Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0625/61**

Paper 6 Alternative to Practical **October/November 2016**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

DC (RW/FD) 115986/5

1 A student uses a pendulum to determine a value for the acceleration of free fall g.

Figs. 1.1 and 1.2 show the apparatus.

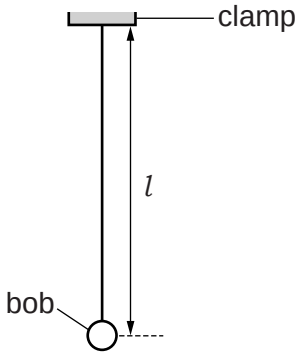


Fig. 1.1

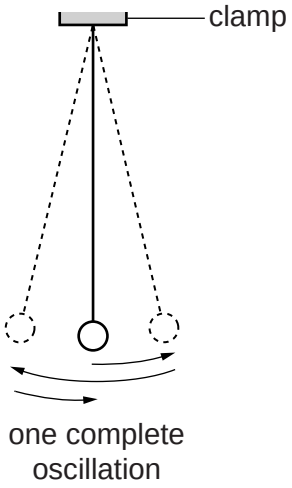


Fig. 1.2

(a) On Fig. 1.1, measure the length l of the pendulum.

l = ... cm [1]

(b) The student adjusts the pendulum until its length l = 50.0 cm. The length l is measured to the centre of the bob.

Explain briefly how the student avoids a parallax (line of sight) error when measuring length l.

.....

.....

.....[1]

(c) The student displaces the pendulum bob slightly and releases it so that it swings.

He measures the time t for 20 complete oscillations of the pendulum.

$t =$ 27.8 s

(i) Calculate the period T of the pendulum. The period is the time for one complete oscillation.

$T =$ .....[1]

(ii) Measuring the time for a large number of oscillations, rather than for one oscillation, gives a more accurate value for T.

Suggest one practical reason why measuring the time for 200 oscillations, rather than 20 oscillations, may **not** be suitable.

.....

.....[1]

(iii) Calculate T^2.

$T^2 =$ .....[1]

(iv) Calculate the acceleration of free fall g using the equation $g = \frac{4\pi^2 l}{T^2}$. Give your answer to a suitable number of significant figures for this experiment.

$g =$ ..... m/s^2 [2]

(d) The student checks the value of the acceleration of free fall *g* in a text book. The value in the book is $9.8\,m/s^2$.

(i) Suggest a practical reason why the result obtained from the experiment may be different.

.....

.....

.....[1]

(ii) Suggest **two** improvements to the experiment.

1. .....

.....

2. .....

.....

[2]

[Total: 10]

2 A student is investigating the cooling of water.

(a) She pours 100 cm^3 of hot water into a beaker.

