Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9499791551

PHYSICS **0625/62**

Paper 6 Alternative to Practical **February/March 2019**

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.

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

This document consists of **12** printed pages.

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1 A student is investigating the reflection of light by a plane mirror.

Fig. 1.1 shows his ray-trace sheet at full size.

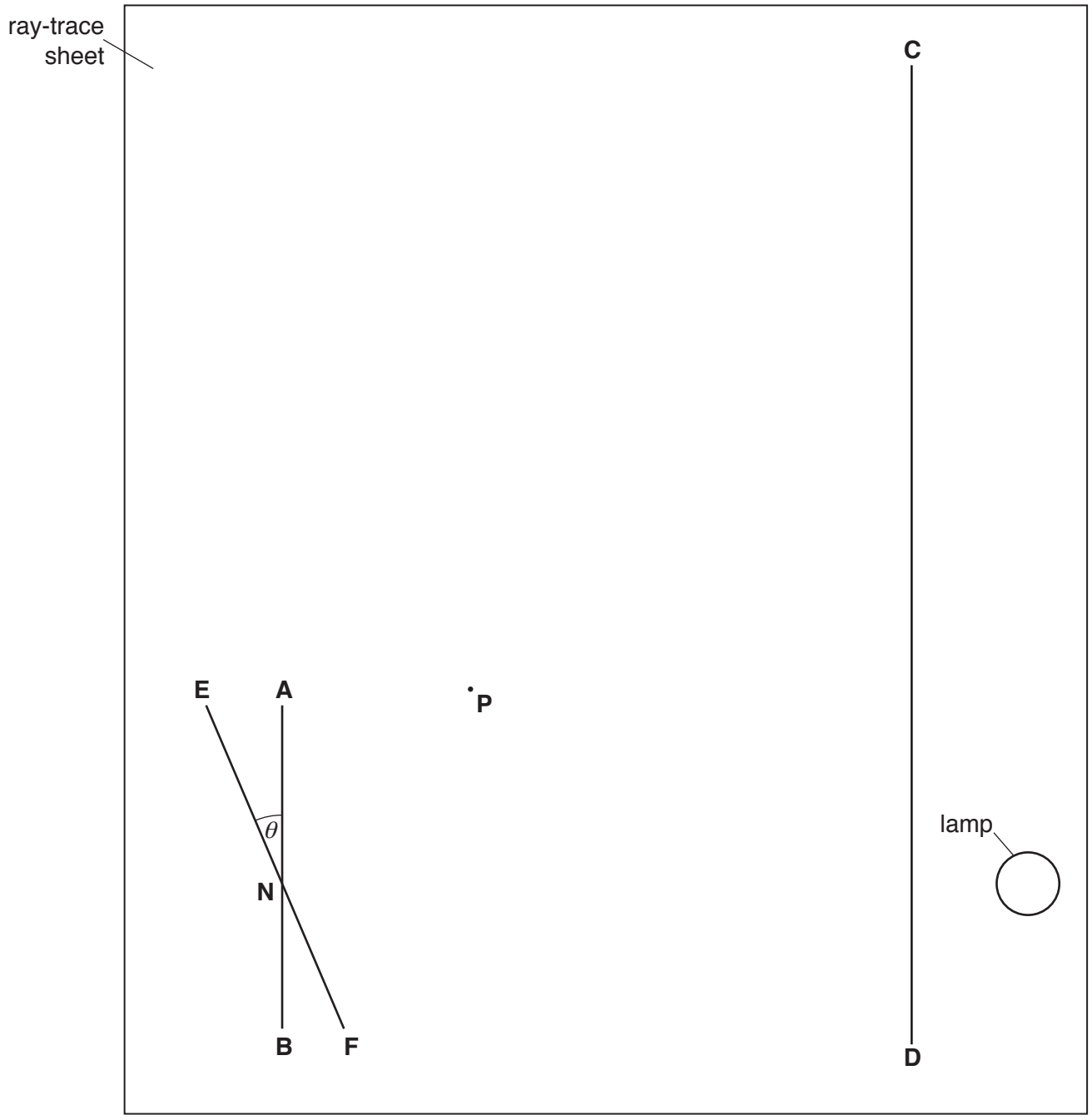


Fig. 1.1

(a) The student carries out an initial experiment.
He draws lines **AB** and **CD** as shown in Fig. 1.1.
He then draws a line **EF** through a point **N** as shown in Fig. 1.1 and at an angle θ to line **AB**.

