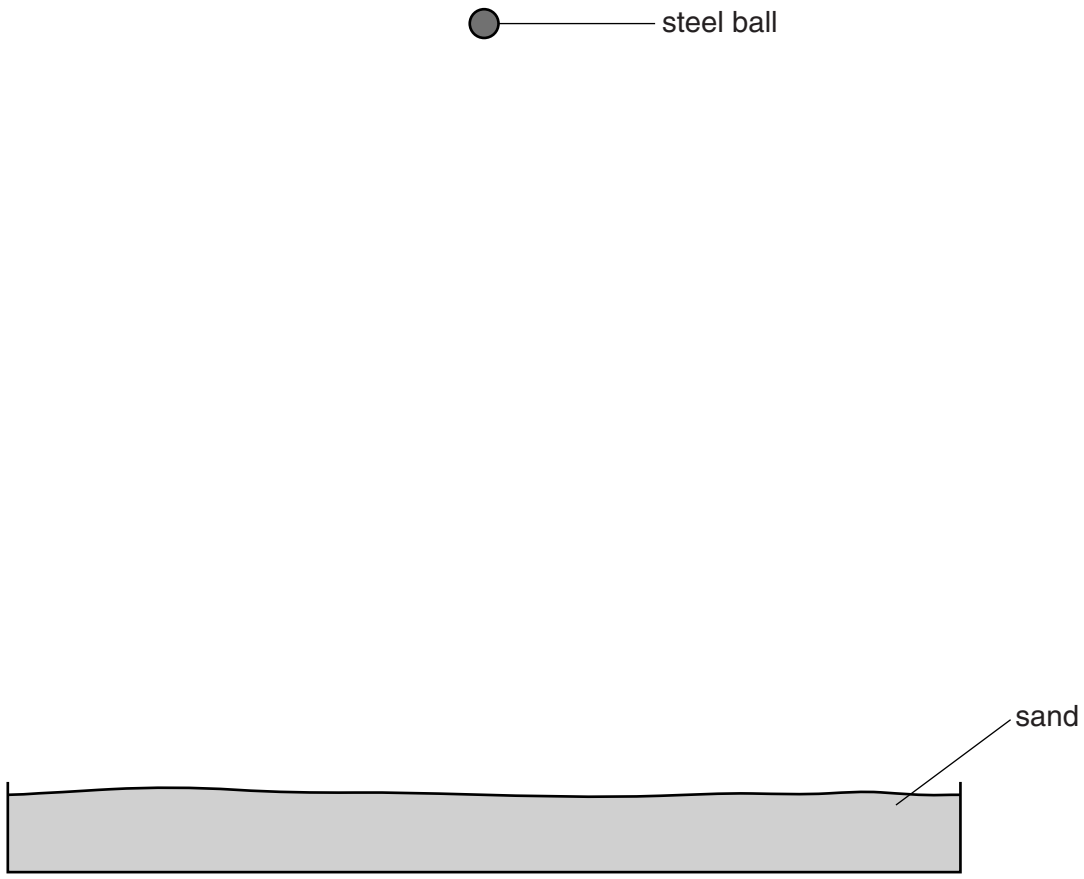


Fig. 5.1

(a) A student is measuring the time it takes for the steel ball to fall through 2.00 m on to the sand. He uses a stopwatch.

Suggest a cause of inaccuracy in the timing.

.....

.....[1]

(b) When the steel ball falls into the sand it creates a circular hole.

Suggest how you would measure the diameter of the hole as reliably as possible. Name the measuring device that you would use. You may draw a diagram.

.....

.....

.....[2]

(c) The student suggests that the diameter of the hole depends on the height from which the ball is dropped, because this affects the speed.

Suggest two other variables on which the size of the hole may depend.

1. .....

2. .....

[2]

[Total: 5]

6 An IGCSE student is taking measurements of a pencil.

Fig. 1.1 shows the pencil, drawn full size.

