Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4390321859

PHYSICS **0625/62**

Paper 6 Alternative to Practical **February/March 2015**

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 **14** printed pages and **2** blank pages.

DC (NH/CGW) 94506/4

CAMBRIDGE
International Examinations

[Turn over

1 A student is determining the mass of a metre rule by a balancing method.

He is using the apparatus shown in Fig. 1.1.

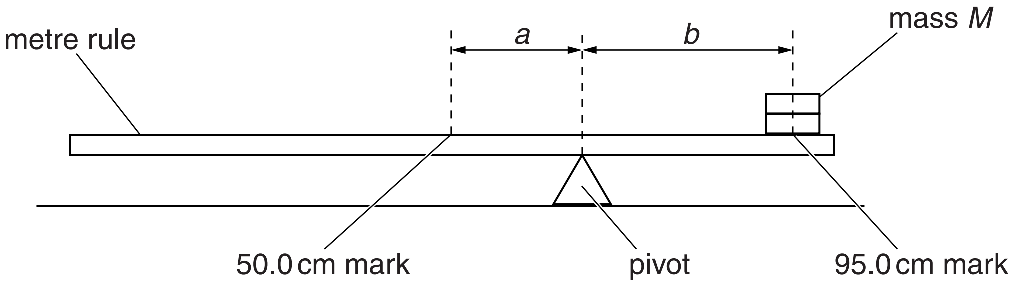

Fig. 1.1

(a) He places the metre rule on the pivot and then places a mass M = 20 g with its centre at the 95.0 cm mark.

Suggest how he could ensure that the mass is placed accurately at the 95.0 cm mark. You may draw a diagram.

....

....

....[1]

(b) Keeping the mass at the 95.0 cm mark, he adjusts the position of the metre rule on the pivot until the metre rule is as near to being balanced as possible.

The student then determines the distance a between the 50.0 cm mark and the pivot and the distance b between the 95.0 cm mark and the pivot.

He repeats the procedure for values of M = 40 g, 60 g, 80 g and 100 g. His results are shown in Table 1.1.

Table 1.1

M / g	a / cm	b / cm	S
20	6.5	38.5	
40	11.2	33.8	
60	15.2	29.8	
80	17.1	27.9	
100	20.0	25.0	

For each value of M, calculate and record in the table the value S, where $S = \frac{a}{b}$. [1]

(c) Plot a graph of S (y-axis) against M/g (x-axis).

[4]

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

G = ...[1]

(ii) The mass M_R of the metre rule is numerically equal to $\frac{1}{G}$.

Write down a value for M_R to a suitable number of significant figures for this experiment.

M_R = ...g [1]

(e) Determination of M_R by this method relies on the centre of mass of the rule being at the 50.0 cm mark.

Suggest how you could use the apparatus to test whether this is the case. You may draw a diagram.

....

....

....[1]

[Total: 9]

2 The class is investigating whether the insulation around a container affects the rate at which water cools.

Two test-tubes are set up as shown in Fig. 2.1.

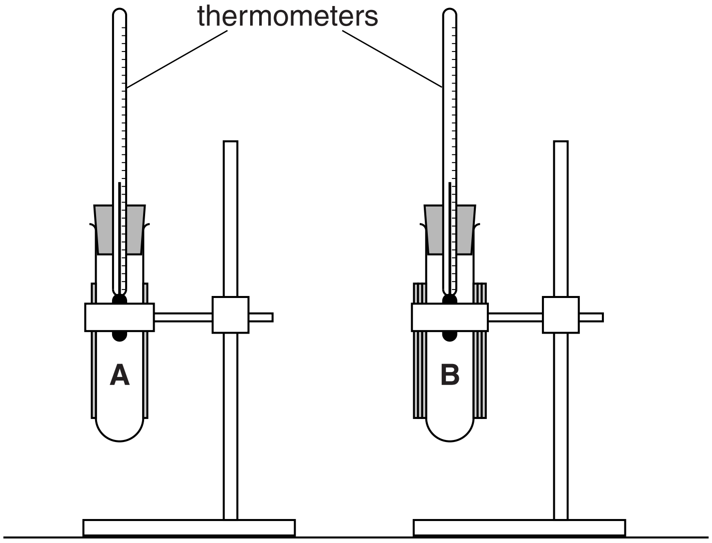

Fig. 2.1

Test-tube **A** has one layer of insulation. Test-tube **B** has three layers of insulation. This is indicated by the cross-sections of the test-tubes shown in Fig. 2.2.

