

--	--	--	--	--

--	--	--	--



For Examiner's Use	
1	
2	
3	
4	
Total	

2

- 1 In this experiment, you will determine the density of modelling clay.

Carry out the following instructions, referring to Fig. 1.1.

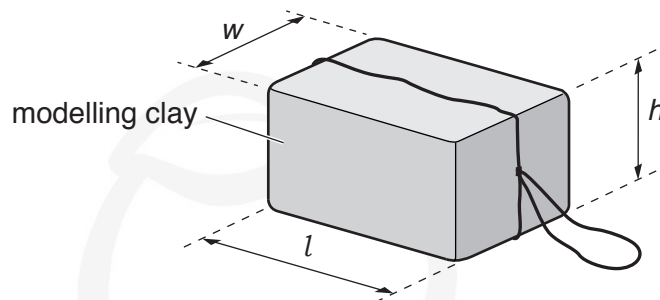


Fig. 1.1

- (a) (i) Measure the length l , width w and height h of the block of modelling clay.

$l =$ cm

$w =$ cm

$h =$ cm
[1]

- (ii) Calculate the volume V_1 of the block, using your measurements from (a)(i) and the equation $V_1 = l \times w \times h$.

$V_1 =$ cm³ [1]

- (b) Suggest a possible source of inaccuracy in measuring the block and describe an improvement to the procedure that will produce more reliable measurements of the block.

suggestion

.....

improvement

.....

.....

[2]

3

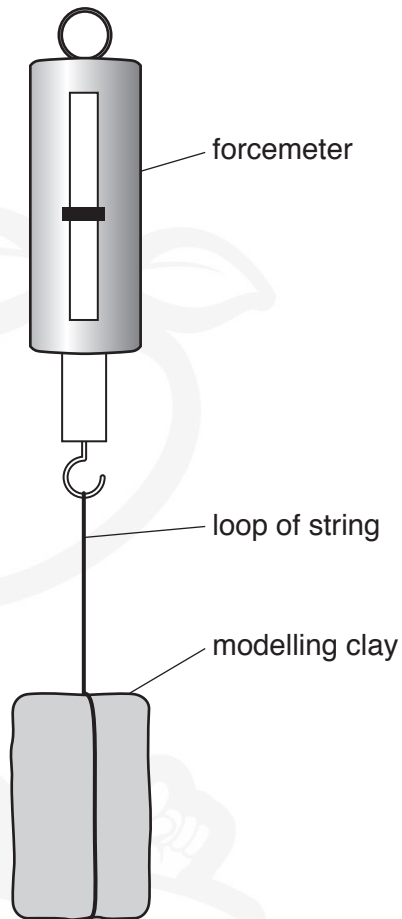


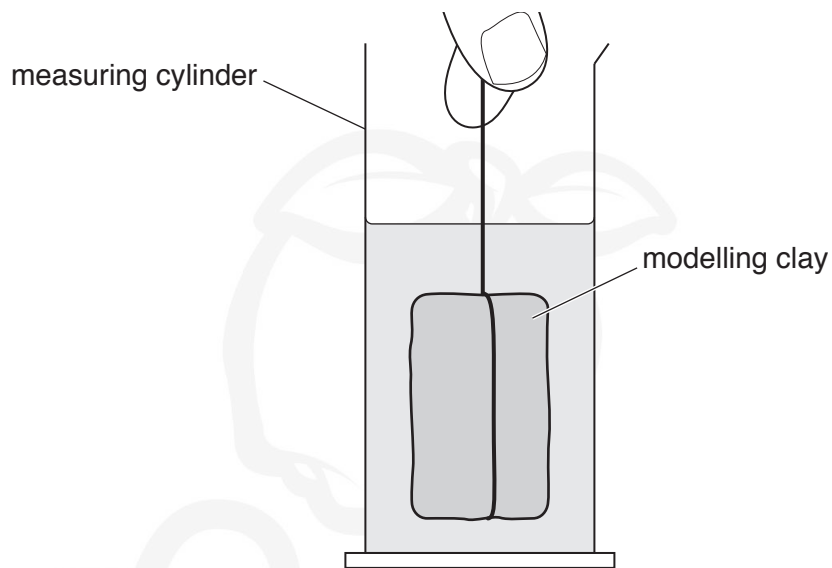
Fig. 1.2

- (c) Measure the weight W of the block of modelling clay, as shown in Fig. 1.2.