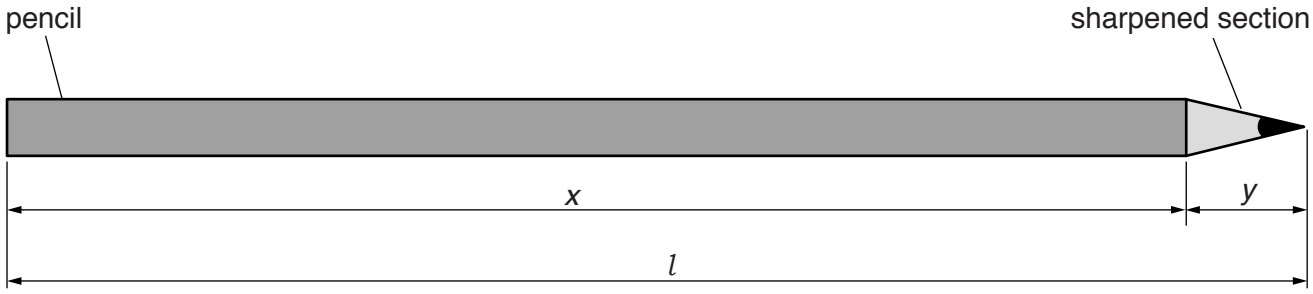


Fig. 1.1

(a) **(i)** On Fig. 1.1, measure, in cm, the total length l of the pencil.

l = ... cm

(ii) Measure, in cm, the length x of the unsharpened section of the pencil.

x = ... cm

(iii) Calculate the length y of the sharpened section of the pencil, using the equation $y = (l - x)$.

y = ... cm
[2]

(b) Describe how you would use a length of string and a rule to determine the circumference c of the unsharpened section of the pencil.

.....

.....

.....

.....

.....[2]

(c) The student's value for the circumference is $c = 2.4\,\text{cm}$.

(i) Suggest a source of inaccuracy in determining the circumference of the pencil.

.....

.....[1]

(ii) Calculate the volume V of the unsharpened section of the pencil using the equation $V = \frac{c^2 x}{4\pi}$.

$V =$ ..... [1]

(iii) Estimate the volume V_E of the sharpened section of the pencil. Show your working or reasoning.

$V_E =$ ..... [2]

[Total: 8]

7 An IGCSE student is taking measurements of a drinks cup.

Carry out the following instructions, referring to Fig. 5.1.

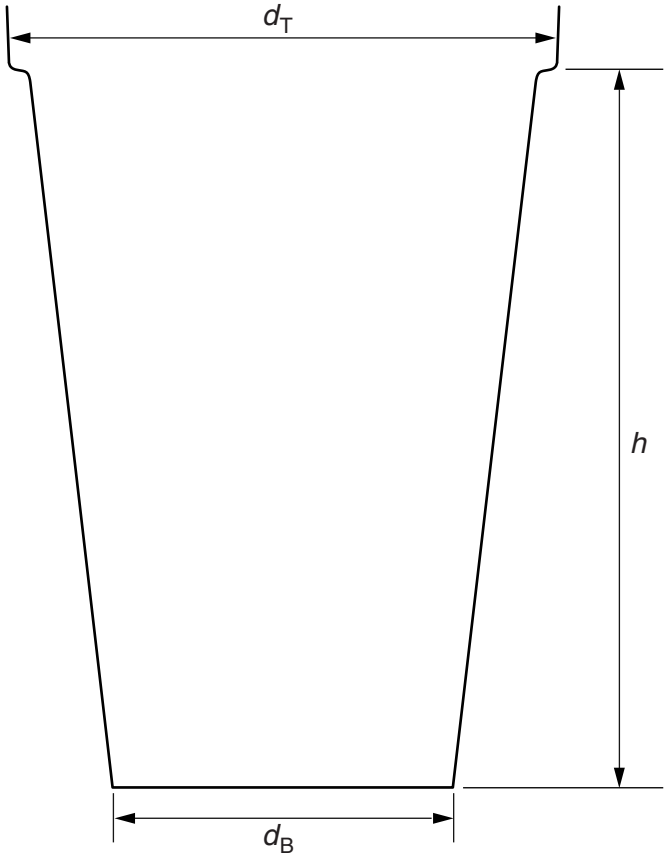


Fig. 5.1

(a) (i) On Fig. 5.1, measure the height h of the cup.