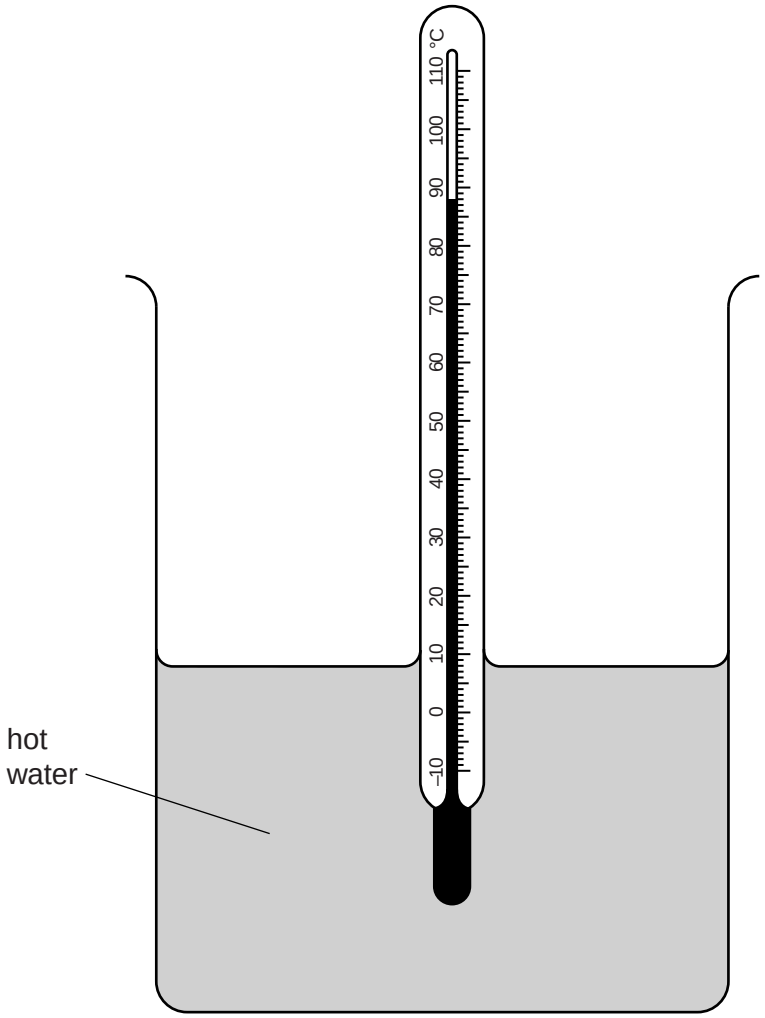


Fig. 2.1

(i) Record the temperature θ_H of the hot water, as shown in Fig. 2.1.

θ_H = ...[1]

(ii) The student measures the temperature θ_C of an equal volume of cold water.

θ_C = 19 °C

Calculate the average temperature θ_{AV} using the equation $\theta_{AV} = \frac{\theta_H + \theta_C}{2}$.

θ_{AV} = ...[1]

(b) The student adds the cold water to the hot water. She records the temperature θ_M of the mixture.

θ_M = 46 °C

State **one** precaution that you would take to ensure that the temperature readings are as reliable as possible.

.....

.....[1]

(c) The student is provided with:

- a lid, with a hole for the thermometer
- some insulating material
- two elastic bands.

In the space below, draw a labelled diagram to show how you would use these items to reduce the loss of thermal energy when the procedure is repeated.

[2]

(d) Using the improvements shown in your diagram, the student repeats the procedure and obtains these readings.

θ_H = 86 °C

θ_C = 20 °C

θ_{AV} = 53 °C

θ_M = 49 °C

Comment on whether the improvements made to the apparatus have significantly changed the value of the temperature θ_M. Use the results to justify your answer.

.....

.....

.....[1]

(e) Suggest **two** conditions that should be kept constant for all parts, **(a)** to **(d)**, of this experiment.

1. .....

2. .....
[2]

[Total: 8]

3 A student is investigating refraction using a transparent block.

Fig. 3.1 shows the first stage of the student's ray trace. **ABCD** is the outline of the transparent block. **E** is at the centre of **AB** and **G** is at the centre of **CD**.