$W = \dots\dots\dots$ N [1]

- (d) Calculate a value ρ_1 for the density of the modelling clay, using your results from (a)(ii) and (c) and the equation $\rho_1 = \frac{W \times k}{V_1}$, where $k = 100 \text{ g/N}$.

$\rho_1 = \dots\dots\dots$ [2]

**Fig. 1.3**

- (e) • Pour approximately 150 cm^3 of water into the measuring cylinder.
- Record the volume V_2 of the water in the measuring cylinder.

$V_2 = \dots\dots\dots \text{ cm}^3$

- Remove the loop of string from the forcemeter and lower the block of modelling clay carefully into the water in the measuring cylinder as shown in Fig. 1.3.
- Record the new reading V_3 of the measuring cylinder, with the piece of modelling clay in the water.

$V_3 = \dots\dots\dots \text{ cm}^3$
[1]

- (f) Describe how a measuring cylinder is read to obtain a value for the volume of water. You may draw a diagram to help you.

.....

.....

..... [1]

- (g) (i) Calculate another value ρ_2 for the density of modelling clay, using your readings from (c) and (e) and the equation $\rho_2 = \frac{W \times k}{(V_3 - V_2)}$, where $k = 100 \text{ g/N}$.

$\rho_2 = \dots\dots\dots$ [1]

- (ii) Suggest which of ρ_1 or ρ_2 is likely to be the more accurate value for the density of the modelling clay.
Justify your answer by referring to the procedure.

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

[Total: 11]

2 In this experiment, you will determine the resistance per unit length of wire **X**.

The circuit has been set up for you.

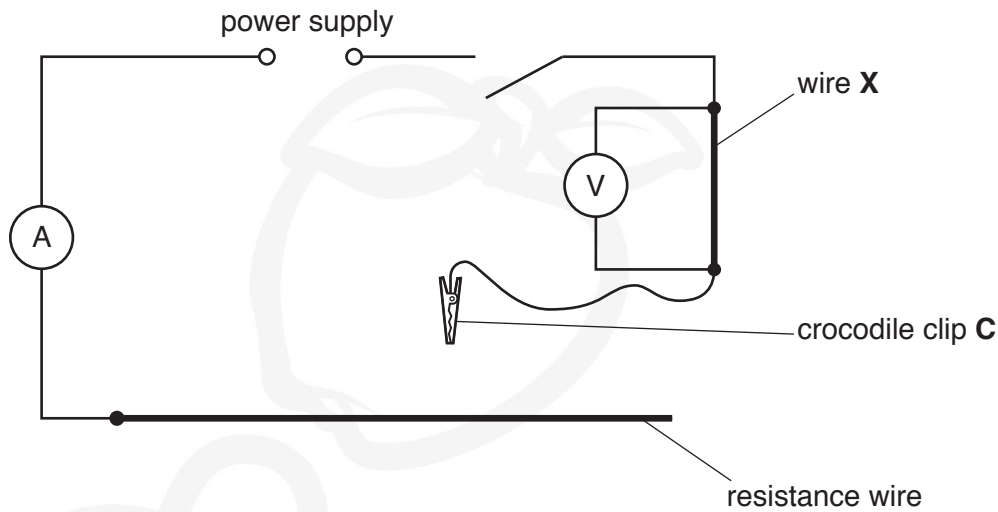


Fig. 2.1

(a) Carry out the following instructions, referring to Fig. 2.1.

