Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2051527297

PHYSICS **0625/63**

Paper 6 Alternative to Practical **May/June 2024**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION
- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

1 A student determines the density of modelling clay by two methods.

Method 1

He uses the block of modelling clay shown in Fig. 1.1.

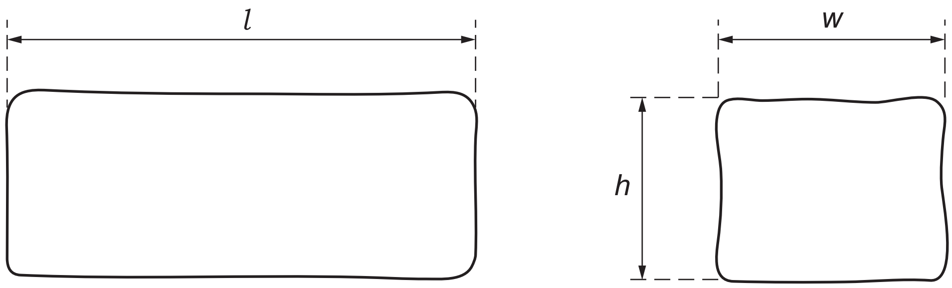

Fig. 1.1

(a) **(i)** Measure the dimensions of the block of modelling clay shown in Fig. 1.1. Record the values in centimetres to the nearest millimetre.

l = ... cm

w = ... cm

h = ... cm
[1]

(ii) Calculate the volume V_A of the block. Use your measurements from **(a)(i)** and the equation $V_A = l \times w \times h$.

V_A = ... cm^3 [1]

(b) Suggest why the value of V_A is only an approximation of the volume of the block.

Describe how the accuracy of V_A can be improved.

suggestion ....

....

improvement ....

....

....
[2]

(c) Record the mass m_A of the block shown on the top-pan balance in Fig. 1.2.

m_A = ... g

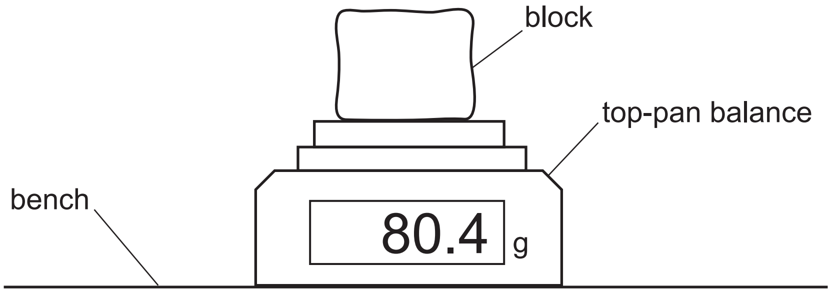

Fig. 1.2

Calculate a value ρ_A for the density of the modelling clay. Use your results from **(a)(ii)** and **(c)** and the equation $\rho_A = \frac{m_A}{V_A}$. Include the unit for the density.

ρ_A = ...

[2]

Method 2

(d) The student then uses a smaller block of modelling clay.

