Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6391660184

PHYSICS **0625/52**

Paper 5 Practical Test **February/March 2022**

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	

This document has **12** pages. Any blank pages are indicated.

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1 In this experiment, you will investigate the extension of a spring and use it to determine the weight of a metre rule.
The spring has been set up for you.

Carry out the following instructions.

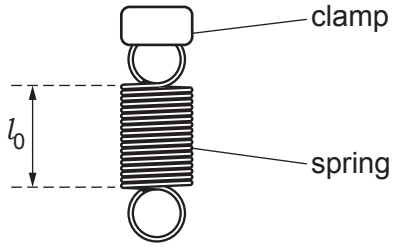


Fig. 1.1

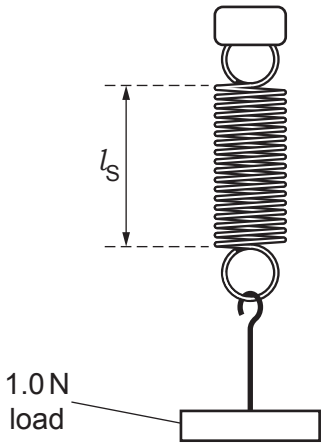


Fig. 1.2

(a) Measure and record the unstretched length l_0 of the spring, as shown in Fig. 1.1.

l_0 = ... cm

Suspend the 1.0 N load from the spring, as shown in Fig. 1.2.

Measure and record the stretched length l_S of the spring.

l_S = ... cm
[1]

(b) Suspend the metre rule from the spring using the hook fixed at the 95.0 cm mark, as shown in Fig. 1.3.

Place the other end of the metre rule so that the 5.0 cm mark of the rule rests on the pivot. The metre rule must rest on the pivot at the 5.0 cm mark throughout the experiment.

Place the load W on the metre rule with its centre at a distance d = 20.0 cm from the pivot.

Ensure that the metre rule is horizontal by adjusting the clamp that holds the spring.

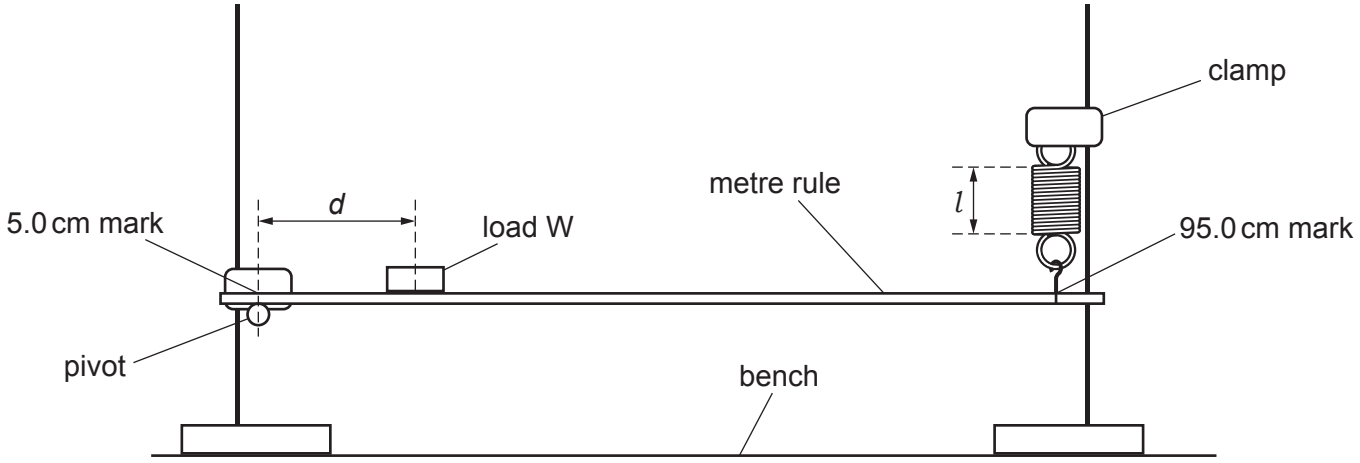


Fig. 1.3

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Measure, and record in Table 1.1, the stretched length l of the spring, as shown in Fig. 1.3.