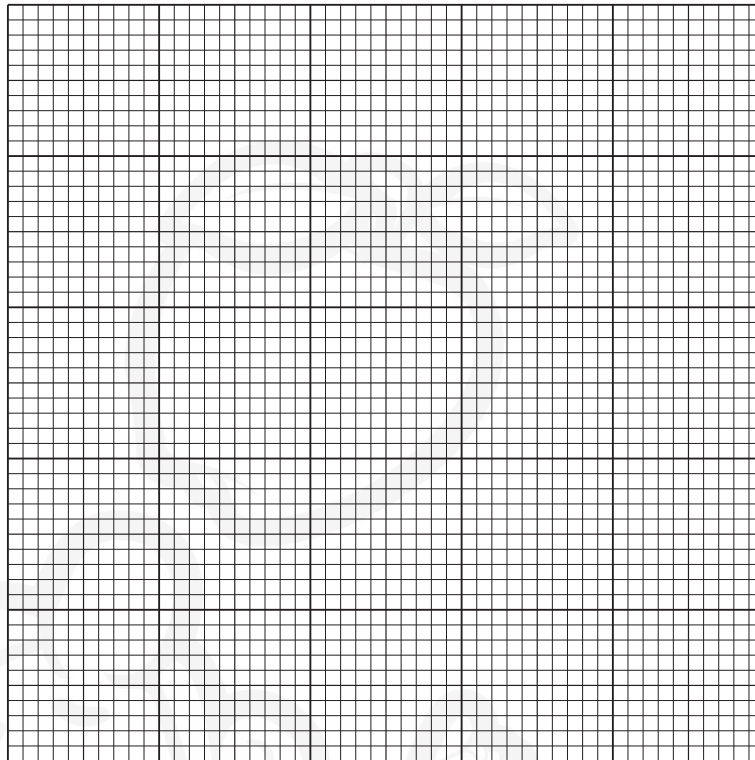
- Connect the crocodile clip **C** to the free end of the resistance wire.
- Switch on. Adjust the position of the crocodile clip **C** until the current shown on the ammeter is as near to 0.40 A as possible.
- Measure, and record in Table 2.1, the potential difference (p.d.) V across wire **X**. Switch off.
- Repeat the procedure for $I = 0.50\text{ A}$, 0.60 A , 0.70 A and 0.80 A .

Table 2.1

I/A	V/V
0.40	
0.50	
0.60	
0.70	
0.80	

[2]

(b) Plot a graph of V/V (y-axis) against I/A (x-axis).



[4]

(c) (i) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

$G =$ [1]

(ii) Measure the length l of wire **X**.

$l =$ cm [1]

(iii) Calculate the resistance R of each centimetre of wire **X**, using the equation $R = \frac{G \times k}{l}$, where $k = 1.0 \Omega \text{ cm}$.
Give the value for R , to a suitable number of significant figures for this experiment.

$R =$ [2]

- (d) A student discovers that the resistance wire becomes very hot when the crocodile clip is connected to short lengths of the wire.