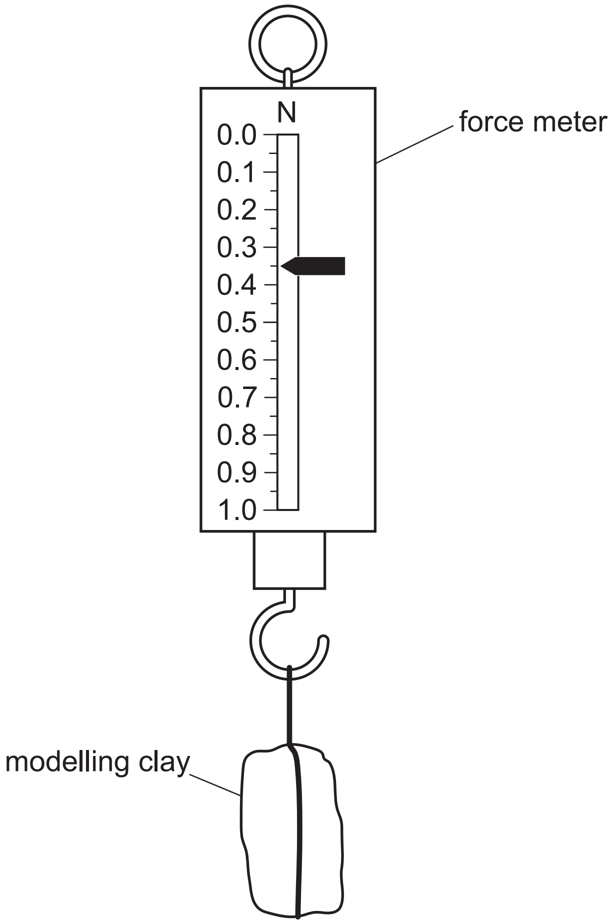

Fig. 1.3

Record the weight W_B of the block of modelling clay shown in Fig. 1.3.

W_B = ... N [1]

(e) **(i)** The student pours water into a measuring cylinder.

Record the volume V_1 of the water in the measuring cylinder shown in Fig. 1.4.

V_1 = ... cm^3 [1]

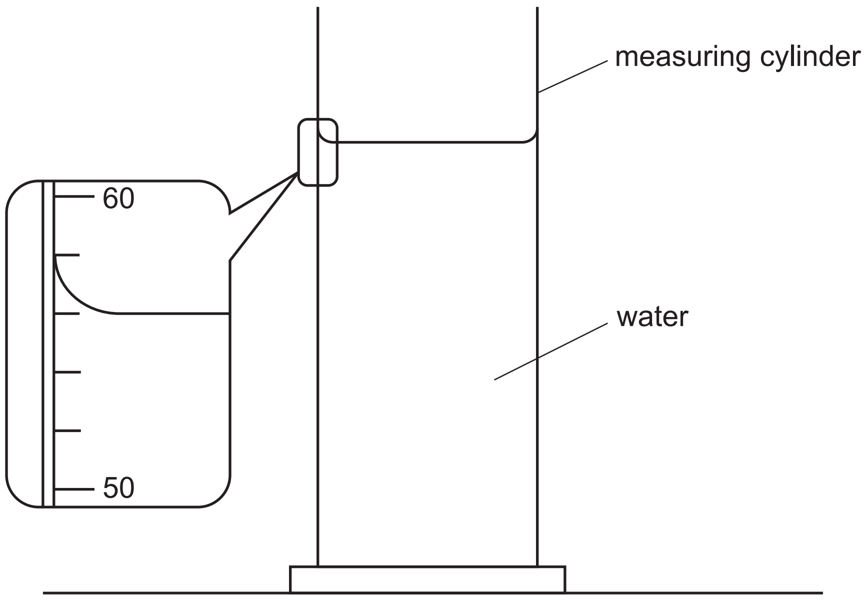

Fig. 1.4

(ii) Describe briefly how a measuring cylinder is read to obtain a value for the volume of water.

....

....

.... [1]

(f) **(i)** The student lowers the modelling clay into the water, as shown in Fig. 1.5.