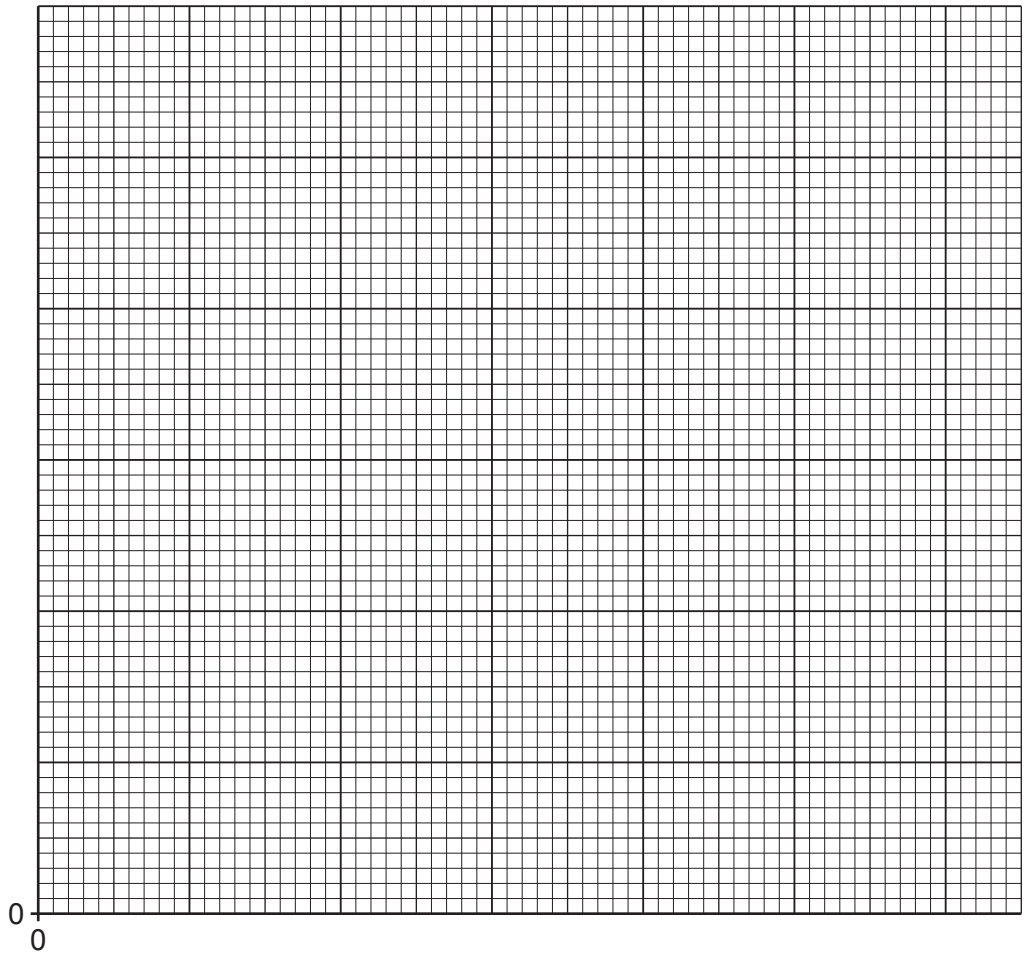
Repeat this procedure for distances d = 30.0 cm, d = 40.0 cm, d = 50.0 cm and d = 60.0 cm from the pivot.

Table 1.1

d / cm	l / cm
20.0	
30.0	
40.0	
50.0	
60.0	

[2]

(c) Plot a graph of l / cm (y-axis) against d / cm (x-axis). Start the axes at the origin (0,0).



[4]

(d) **(i)** From your graph, determine L, the value of l when d = 0.0 cm.

L = ... [1]

(ii) Calculate W_R, the weight of the metre rule, using your value of L from **(d)(i)**, the values of l_0 and l_S from **(a)** and the equation

$$W_R = \frac{2(L - l_0)}{(l_S - l_0)} \times k$$

where k = 1.0 N.

W_R = ... [1]

(e) (i) It is sometimes difficult to position the load W on the scale of the metre rule at the correct distance d from the pivot.

Suggest **one** change to the apparatus to overcome this difficulty.

.....

..... [1]

(ii) Suggest **one** possible source of inaccuracy other than the difficulty described in **(e)(i)**. Assume that the experiment is carried out carefully.

.....

..... [1]

[Total: 11]

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2 In this experiment, you will investigate the thermal insulation properties of air.

Carry out the following instructions, referring to Fig. 2.1 and Fig. 2.2.

