Length & Time

Question Paper 4

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	General Physics
Sub-Topic	Length & Time
Paper Type	Alternative to Practical
Booklet	Question Paper 4

Time Allowed: **48 minutes**

Score: **/40**

Percentage: **/100**

1 **(a)** Table 5.1 shows some measurements taken by three IGCSE students. The second column shows the values recorded by the three students. For each quantity, underline the value most likely to be correct.

The first one is done for you.

Table 5.1

Quantity measured	**Recorded values**
The mass of a wooden metre rule	<u>0.112 kg</u> 1.12 kg 11.2 kg
The weight of an empty 250 cm^3 glass beaker	0.7 N 7.0 N 70 N
The volume of one sheet of this examination paper	0.6 cm^3 6.0 cm^3 60 cm^3
The time taken for one swing of a simple pendulum of length 0.5 m	0.14 s 1.4 s 14 s
The pressure exerted on the ground by a student standing on one foot	0.4 N/cm^2 4.0 N/cm^2 40 N/cm^2

[4]

(b) **(i)** A student is to find the value of the resistance of a wire by experiment. Potential difference V and current I can be recorded. The resistance is then calculated using the equation $R = V/I$.

The student knows that an increase in temperature will affect the resistance of the wire. Assuming that variations in room temperature will not have a significant effect, suggest two ways by which the student could minimise temperature increases in the wire during the experiment.

1. ....

2. ....[2]

(ii) Name the circuit component that the student could use to control the current.

....[1]

[Total: 7]

2 An IGCSE student is investigating the average speed of a toy car travelling down a slope.

She releases the toy car on the slope. She uses a stopwatch to measure the time taken for the car to travel down part of the slope. Fig. 5.1 shows the slope.

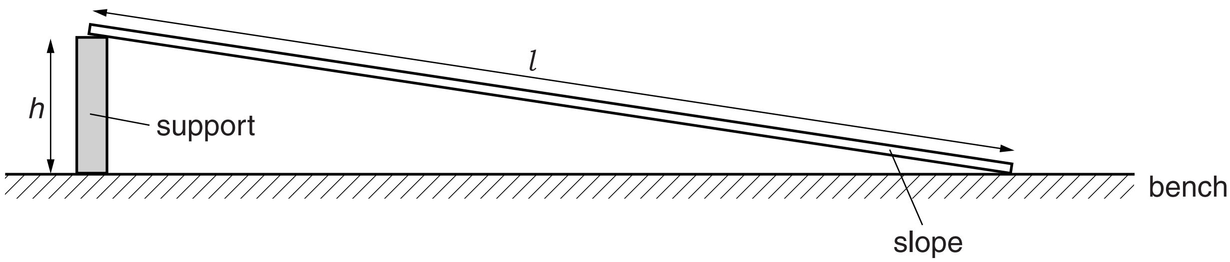


Fig. 5.1

(a) (i) Suggest a suitable length l for the slope used in this school laboratory experiment.

l = ...

(ii) Suggest a suitable height h, above the laboratory bench, for one end of the slope.

h = ...
[2]

(b) The student tries to determine the time that the toy car takes to travel a distance down the slope.

Make three suggestions about what she could do to ensure that the distance travelled and the time taken by the toy car are measured as reliably as possible.

1. ....

....

2. ....

....

3. ....

....
[3]

[Total: 5]

3 An IGCSE student is taking measurements of a sample of modelling clay. She has moulded the sample of modelling clay into a cube, as shown in Fig. 1.1.

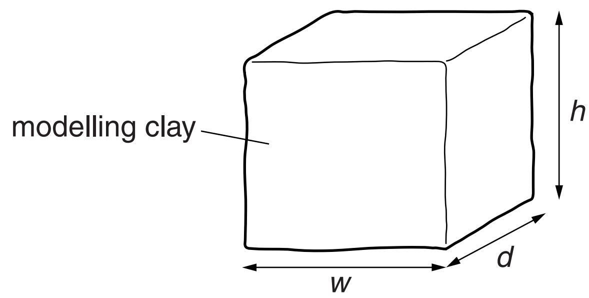


Fig. 1.1

(a) (i) On Fig. 1.2, measure the height *h* and width *w* of the piece of modelling clay.

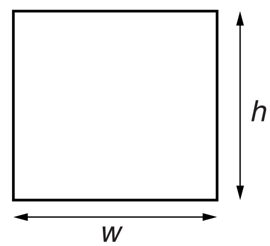


Fig. 1.2

h = ...cm

w = ...cm

(ii) On Fig. 1.3, measure the depth *d* of the piece of modelling clay.

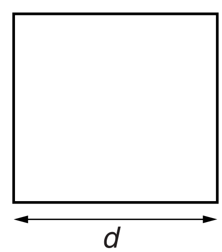


Fig. 1.3

d = ...cm

(iii) Calculate the volume V_A of the modelling clay using the equation $V_A = hwd$.

V_A = ... cm^3

(iv) The mass m of the piece of modelling clay is shown in Fig. 1.4.