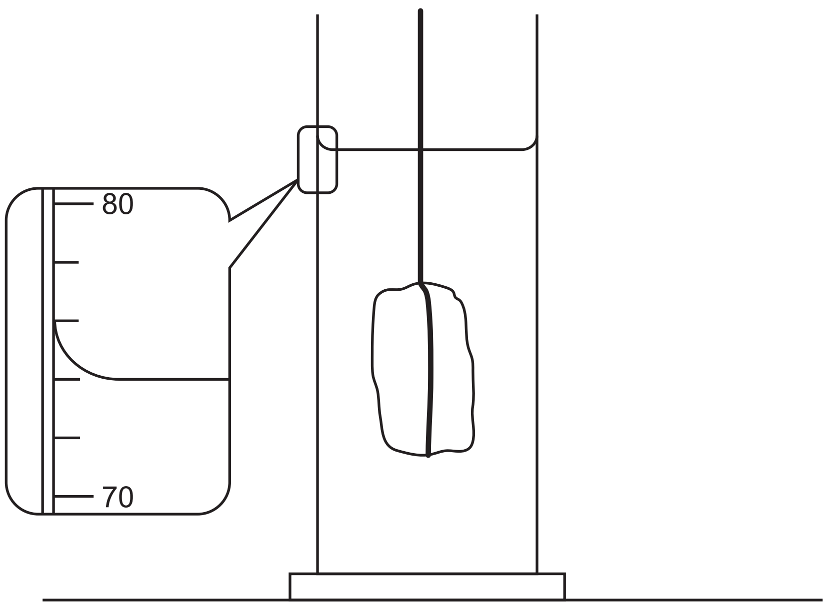

Fig. 1.5

Record the new reading V_2 of the measuring cylinder.

V_2 = ... cm^3

Calculate another value ρ_B for the density of modelling clay. Use your value for V_2, your readings from **(d)** and **(e)(i)** and the equation $\rho_B = \dfrac{W_B \times k}{(V_2 - V_1)}$, where k = 100 g / N.

ρ_B = ...
[1]

(ii) Suggest which of ρ_A and ρ_B is likely to be the more accurate value.

Justify your answer by referring to method 1 and method 2.

....

....

.... [1]

[Total: 11]

2 A student investigates how the volume of water affects the rate at which water in a beaker cools.

She uses the apparatus shown in Fig. 2.1.

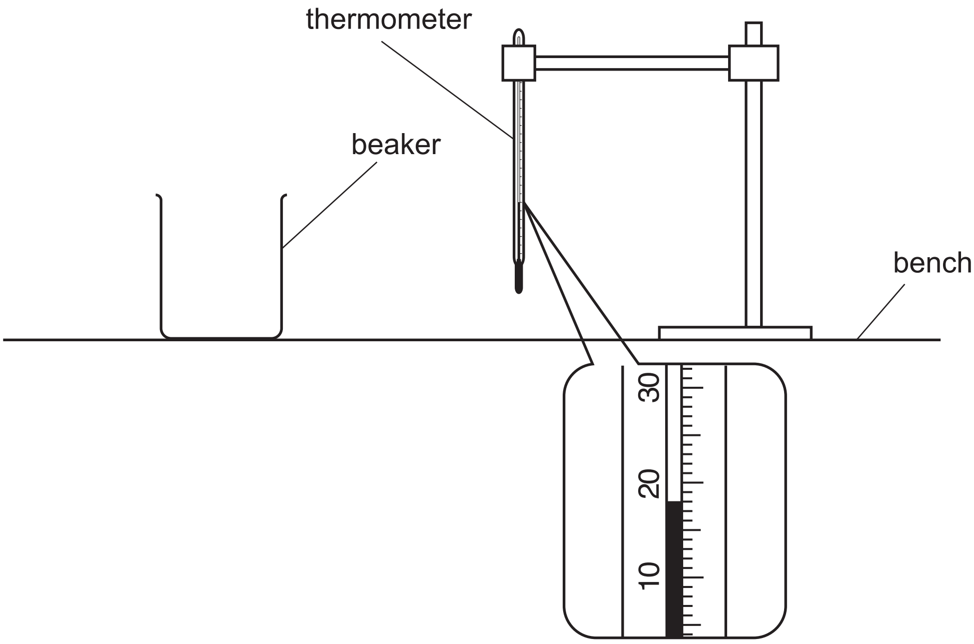

Fig. 2.1

(a) Record the room temperature θ_R shown on the thermometer in Fig. 2.1.