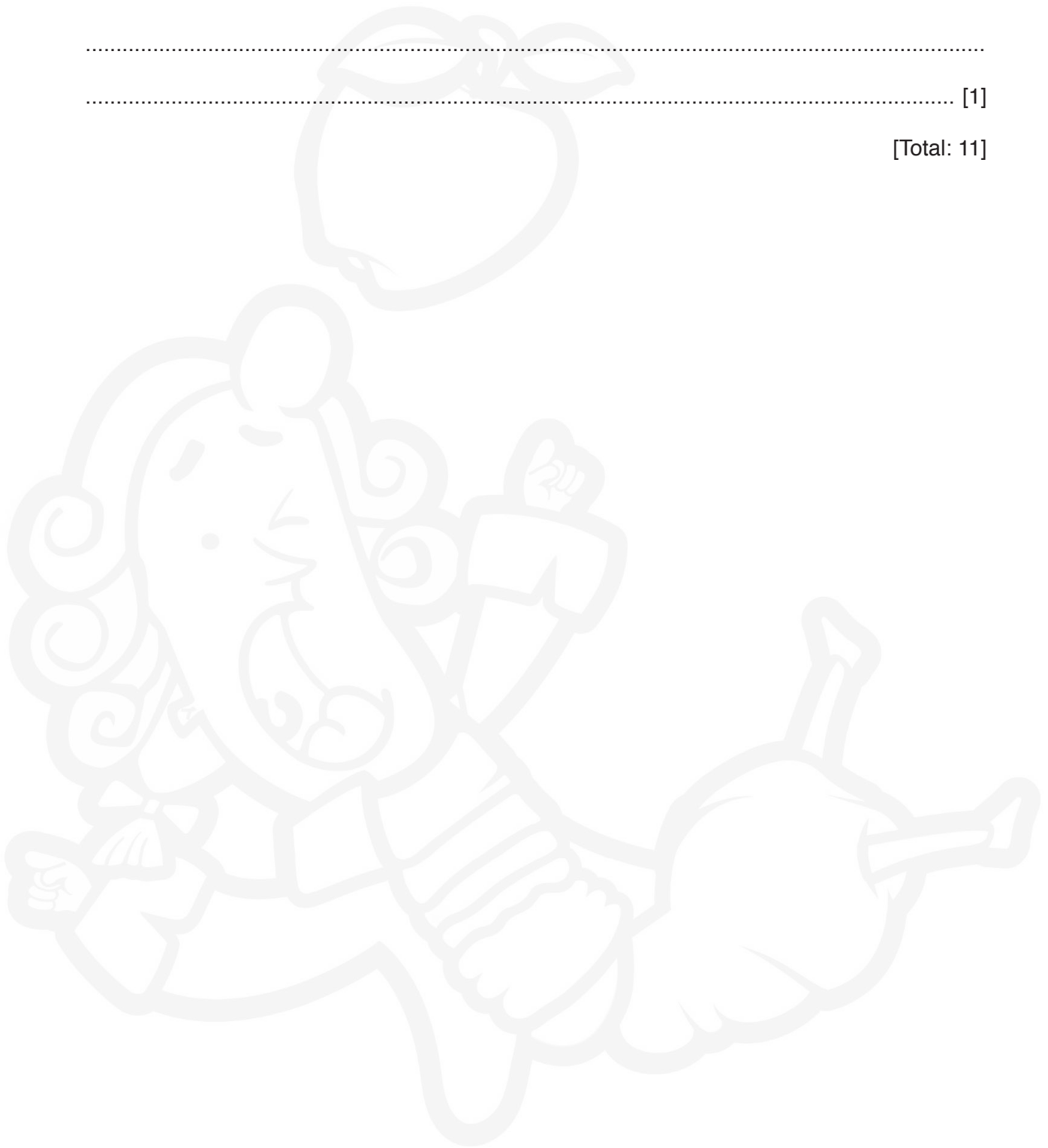
Suggest an improvement that would help to reduce this effect.

.....

.....

..... [1]

[Total: 11]



BLANK PAGE



- 3 In this experiment, you will investigate the reflection of light by a plane mirror.