Beaker A is covered in thin black card.
Beaker A is used on its own for the first part of the investigation and is placed inside beaker B for the second part of the investigation.

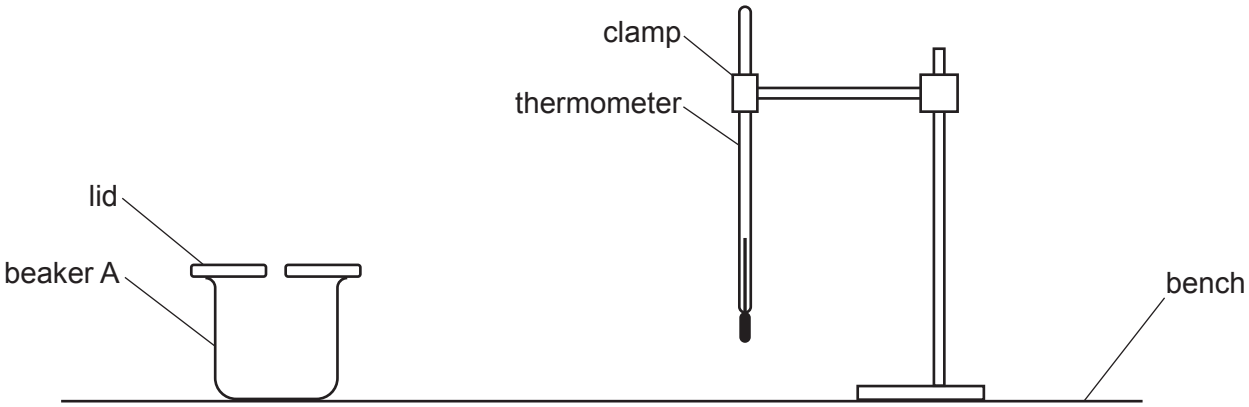


Fig. 2.1

(a) Remove the lid from beaker A.
Pour 150 cm^3 of hot water into beaker A and replace the lid.
Place the thermometer in the water.

In the first row of Table 2.1, record the temperature θ of the water at t = 0 and immediately start the stop-clock.

Record the temperature θ of the water at times t = 30 s, t = 60 s, t = 90 s, t = 120 s, t = 150 s and t = 180 s. [1]

(b) Remove the thermometer and lid from beaker A and pour away the water.
Place beaker A inside beaker B, as shown in Fig. 2.2, so that there is an air gap between the sides of the two beakers.

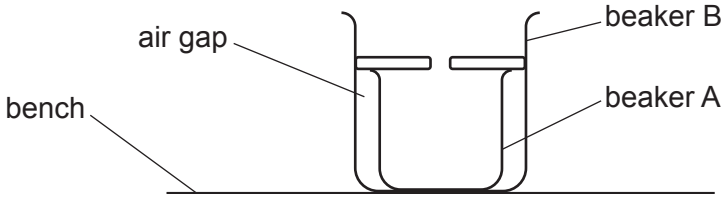


Fig. 2.2

(i) Repeat **(a)** for this arrangement, ensuring that the lid fits inside beaker B after pouring water into beaker A. [2]

(ii) Add units to the column headings in Table 2.1. [1]

Table 2.1

	beaker A	beaker A inside beaker B
t/	θ/	θ/
0		
30		
60		
90		
120		
150		
180		

(c) Write a conclusion stating whether the air gap affects the rate of cooling of the water.
Justify your answer by reference to values from your results.

.....

.....

.....

..... [2]

(d) A student suggests that glass is a thermal insulator and the experiment does not just test the effect of the air gap.

Suggest **one** change to the apparatus that would test the air gap more effectively.

.....

..... [1]

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(e) Another student repeats the experiment using the apparatus you used for your investigation.

State **two** variables that this student should control to obtain readings as close as possible to your readings.

1. .....

.....

2. .....

.....

[2]

(f) Calculate the average cooling rate R for beaker A cooling on its own. Use your readings for **beaker A** in Table 2.1 and the equation

$$R = \frac{\theta_0 - \theta_{180}}{T}$$

where T = 180 s and θ_0 and θ_{180} are the temperatures of the water in beaker A at t = 0 and t = 180 s.
Include the unit for the cooling rate.

R = ... [2]

[Total: 11]

3 In this experiment, you will investigate the refraction of light using a transparent block.

Carry out the following instructions, using the separate ray-trace sheet provided.
You may refer to Fig. 3.1 for guidance.