θ_R = ... [1]

(b) The student pours a volume of 200 cm^3 of hot water into the beaker and records the temperature θ of the water at time t = 0.

She records the temperature of the water in the beaker every 30 s.

She pours the water out and pours a volume of 75 cm^3 of hot water into the beaker.

The student repeats the temperature measurements for this volume of water.

(i) Describe **two** precautions that can be taken to ensure that temperature readings in the experiment are as accurate as possible.

1 ....

....

2 ....

.... [2]

(ii) Her readings are shown in Table 2.1.

Add units to the column headings in Table 2.1.

Table 2.1

	beaker with 200 cm^3 of hot water	beaker with 75 cm^3 of hot water
t /	θ /	θ /
0	87.5	85.5
30	85.5	82.0
60	84.0	78.5
90	82.5	75.0
120	81.0	72.0
150	80.0	69.5
180	79.0	67.0

[1]

(c) Write a conclusion stating how the volume of water affects the rate of cooling of the water.

Justify your answer by reference to the results.

....

....

....

.... [2]

(d) (i) Using the values for 75 cm^3 of water, calculate the average cooling rate x_1 for the first 90 s of the experiment. Use the readings from Table 2.1 and the equation

$$x_1 = \frac{\theta_0 - \theta_{90}}{T}$$

where T = 90 s and θ_0 and θ_{90} are the temperatures at t = 0 and t = 90 s.
Include the unit for the cooling rate.

x_1 = ...

Using the values for 75 cm^3 of water, calculate the average cooling rate x_2 for the last 90 s of the experiment. Use the readings from Table 2.1 and the equation

$$x_2 = \frac{\theta_{90} - \theta_{180}}{T}$$

where T = 90 s and θ_{90} and θ_{180} are the temperatures at t = 90 s and t = 180 s.

x_2 = ...
[2]

(ii) A student states that it is important to start the two experiments in **(b)** with water at the same initial temperature.

Explain whether your values for x_1 and x_2 support this statement.

....

....

.... [1]

(e) Another student repeats the experiment.

State **two** variables, other than initial water temperature, that he should control to obtain readings that are as close as possible to those in Table 2.1.

1 ....

....

2 ....

....
[2]

[Total: 11]

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

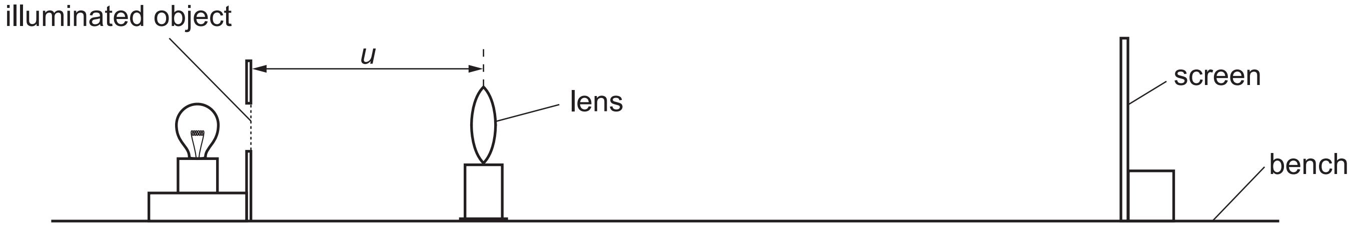

Fig. 3.1

(a) The student sets up the apparatus as shown in Fig. 3.1.

He sets the distance u between the illuminated object and the lens to 25.0 cm.

He places the screen near the lens and moves the screen until a focused image of the illuminated object is seen on the screen.

Describe a technique for obtaining an image that is as sharp as possible.

....

....

.... [1]

(b) The shapes of the illuminated object and the image seen on the screen are shown full size in Fig. 3.2 and Fig. 3.3.

