Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 5 2 2 8 1 8 5 7 7 0 *

PHYSICS **0972/51**

Paper 5 Practical Test **October/November 2020**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

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 [ ].

For Examiner's Use	
1	
2	
3	
4	
Total	

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1 In this experiment, you will determine the density of modelling clay by two methods.

Method 1

(a) (i) Measure the length l, width w and height h of the sample A of modelling clay. Do **not** change the shape of the sample.

l = ... cm

w = ... cm

h = ... cm
[1]

(ii) Calculate the volume V_A of sample A using the equation $V_A = l \times w \times h$.

V_A = ... cm^3 [1]

(iii) Measure and record the mass m_A of sample A of modelling clay using the balance provided.

m_A = ... g [1]

(iv) Calculate the density ρ_A of sample A using the equation $\rho_A = \frac{m_A}{V_A}$.

Give your answer to a suitable number of significant figures for this method and include the unit.

ρ_A = ... [2]

Method 2

(b) Pour approximately 50 cm^3 of the water provided into the measuring cylinder.

(i) Record the volume V_1 of water in the measuring cylinder.

V_1 = ... cm^3

Carefully lower sample B of the same modelling clay into the measuring cylinder until it is completely covered with water.

Record the new reading V_2 of the water level in the measuring cylinder.

V_2 = ... cm^3

Calculate the volume V_B of sample B using the equation $V_B = V_2 - V_1$.

V_B = ... cm^3
[1]

(ii) Measure and record the mass m_B of sample B of measuring clay using the balance provided.

m_B = ... g

Calculate the density ρ_B of sample B using the equation $\rho_B = \frac{m_B}{V_B}$.

Give your answer to a suitable number of significant figures for this experiment and include the unit.

ρ_B = ...
[1]

(c) A student suggests that the density of modelling clay is **not** affected by either the mass or the volume of the sample used.

State whether your results agree with the suggestion. Justify your answer by reference to your results.

statement ....

justification ....

....
[2]

(d) Fig. 1.1 shows some water in a measuring cylinder. The surface of the liquid is curved and is called the meniscus.

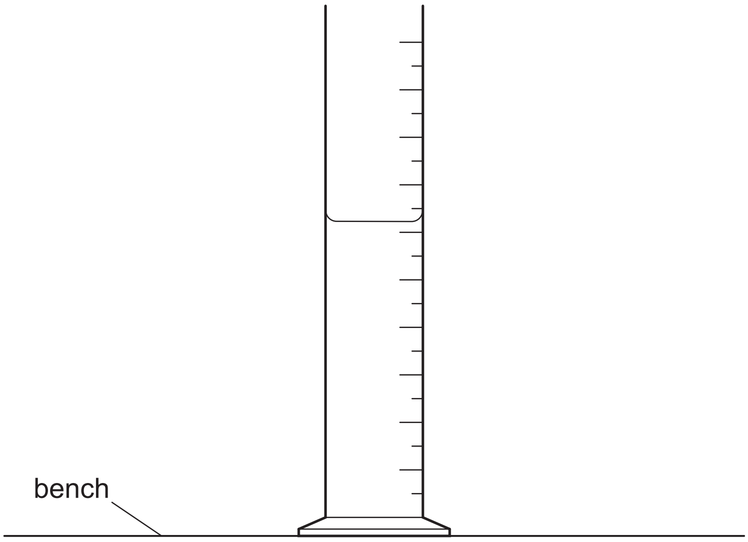

Fig. 1.1

Tick the boxes that describe the correct line of sight for taking a reading of the volume of water in a measuring cylinder.

- ☐ along the scale
- ☐ parallel to the scale
- ☐ perpendicular to the scale
- ☐ vertical to the scale
- ☐ in line with the bottom of the meniscus
- ☐ in line with the top of the meniscus
- ☐ in line with midway between the top and bottom of the meniscus.

[2]

[Total: 11]

2 In this experiment, you will investigate the cooling of water under different conditions.

Carry out the following instructions referring to Fig. 2.1. The thermometer must remain in the clamp for the whole of this experiment. Do **not** adjust the position of the thermometer in the clamp.