Calculate the density ρ of the modelling clay using the equation $\rho = \frac{m}{V_A}$.

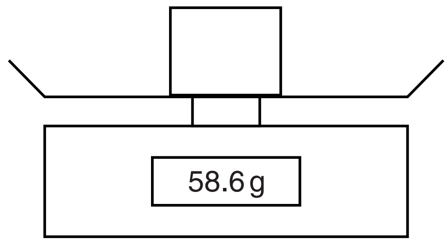


Fig. 1.4

ρ = ...
[3]

(b) The student moulds the piece of modelling clay into a spherical shape.

Draw a diagram to show how you would use two rectangular blocks of wood and a rule to measure the diameter of the sphere of modelling clay.

[1]

(c) The student pours water into a measuring cylinder, as shown in Fig. 1.5.

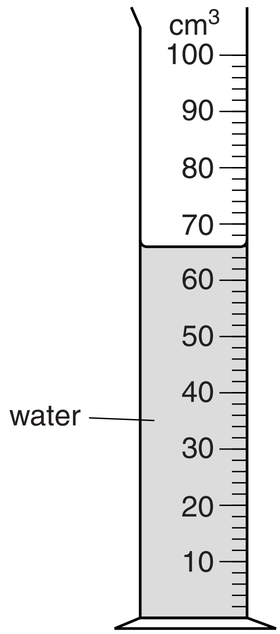


Fig. 1.5

(i) Record the volume V_1 of water shown in Fig. 1.5.

V_1 = ...[1]

(ii) On Fig. 1.5, show clearly the line of sight required to take the reading of V_1. [1]

(d) The student uses a piece of string to lower the sample of modelling clay into the measuring cylinder until it is completely covered with water. The new volume reading V_2 is $84\,cm^3$.

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

V_B = ...[1]

(e) The 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: 9]

4 The IGCSE class is investigating the loading of a metre rule.

Fig. 1.1 shows the apparatus.

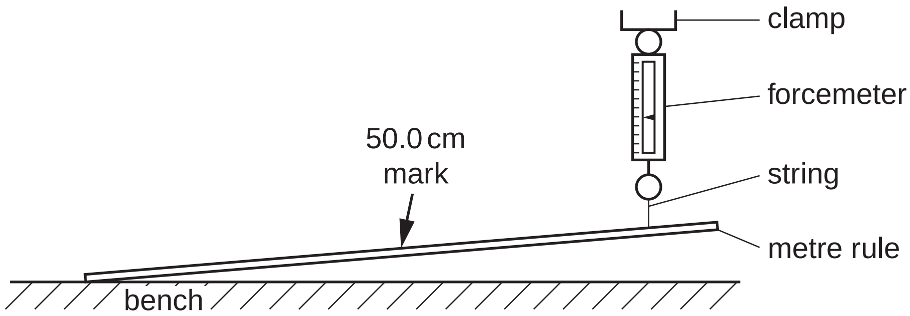


Fig. 1.1

(a) A metre rule is attached at one end to the bench. The other end is supported by a forcemeter.

A student records in Table 1.1 the reading *F* on the forcemeter.

He places a 100 g mass on the rule at the 50.0 cm mark and records in the table the value of the reading *F* on the forcemeter. He repeats the procedure using masses of 200 g, 300 g, 400 g and 500 g. The forcemeter readings are shown in the table.

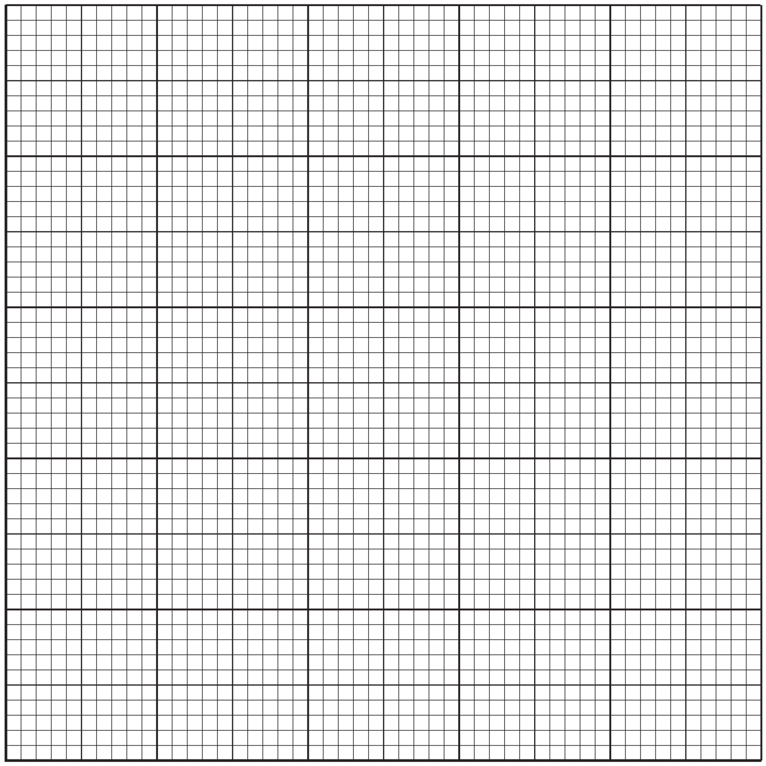
Write the mass values in the table.