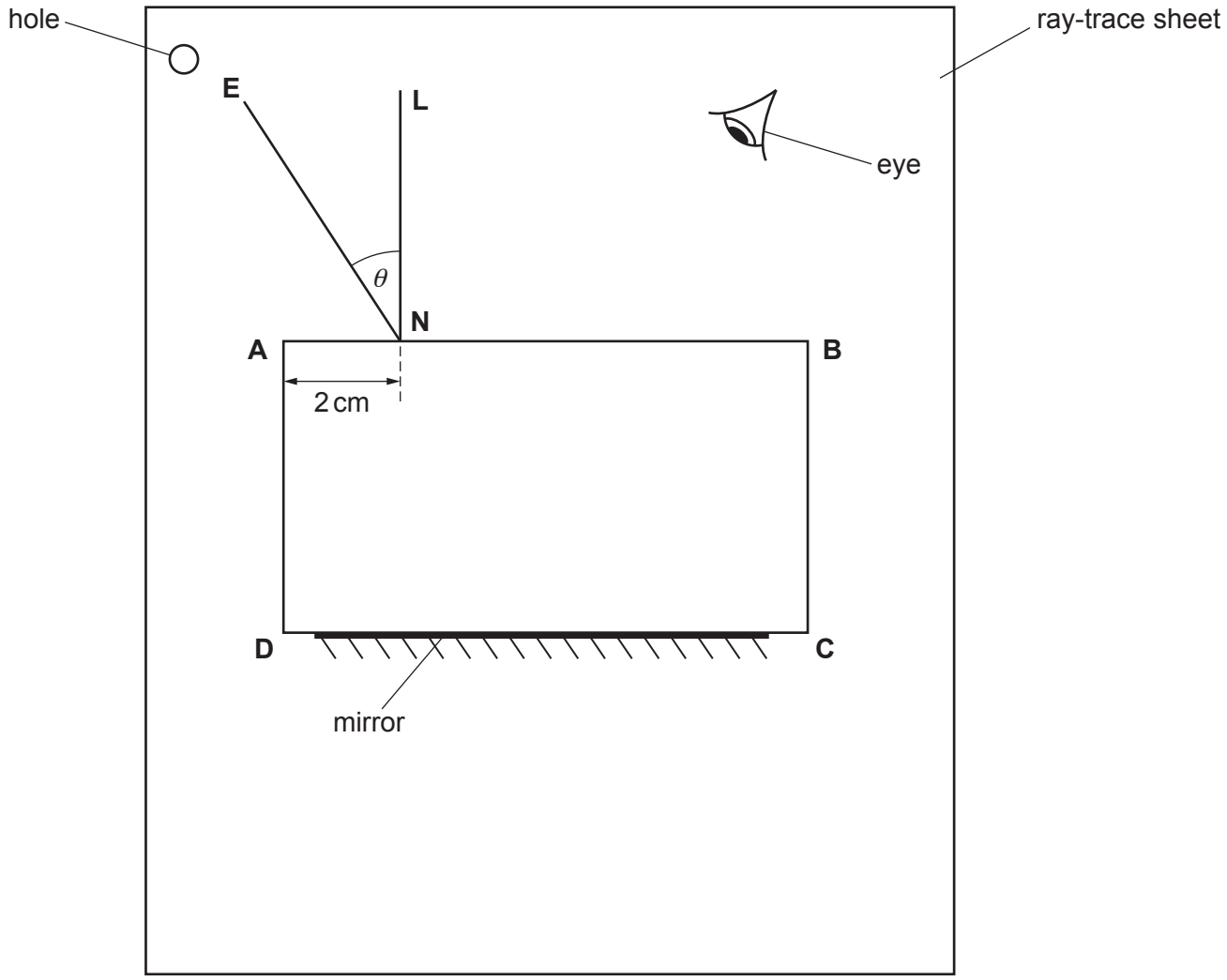


Fig. 3.1

(a)
- Place the transparent block approximately in the centre of the ray-trace sheet. Carefully draw round the block and label the corners **ABCD**, as shown in Fig. 3.1.
- Remove the block from the ray-trace sheet.
- Draw a normal to line **AB** at a point 2 cm from **A**. Label the normal **NL**, as shown in Fig. 3.1.
- Draw a line **NE**, 8 cm long and at an angle θ_1 = 15°, as indicated in Fig. 3.1.