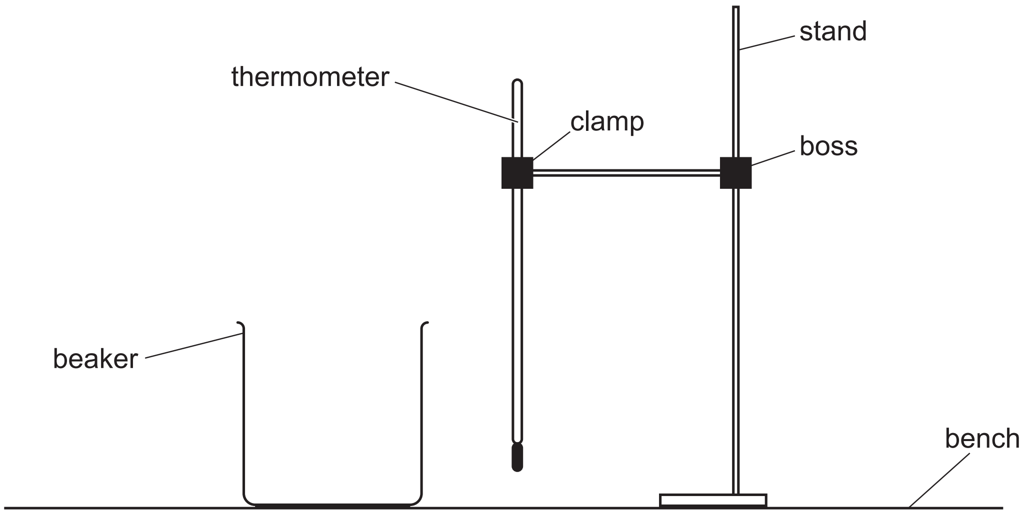

Fig. 2.1

(a) Use the thermometer to measure room temperature θ_R.

θ_R = ... [1]

(b) (i) Pour 200 cm^3 of hot water into the beaker. Place the thermometer in the beaker by moving the clamp stand.

Record in Table 2.1 the temperature θ_1 of the hot water at time $t = 0$. Immediately start the stopclock.

After 180 s, measure the temperature θ_1 of the water. Record the time $t = 180$ s and the temperature reading in Table 2.1.

[1]

(ii) Calculate the drop in temperature $\Delta\theta_1$ between times $t = 0$ and $t = 180$ s.

$\Delta\theta_1$ = ... [1]

(iii) Calculate the average rate of cooling R_1 of the water using the equation $R_1 = \frac{\Delta\theta_1}{\Delta t}$, where $\Delta t = 180$ s. Include the unit.

R_1 = ... [1]

Table 2.1

t / s	θ_1 / °C

(c) **(i)** Empty the beaker.

Pour 150 cm^3 of hot water into the beaker. Add 50 cm^3 of cold water to the beaker. Place the thermometer in the beaker by moving the clamp stand.

Record in Table 2.2 the temperature θ_2 of the water in the beaker at time $t = 0$. Immediately start the stopclock.

After 180 s, measure the temperature θ_2 of the water. Record the time t = 180 s and the temperature reading in Table 2.2.

Table 2.2

t / s	θ_2 / °C

[1]

(ii) Calculate the drop in temperature $\Delta\theta_2$ between $t = 0$ and t = 180 s.

$\Delta\theta_2$ = ...

Calculate the average rate of cooling R_2 of the water using the equation $R_2 = \frac{\Delta\theta_2}{\Delta t}$, where Δt = 180 s. Include the unit.

R_2 = ...
[1]

(d) A student suggests that the average rate of cooling R of the water depends on the difference D between the temperature of the water at time $t = 0$ and room temperature.

(i) Calculate the difference D_1 using the readings in Table 2.1 and your answer to **(a)**.

D_1 = ...

Calculate the difference D_2 using the readings in Table 2.2 and your answer to **(a)**.

D_2 = ...
[1]

(ii) Write a conclusion about the relationship between *R* and *D*. Justify your answer by reference to your results.

conclusion ....