Table 1.1

m / g	*F* / N
0	1.10
	1.85
	2.20
	2.95
	3.50
	4.20

[1]

(b) Plot a graph of *F*/N (*y*-axis) against *m*/g (*x*-axis).



[5]

(c) Use the graph to find the value of *F* when *m* = 375 g. Show clearly on the graph how you obtained the result.

F = ...[2]

(d) The forcemeter shows a reading when no mass has been added to the metre rule. Assuming that the forcemeter has no zero error, suggest a reason for the reading.

....

....[1]

[Total: 9]

5 The IGSCE class is determining the density of modelling clay by two methods.

(a) Method 1

A student moulds a piece of modelling clay into a cube shape as shown in Fig. 5.1.

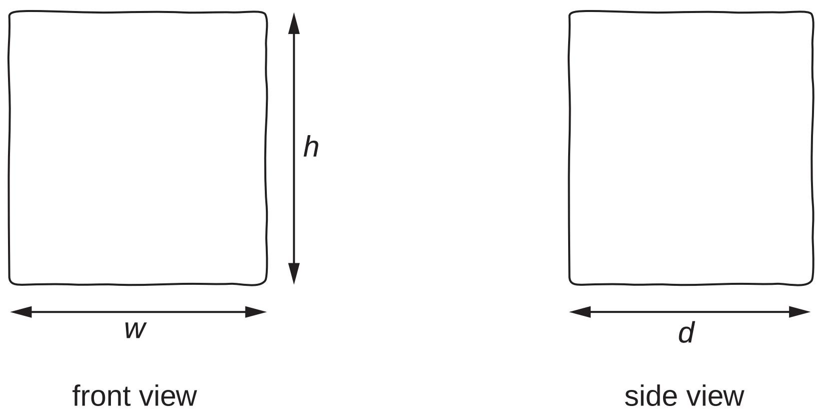


Fig. 5.1

(i) On Fig 5.1, measure the height h, width w and depth d of the cube-shaped piece of modelling clay.

h = ... cm

w = ... cm

d = ... cm

(ii) Calculate the volume V of the modelling clay using the equation $V = hwd$.

V = ...

(iii) Calculate the density ρ of the modelling clay using the equation $\rho = \frac{m}{V}$, where the mass of the modelling clay $m = 103\,\text{g}$.

ρ = ... [3]

(b) Method 2

The student cuts the piece of modelling clay into two pieces. One piece is approximately twice the size of the other piece. The mass m_s of the smaller piece is 34.5 g.

Fig. 5.2a shows a measuring cylinder containing water. Fig. 5.2b shows the same measuring cylinder after the smaller piece of modelling clay has been lowered into it.

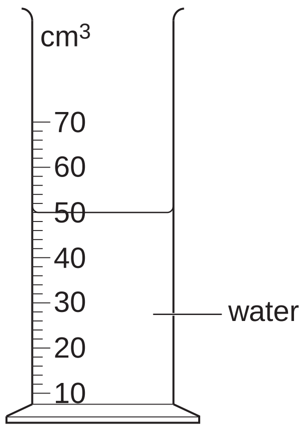


Fig. 5.2a

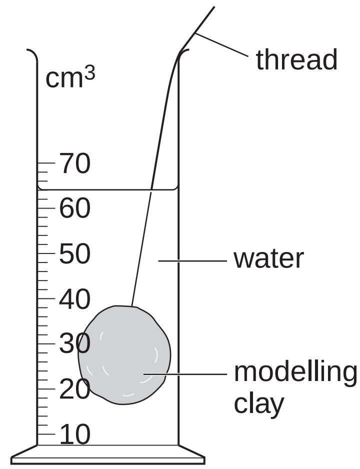


Fig. 5.2b

(i) Record the volume of water V_1 in the measuring cylinder, as shown in Fig. 5.2a.

V_1 = ... [1]

(ii) Record the new volume V_2 in the measuring cylinder, as shown in Fig. 5.2b.

V_2 = ... [1]

(iii) Describe briefly one precaution you would take to read the measuring cylinder correctly.

....

....

....[1]

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

V_s = ...

(v) Calculate the density ρ of the modelling clay using the equation $\rho = \frac{m_s}{V_s}$, where m_s = 34.5 g.

ρ = ... [1]

(c) **(i)** Assuming that the experiment has been carried out with care, suggest two reasons why the two values obtained for the density of the modelling clay in **(a)** and **(b)** may not be the same.

1. ....

....

2. ....

....[2]

(ii) State which of the two methods for determining density (method 1 or method 2) you judge to be less accurate. Give a reason for your judgement.

method ....

reason ....

....[1]

[Total: 10]