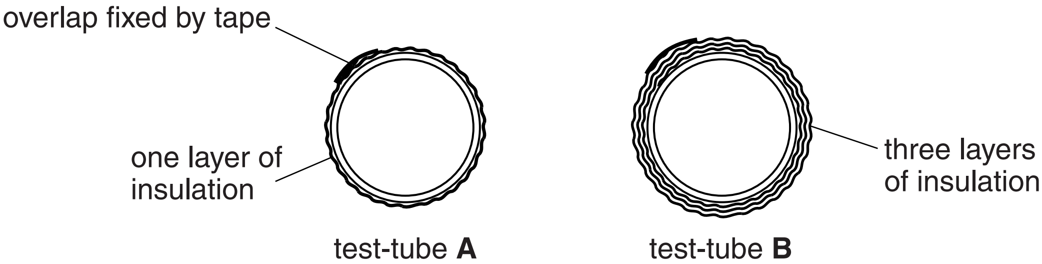

Fig. 2.2

(a) The students pour hot water into each test-tube, up to the level of the top of the insulation.

They record, in Table 2.1, the temperatures θ of the water in each test-tube and immediately start a stopclock. They also record the temperatures θ at times t = 30 s, 60 s, 90 s, 120 s,150 s and 180 s.

Complete the table.

Table 2.1

	test-tube **A** (1 layer)	test-tube **B** (3 layers)
t/	θ/	θ/
	71.0	75.5
	68.5	73.5
	66.0	71.0
	64.0	69.5
	62.0	67.5
	60.5	66.0
	58.5	64.5

[2]

(b) From the results in the table, state how increasing the number of layers of insulation affects the rate at which water cools. Justify your answer by referring to the results.

statement ....

....

justification ....

....

....

....
[2]

(c) State two ways in which the temperature readings in this experiment could be made as reliable as possible.

1. ....

....

2. ....

....
[2]

(d) Suggest two improvements to the apparatus or procedures which will ensure that the investigation into the effect of insulation on the rate of cooling is more reliable.

1. ....

....

2. ....

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[2]

[Total: 8]

3 Some students are investigating the link between the brightness of a filament lamp and its resistance.

The circuit is shown in Fig. 3.1.

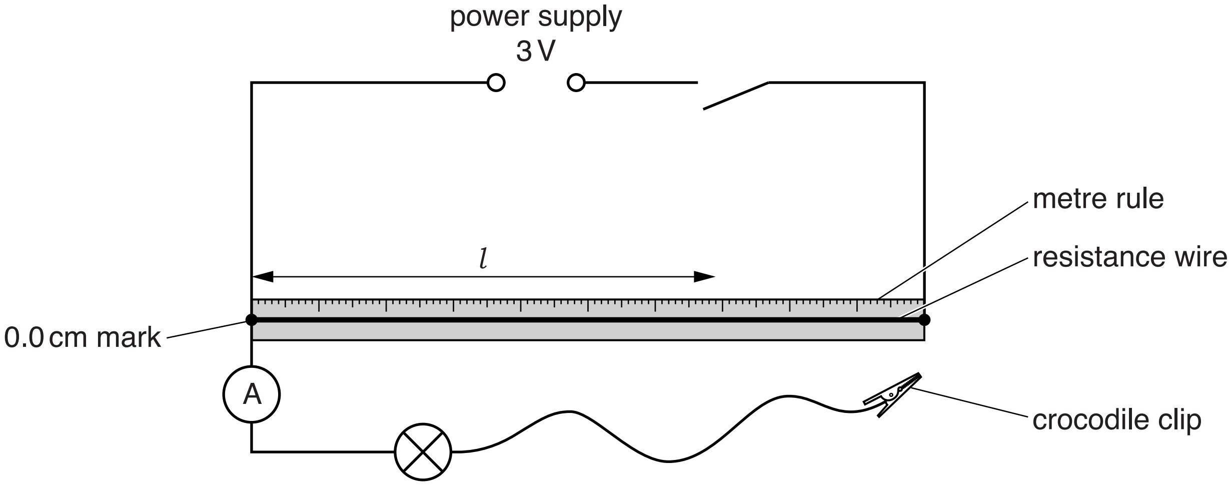

Fig. 3.1

(a) On Fig. 3.1, use standard symbols to show a voltmeter connected to measure the potential difference across the lamp. [1]

(b) The students attach the crocodile clip to various lengths l of the resistance wire and record, in Table 3.1, the potential difference V and the current I for the lamp. They also record observations of the lamp filament.