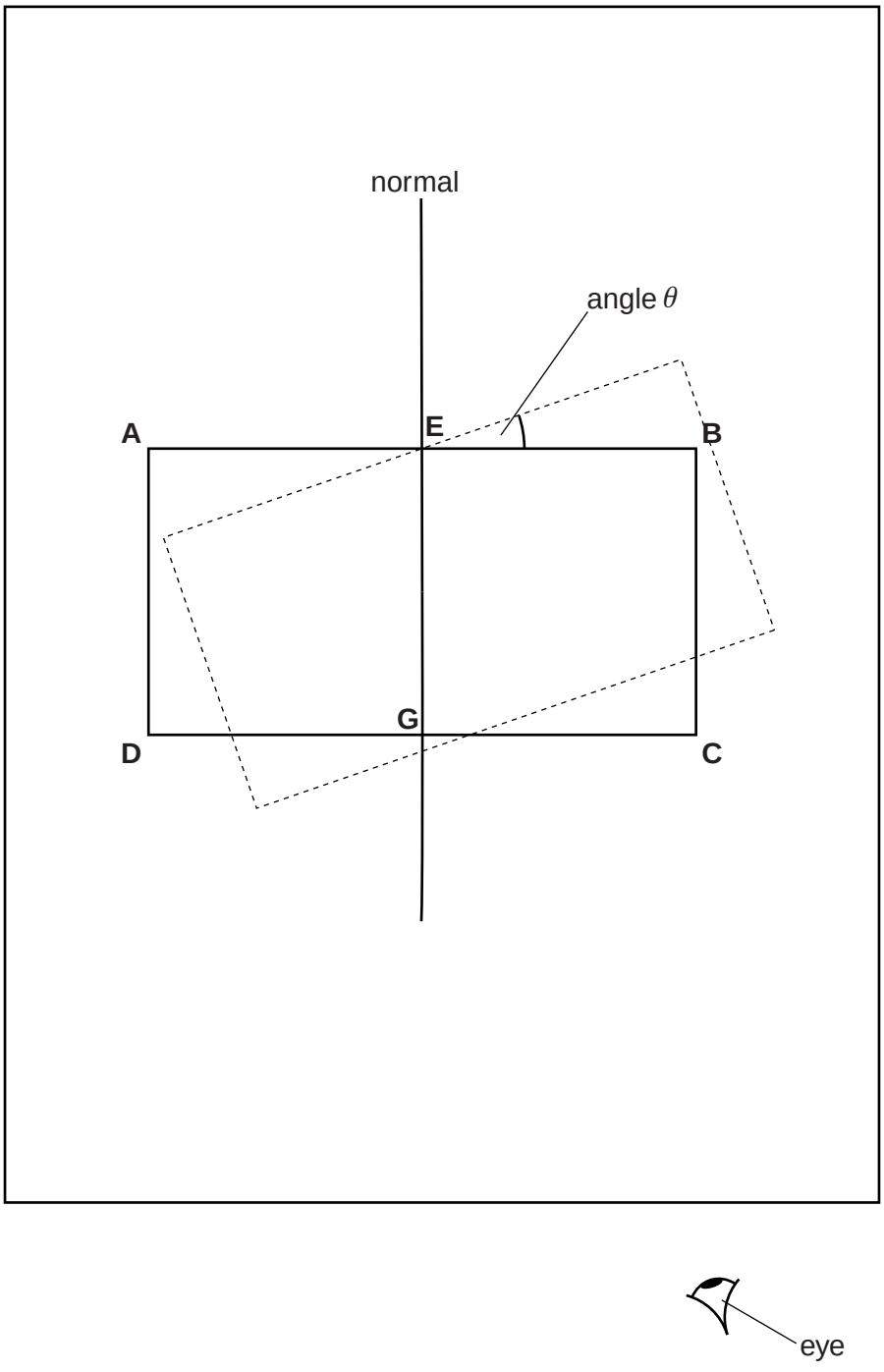


Fig. 3.1

(a) On Fig. 3.1, draw a line **FE** to the left of the normal, above the outline of the block, and at an angle $i = 20°$ to the normal. [1]

(b)
- The student places a pin P on the line **FE**, at a suitable distance from the block.
- There is a vertical line L_1 drawn on side **AB** of the block at point **E**. There is a second vertical line L_2 drawn on side **CD** at point **G**.
- The student observes the images of L_1 and P through side **CD** of the block. He carefully turns the block to the dashed position in Fig. 3.1. In this position the vertical line L_2 and the images of L_1 and P appear one behind the other.

(i) On Fig. 3.1, mark with a cross (×) a suitable position for pin P. [1]

(ii) Explain briefly the experimental reason for your choice of position for pin P.

.....

.....

.....[1]

(iii) On Fig. 3.1, measure the angle θ and enter it in the first row of Table 3.1, on page 10. [1]

(c) • The student measures the angle θ between the original position of **AB** and the new position of **AB**, as indicated in Fig. 3.1.