[2]

(b)
- Replace the block in exactly the same position as in **(a)**.
- Place the plane mirror on line **CD** with its face against the block, as shown in Fig. 3.1.
- Place two pins, P_1 and P_2, on line **NE** a suitable distance apart for accurate ray tracing.
- Label the positions of pins P_1 and P_2.
- View the images of pins P_1 and P_2 through the block from the direction indicated by the eye in Fig. 3.1. Place two pins, P_3 and P_4, a suitable distance apart so that pins P_3 and P_4, and the images of pins P_1 and P_2, all appear exactly one behind the other.
- Label the positions of pins P_3 and P_4.
- Remove the block, mirror and pins from the ray-trace sheet.

[1]

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(c)
- Draw a line through P_3 and P_4 and extend this line 4 cm below **CD**.
- Label the point at which this line meets **AB** with the letter **G**.
- Label the lower end of this line with the letter **H**.

[1]

(d) (i)
- Draw a new line **NE**, 8 cm long and at an angle $\theta_2 = 35°$, as indicated in Fig. 3.1.
- Repeat the steps in **(b)**.
- Draw a line joining the new positions of pins P_3 and P_4 and extend this line 4 cm below **CD**.
- Label the point at which this line meets **AB** with the letter **R**.
- Label the lower end of this line with the letter **S**.
- Label the point at which **GH** and **RS** cross with the letter **T**.

[2]

(ii) Measure the angle β, where β is the angle between lines **GT** and **RT**.

β = ... [1]

(iii) A student suggests that the angle β should be equal to θ_s, where θ_s is calculated using the equation

$$\theta_s = \theta_2 - \theta_1.$$

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

statement .....

justification .....

.....

[2]

(e) Suggest **one** precaution to take in this type of experiment to ensure accurate results.

.....

..... [1]

(f) Suggest **one** reason why different students, all carrying out this experiment carefully, may **not** obtain identical results.

.....

..... [1]

[Total: 11]

Tie your ray-trace sheet into this booklet between pages 8 and 9.

4 A student investigates the heating of water using an immersion heater.
An immersion heater is an electrical heater that can be placed directly into water.

Plan an experiment to investigate how **one** factor affects the rate at which the temperature of the water rises when heated using an immersion heater.

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

The apparatus available includes:
- an immersion heater
- equipment to connect the circuit, part of which is shown in Fig. 4.1
- a stop-clock
- a beaker to contain the water.

In your plan, you should:

- state the **one** factor which you have chosen and list any additional apparatus needed to measure the factor
- complete the circuit diagram in Fig. 4.1
- explain how to do the experiment, including any precautions to ensure reliable results
- state the key variables to be kept 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.

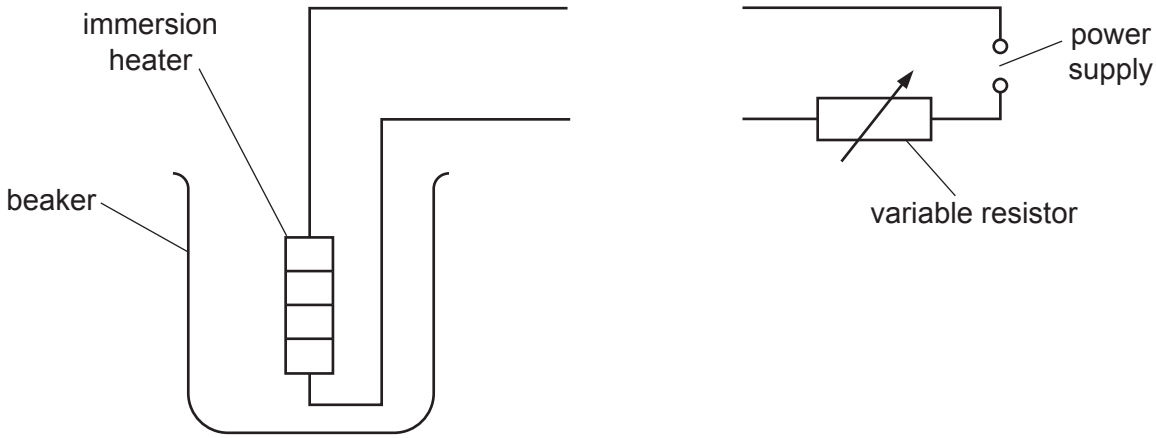


Fig. 4.1

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