....

justification ....

.... [2]

(e) **(i)** Explain why the thermometer scale should be read at right angles.

....

.... [1]

(ii) Explain why the mixture of hot and cold water should be stirred before taking the temperature reading at the start of the experiment in **(c)(i)**.

....

.... [1]

[Total: 11]

3 In this experiment, you will investigate the magnification of the image produced by a lens.

Carry out the following instructions referring to Fig. 3.1 and Fig. 3.2.

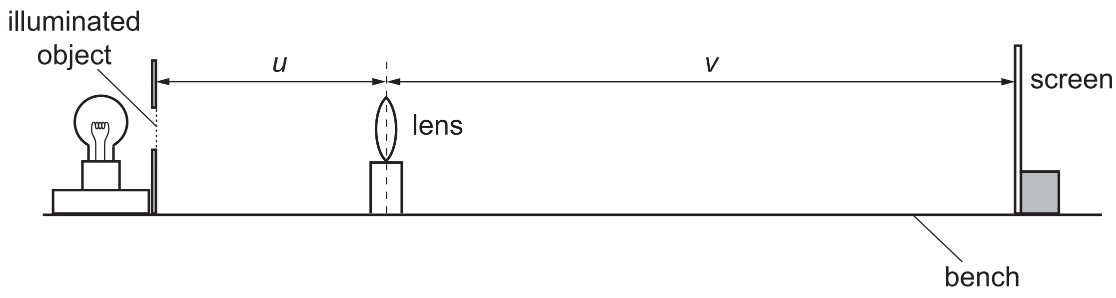

Fig. 3.1

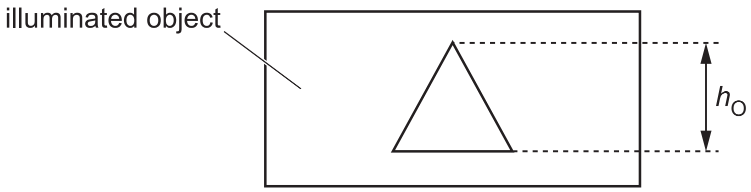

Fig. 3.2 This figure has **not** been drawn to scale.

(a) Measure and record the height h_O of the illuminated object provided in your experiment.

h_O = ... [1]

(b)
- Place the lens a distance u = 20.0 cm from the illuminated object.
- Move the screen slowly until a clearly-focused image is formed on the screen.
- Measure the distance v between the centre of the lens and the screen and record the value in Table 3.1.
- Calculate, and record in Table 3.1, the magnification m using the equation $m = \frac{v}{u}$.
- Repeat the procedure using values of u equal to 25.0 cm, 30.0 cm, 35.0 cm and 40.0 cm.

Table 3.1

u / cm	v / cm	m
20.0		
25.0		
30.0		
35.0		
40.0		

[3]

(c) Plot a graph of u/cm (y-axis) against m (x-axis). Start the y-axis at u = 20.0 cm.

[4]

(d) Use the graph to determine the value of the object distance u_1 when the magnification m = 1.0.

Show clearly on the graph how you obtained the necessary information.

u_1 = ... cm [2]

(e) Calculate the focal length f of the lens using the equation $f = \frac{u_1}{2}$.

f = ... cm [1]

[Total: 11]

4 A student investigates the resistances of different wires.

Plan an experiment to investigate the resistances of wires made from different metals.

Resistance is calculated using the equation $R = \frac{V}{I}$. You are **not** required to carry out the investigation.

The following apparatus is available:

ammeter
voltmeter
power supply
metre rule
a selection of wires made from different metals.

You can also use other apparatus and materials that are usually available in a school laboratory.

In your plan, you should:

- write a list of suitable metals for the wires you will investigate
- draw a diagram of a suitable electrical circuit using standard electrical symbols
- explain briefly how to carry out the investigation
- state the key variables to keep constant
- draw a table, or tables, with column headings, to show how to display your readings (you are **not** required to enter any readings in the table).

[7]

[Total: 7]

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