(i) Measure the angle θ.

θ = ... [1]

(ii) Draw a normal to line **AB** at point **N** and extend the normal to line **CD**. Label the point at which the normal crosses line **CD** with the letter **L**. [1]

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(b) The student places a plane mirror on line **EF** and a screen with a 2 mm slit on line **CD**. He arranges the screen so that a ray of light shines along line **LN**.
The ray reflected from the mirror passes through point **P**.

State and explain whether point **P**, shown on Fig. 1.1, is at a suitable distance from point **N** for this investigation.

statement .....

explanation .....
[1]

(c)
- Draw a line joining point **N** and point **P**. Extend this line until it meets line **CD**.
- Label the point at which this line meets line **CD** with the letter **G**.
- Measure the length *a* of line **LG**.

a = ... cm [2]

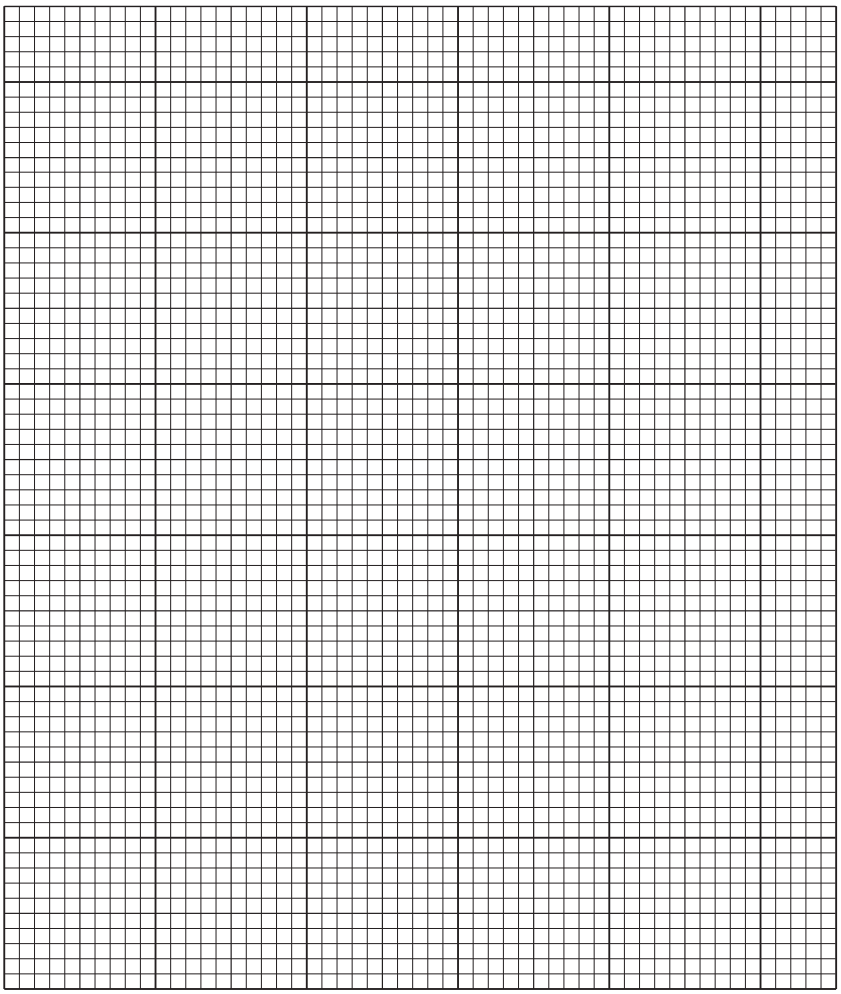
(d) The student repeats the procedure for values of $\theta = 25°, 20°, 15°, 10°$ and 5°.
His values for *a* are shown in Table 1.1.