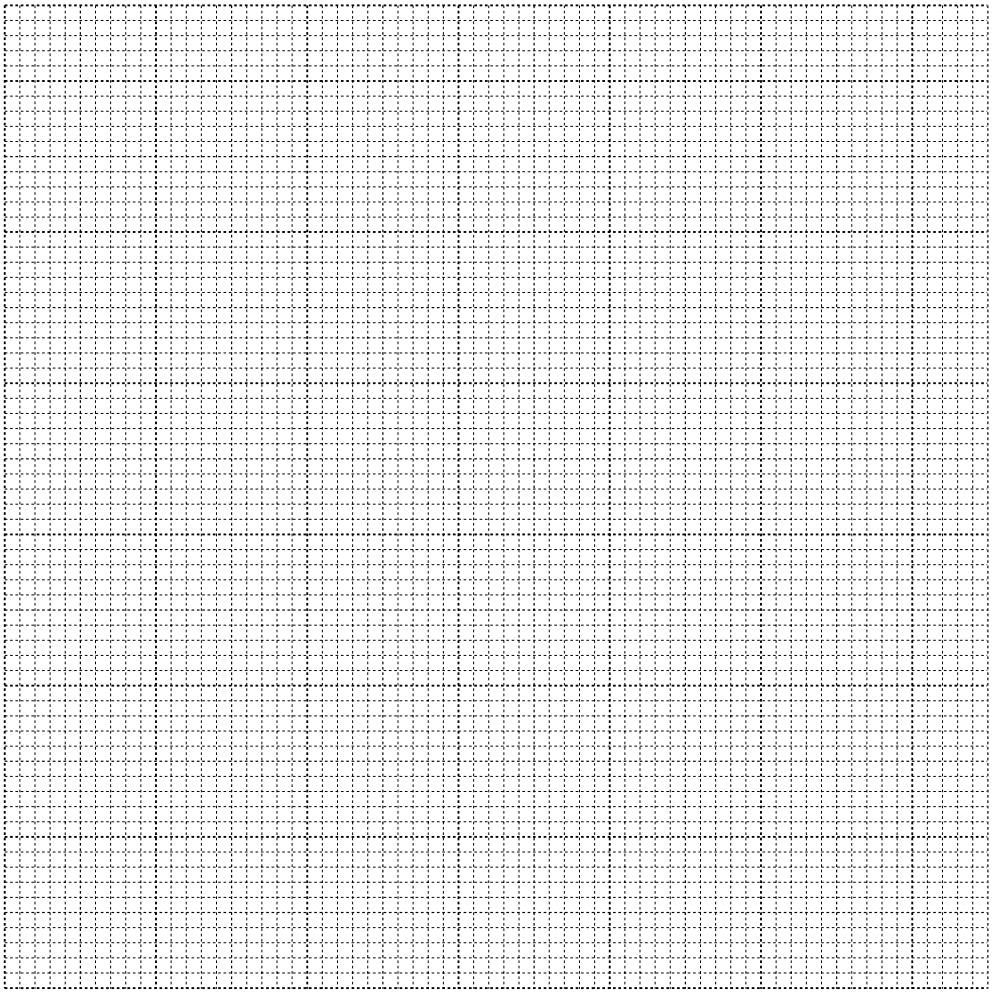
• He repeats the procedure, using values of i = 30°, 40°, 50° and 60°.

• The readings are shown in Table 3.1.

Table 3.1

i/°	θ/°
20	
30	29
40	41
50	51
60	59

Plot a graph of θ/° (y-axis) against i/° (x-axis).



[4]

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

G = ...[2]

[Total: 10]

4 A student is investigating resistors connected in parallel.

The following apparatus is available to the student:

ammeter
voltmeter
power supply
variable resistor
switch
connecting leads
a box of identical resistors.

Plan an experiment to investigate how the combined resistance of the resistors, connected in parallel, depends on the number of resistors.

You should:

- draw a diagram of the circuit you could use to determine the resistance of resistors connected in parallel (show only two resistors in your diagram),
- explain briefly how you would carry out the investigation,
- draw a table or tables, with column headings, to show how you would display your readings. You are **not** required to enter any readings into the table.

.....

.....

[7]

[Total: 7]

5 A student is investigating the extension of a spring.

(a) Fig. 5.1 shows the spring with, and without, a load attached.