ray-trace sheet

hole

eye

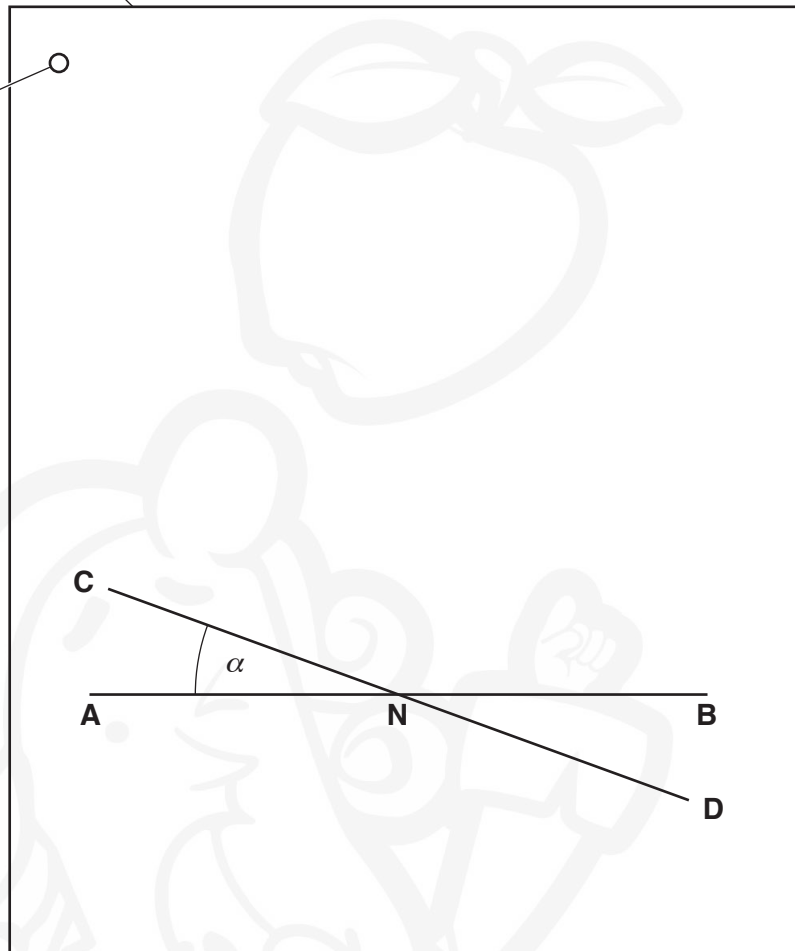


Fig. 3.1

- (a) Carry out the following instructions, using the separate ray-trace sheet provided. Refer to Fig. 3.1 for guidance.

- Draw a line about 10cm from the bottom of your ray-trace sheet. Label this line **AB**.
- Mark a point **N**, near the centre of **AB**.
- Draw a normal to **AB** at point **N**, towards the top of the page. Label the other end of this normal line **L**. [1]

- (b) Draw a line **CD** passing through **N** and at an angle α to **AB** where $\alpha = 20^\circ$. [1]

- (c)
- Place two pins P_1 and P_2 on line **LN**, a suitable distance apart for ray tracing. Label the positions of P_1 and P_2 .
 - Place the reflecting surface of the mirror on line **CD** and view the images of P_1 and P_2 from the direction indicated by the eye in Fig. 3.1.
 - Place two pins P_3 and P_4 some distance apart so that the images of P_1 and P_2 , and the pins P_3 and P_4 , all appear exactly one behind the other. Label the positions of P_3 and P_4 .
 - Remove the mirror and the pins.
 - Draw a line passing through the P_3 and P_4 positions and reaching **LN**.
 - Measure and record in Table 3.1, the angle θ between this line and the normal **LN**.

Table 3.1

$\alpha/^\circ$	$\theta/^\circ$
20	
35	

[3]

- (d) Repeat steps (b) and (c) for an angle $\alpha = 35^\circ$, replacing pins P_1 and P_2 in their original positions in step (c). [2]
- (e) A student suggests that when the mirror is moved, the **change in** θ should be equal to twice the **change in** α .

State whether your readings support this idea. Justify your answer with reference to the readings.

statement

justification

.....

.....

[2]

- (f) Suggest two precautions that you took to ensure accurate results from this type of experiment.

1

.....

2.....

.....

[2]

[Total: 11]

Tie your ray trace sheet between pages 10 and 11.

- 4 A student is investigating the conduction of thermal energy by metals.

Plan an experiment to compare the rates at which different metals conduct thermal energy.

You are **not** required to carry out the experiment.

The apparatus available includes:

strips of different metals, shaped as shown in Fig. 4.1
a test-tube in a clamp stand
a beaker
a supply of cold water
a supply of hot water.

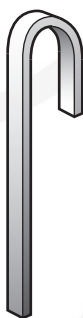


Fig. 4.1

The shorter section of each strip of metal can fit inside a test-tube.

Write a plan for the experiment.

You should:

- list any additional apparatus needed
- draw a labelled diagram of how the apparatus will be arranged
- explain briefly how you will carry out the experiment
- explain how the metals will be compared
- state the precautions which should be taken to obtain reliable results.

..... [7]

[Total: 7]





BLANK PAGE



Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.