Table 1.1

θ/°	*a*/cm
25	12.2
20	8.3
15	5.7
10	3.6
5	1.8

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Use the values from Table 1.1 to plot a graph of a/cm (y-axis) against θ/° (x-axis).



[4]

(e) Suggest a possible source of inaccuracy in this experiment, even if it is carried out carefully.

.....

..... [1]

(f) A student wishes to check if his values for a are reliable.

Suggest how he could improve the experiment, using the same apparatus, to check the reliability of his results.

.....

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..... [1]

[Total: 11]

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2 Students are investigating how the use of a lid or insulation affects the rate of cooling of hot water in a beaker. They use the apparatus shown in Fig. 2.1.

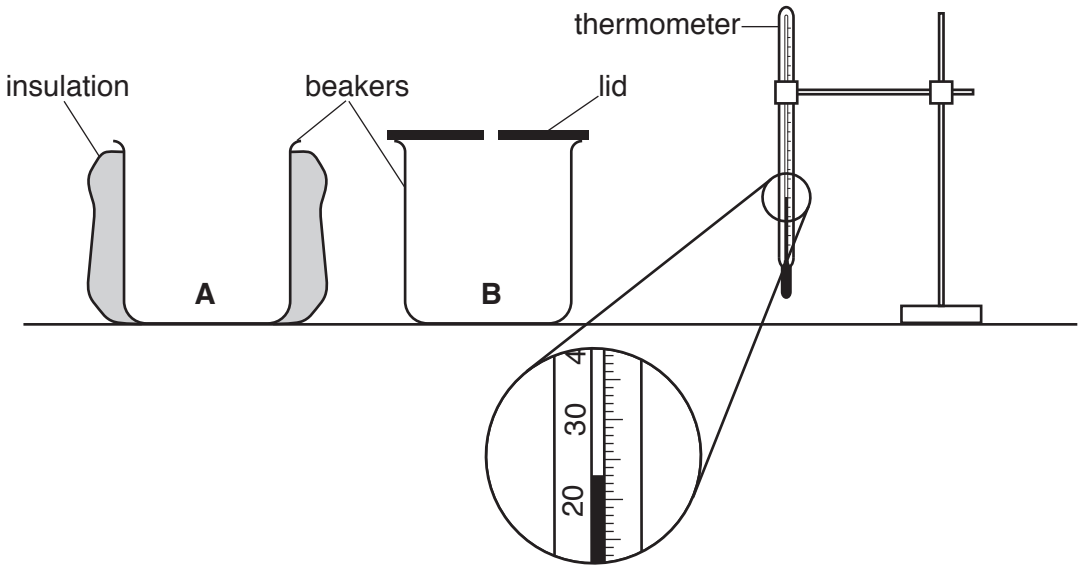


Fig. 2.1

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

θ_R = ... [1]

(b)
- 100 cm^3 of hot water is poured into beaker **A** and the initial temperature θ is recorded in Table 2.1.
- The temperature θ of the water at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s are shown in Table 2.1.
- This process is repeated for beaker **B**.

Complete the headings and the time column in Table 2.1. [2]

Table 2.1

	beaker **A** with insulation	beaker **B** with a lid
t/	θ/	θ/
0	83.0	86.0
	79.0	84.0
	75.5	82.5
	73.0	81.0
	71.0	80.0
	69.5	79.0
	68.5	78.5

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[Turn over

(c) Write a conclusion stating whether the insulation or the lid is more effective in reducing the cooling rate of the water in the beakers in this experiment.

Justify your answer by reference to the results.

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..... [2]

(d) One student thinks that the experiment does not show how effective insulation is on its own or how effective a lid is on its own.

Suggest an additional experiment which could be used to show how effective a lid or insulation is.

Explain how the additional results could be used.

additional experiment .....

.....

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explanation .....

.....

.....