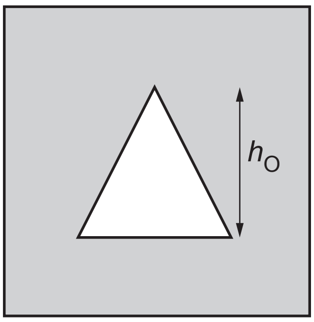

Fig. 3.2

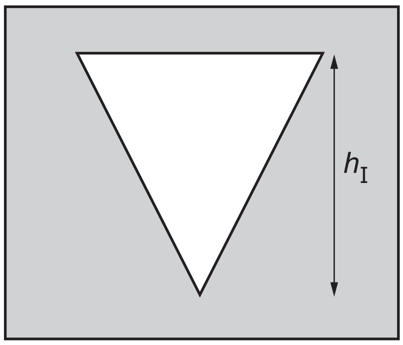

Fig. 3.3

(i) Measure h_O, the height of the illuminated object, as shown in Fig. 3.2.

h_O = ... cm

Measure h_I, the height of the image on the screen, as shown in Fig. 3.3.

h_I = ... cm
[2]

(ii) Calculate a value W using your measurements from **(b)(i)** and the equation $W = \frac{h_O}{h_I}$.

W = ... [1]

(c) The student repeats this procedure for u = 20.0 cm, 30.0 cm, 40.0 cm, 50.0 cm and 60.0 cm. His results are shown in Table 3.1.

Table 3.1

u / cm	h_I / cm	W
20.0	5.0	0.4
30.0	2.0	1.0
40.0	1.3	1.6
50.0	0.8	2.4
60.0	0.7	2.9

Plot a graph of u / cm (y-axis) against W (x-axis). Use the results from Table 3.1. You do **not** need to start your axes at the origin (0, 0). Draw the best-fit line.

[4]

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

G = ... [1]

(ii) The focal length f of the lens is numerically equal to the gradient G.

Record a value of f for this experiment.

f = ... cm [1]

(e) A student decides to continue the experiment using larger values of u.

Explain why this produces less accurate values for W.

....

....

.... [1]

[Total: 11]

BLANK PAGE

4 A student investigates the relationship between the diameter of a wire and the electrical resistance of the wire.

Plan an experiment which enables her to investigate how the diameter of a wire affects the resistance of the wire.

Resistance R is calculated from the equation $R = \frac{V}{I}$

where V is the potential difference (p.d.) across the wire and I is the current in the wire.

The apparatus available includes wires of different known diameters.

In your plan:

- list any additional apparatus needed
- complete Fig. 4.1 to show a circuit suitable for measuring the resistance of a wire
- explain briefly how to do the experiment, including the measurements to take so that the resistance can be determined
- state the key variables to keep constant
- draw a table, or tables, with column headings, to show how to display the readings (you are **not** required to enter any readings in the table)
- explain how to use the readings to reach a conclusion.

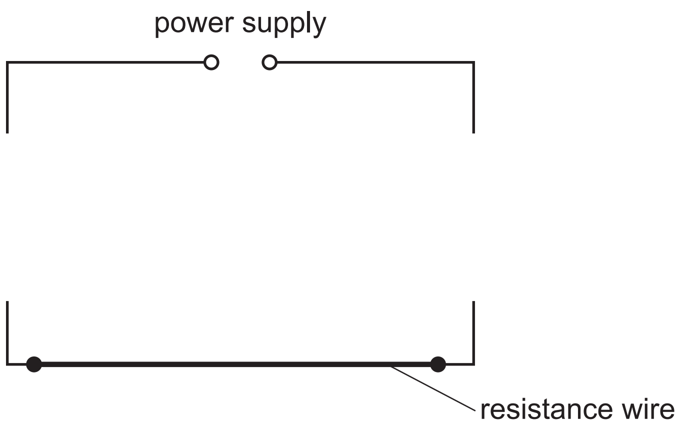

Fig. 4.1

[7]

BLANK PAGE