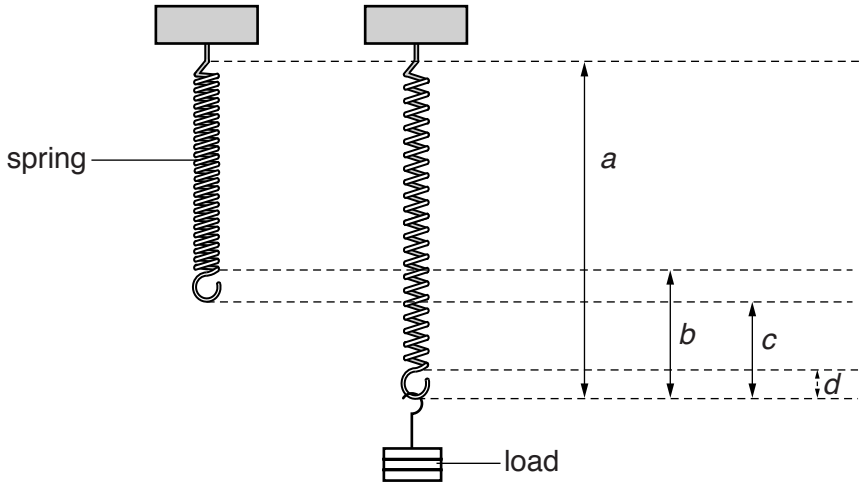


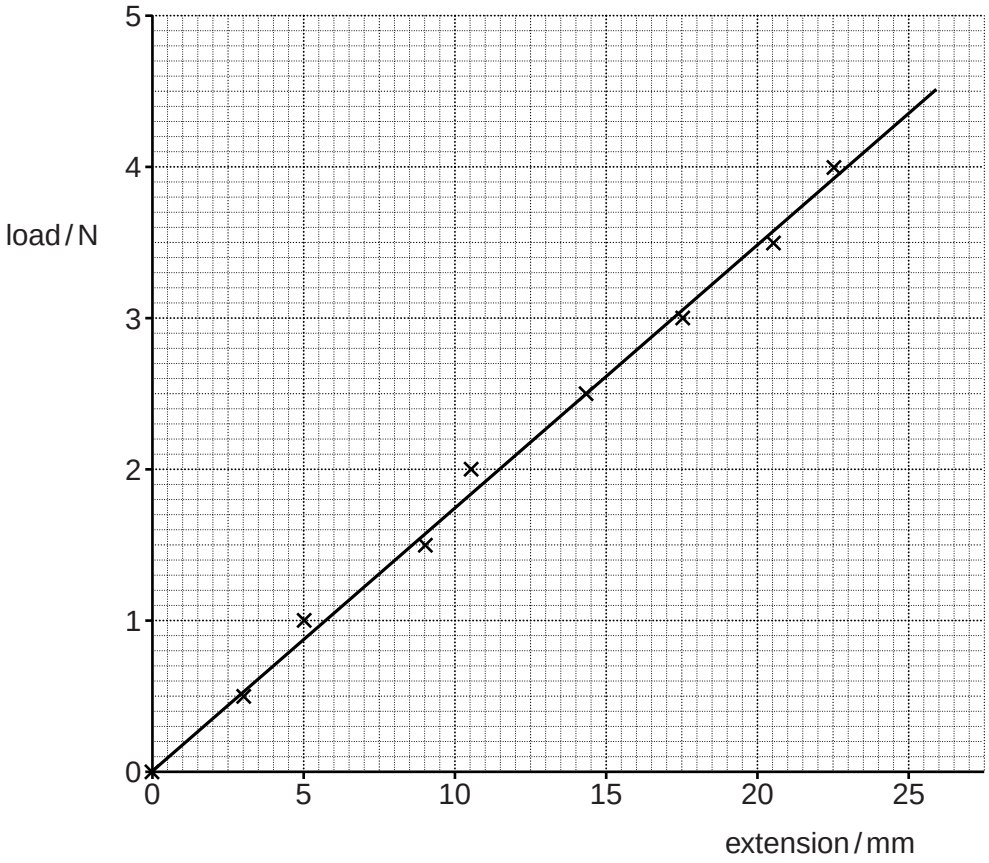
Fig. 5.1

Tick the distance that shows the extension of the spring when the load is added.

☐ *a* ☐ *b* ☐ *c* ☐ *d*

[1]

(b) The graph shows the student's results.



(i) State whether the graph shows that the load and the extension are directly proportional. Justify your answer by reference to the graph.

statement .....

justification .....

.....

[2]

(ii) The student determines the gradient *G* of the graph line.

G = 0.1744729

G is numerically equal to a constant *k* for the spring.

Write down the value of the constant *k*. Give your answer to a suitable number of significant figures and include the unit.

k = ...[2]

[Total: 5]

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