[2]

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(e) (i) Calculate x_A, the average cooling rate for beaker **A** over the whole experiment. Use the readings for beaker **A** from Table 2.1 and the equation

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

where $T = 180\,s$ and θ_0 and θ_{180} are the temperatures at time $t = 0$ and time $t = 180\,s$. Include the unit for the cooling rate.

x_A = ... [2]

(ii) Students in another school are carrying out this experiment using identical equipment.

State why they should make the initial temperature of the water the same as in this experiment if they are to obtain average cooling rates that are the same as in Table 2.1. Assume that the room temperature is the same in each case.

Use the results from beaker **A** to explain why this factor should be controlled.

statement .....

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explanation .....

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[2]

[Total: 11]

3 A student is investigating a resistance wire. She uses the circuit shown in Fig. 3.1.

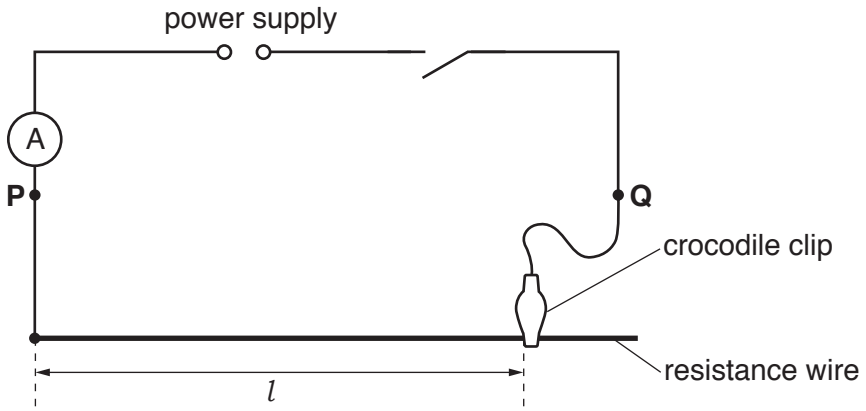


Fig. 3.1

(a) (i) On Fig. 3.1, draw a voltmeter connected to measure the potential difference V across terminals **P** and **Q**. [1]

(ii) The student connects the crocodile clip to a length $l = 90.0\,\text{cm}$ of the resistance wire and measures the potential difference V across terminals **P** and **Q** and the current I in the circuit.

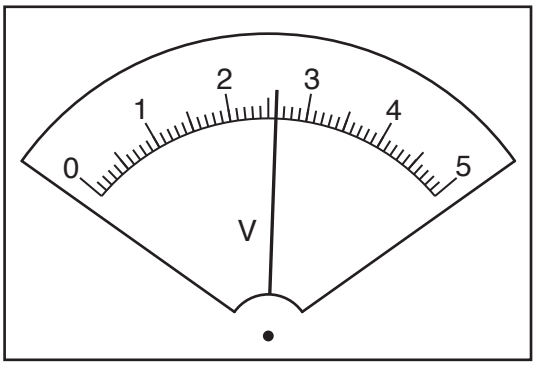


Fig. 3.2

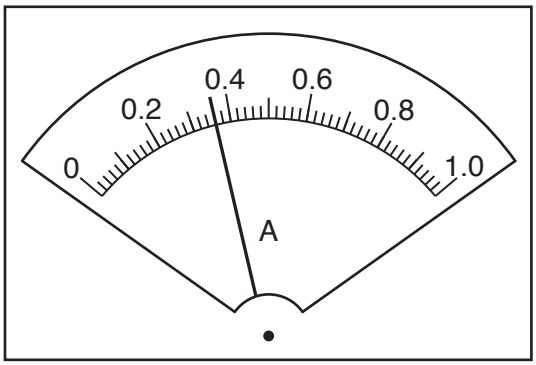


Fig. 3.3

Read, and record in Table 3.1, the values of V and I shown on the meters in Fig. 3.2 and Fig. 3.3. [2]

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(b) The student then connects the crocodile clip to lengths l = 60.0 cm and l = 40.0 cm of the resistance wire. She measures the potential difference V across terminals **P** and **Q** and the current I in the circuit. Her readings are shown in Table 3.1.