h = ... cm

(ii) On Fig. 5.1, measure the diameter d_T of the top of the cup.

d_T = ... cm

(iii) On Fig. 5.1, measure the diameter d_B of the bottom of the cup.

d_B = ... cm

(iv) Calculate the average diameter d_A, using the equation $d_A = \frac{d_T + d_B}{2}$.

d_A = ... cm

(v) Calculate an approximate value for the volume V of the cup, using the equation $V = \frac{\pi d_A^2 h}{4}$.

V = ...
[3]

(b) The student determines the average circumference of the cup, using a 50 cm length of string and a metre rule.

Fig. 5.2 shows how the student used the string to determine the average circumference.

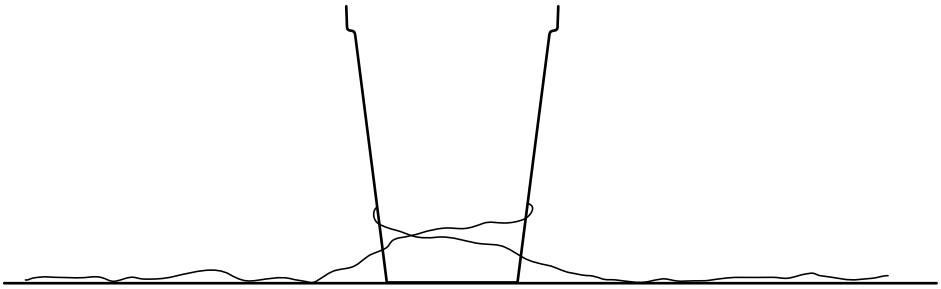


Fig. 5.2

Describe how you would use the string to obtain a more reliable value for the average circumference.

.....

.....

.....[2]

(c) The student fills a measuring cylinder to the 500 cm^3 mark. He pours water from the measuring cylinder into the cup until the cup is full. Fig. 5.3 shows the water remaining in the measuring cylinder.

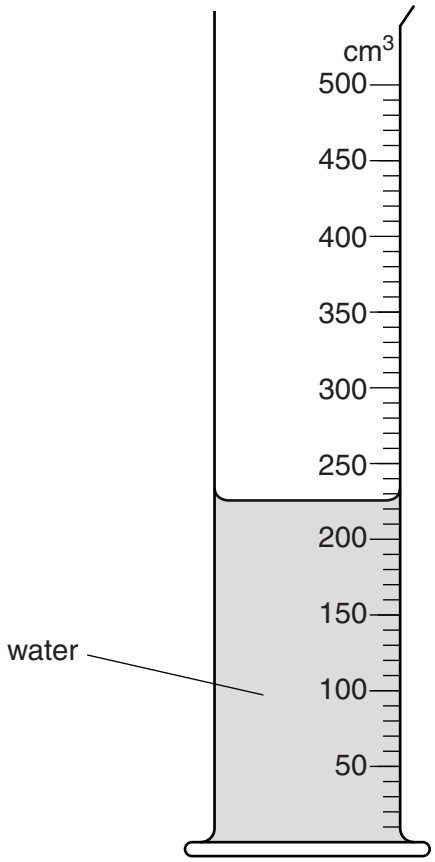


Fig. 5.3

(i) Record the volume of water V_R remaining in the measuring cylinder.

V_R = ...

(ii) Calculate the volume V_W of the water in the cup.

V_W = ...
[2]

(d) On Fig. 5.3, show clearly the line of sight required to take the reading of V_R. [1]

[Total: 8]