Complete the column headings in Table 3.1. [1]

Table 3.1

l/cm	V/	I/	R/Ω	$\frac{R}{l}$/$\frac{\Omega}{\text{cm}}$
90.0				
60.0	2.5	0.52		
40.0	2.3	0.71		

(c) **(i)** Calculate, and record in Table 3.1, the resistance R of each length l of the wire.
Use the readings from Table 3.1 and the equation $R = \frac{V}{I}$.

[2]

(ii) Calculate, and record in Table 3.1, the value of $\frac{R}{l}$ for each length of the wire.

[1]

(d) Use your results in Table 3.1 to calculate the resistance R_{25} of a 25.0 cm length of the resistance wire.
Show your working.

R_{25} = ... Ω [1]

(e) Suggest **one** reason why different students, carrying out the experiment carefully with the same equipment, may **not** obtain identical results.

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..... [1]

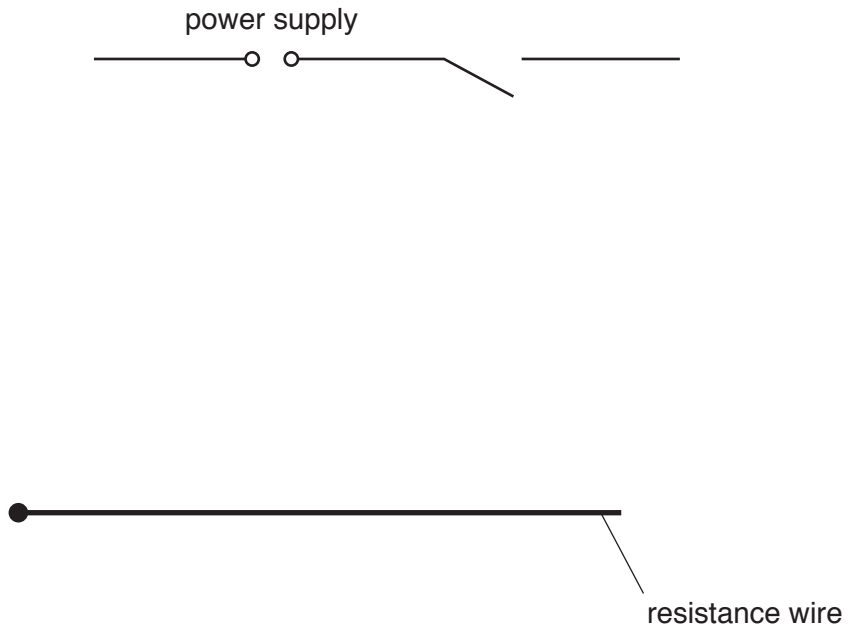
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(f) The student finds that, during the experiment, the wire becomes hot because of a high current.

She decides to use a variable resistor to prevent this.

Complete the circuit in Fig. 3.4 to show a variable resistor used for this purpose in the experiment.



[2]

Fig. 3.4

[Total: 11]

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4 A student wants to investigate the effect of air resistance on the swing of a pendulum.

Plan an experiment which will enable him to investigate how air resistance changes the way in which a pendulum swings.

The apparatus available includes:

a light wooden rod, approximately 80 cm long with a hole at one end, through which a nail will fit
a piece of modelling clay to act as a pendulum bob, as shown in Fig. 4.1
a sheet of thick card which will provide the air resistance when the pendulum swings.

In your plan, you should:

- list any additional apparatus needed
- explain briefly how you would carry out the experiment including exactly which measurements should be taken
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may add to Fig. 4.1 or draw an additional diagram if it helps to explain your plan.

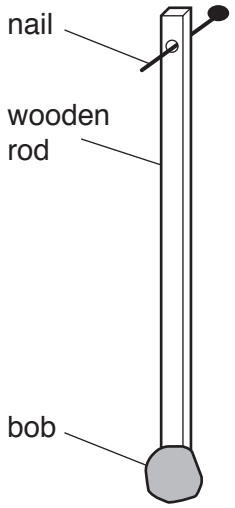


Fig. 4.1

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[Total: 7]

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