Table 3.1

l/cm	V/V	I/A	observation of lamp filament	R/Ω
100	2.5	0.26	bright	
60	1.5	0.19	dim	
20	0.5	0.11	just glowing	

Voltmeters with the ranges shown in Fig. 3.2 are available.

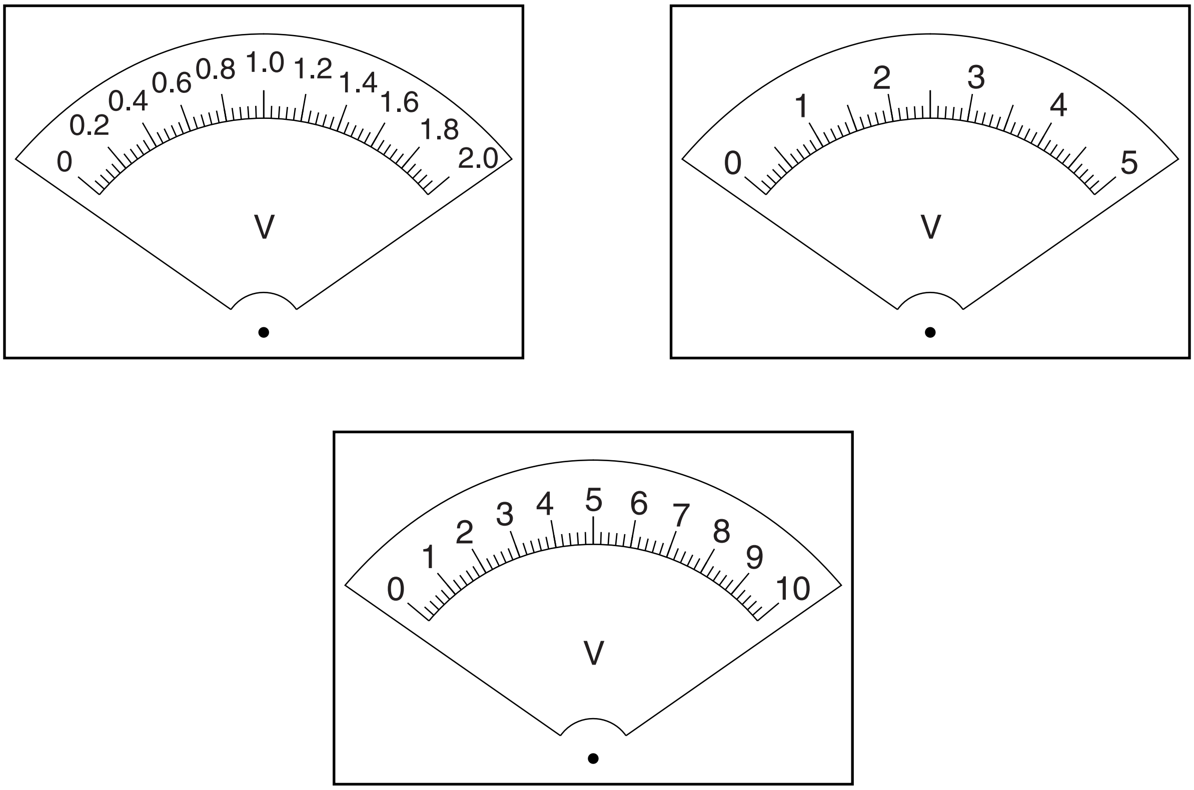

Fig. 3.2

(i) On Fig. 3.2, circle the voltmeter which is most appropriate for this experiment.

(ii) Draw an arrow on this voltmeter to show the reading when the crocodile clip is attached to a length $l = 60\,\text{cm}$ of the resistance wire.

[2]

(c) Calculate, and record in the table, the resistance R of the lamp for each value of l, using the equation $R = \dfrac{V}{I}$. [2]

(d) From the results and the observations of the lamp filament, state the link, if any, between the brightness of the lamp and its resistance. Explain clearly how the results support your statement.

statement ....

explanation ....

....

....

....

[2]

(e) A student wishes to see if another lamp shows the same link between brightness and resistance. However, his lamp only glows dimly when a potential difference of 3V is applied across it.

The student decides that a method using a resistance wire is not suitable.

Suggest an alternative circuit and apparatus which would allow him to vary the brightness of his lamp and measure the potential difference and current for his lamp. You may draw a circuit diagram.

....

....

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....[3]

[Total: 10]

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4 A student is carrying out an experiment with a small converging lens. The student sets up the apparatus as shown in Fig. 4.1. The distances are shown full size.

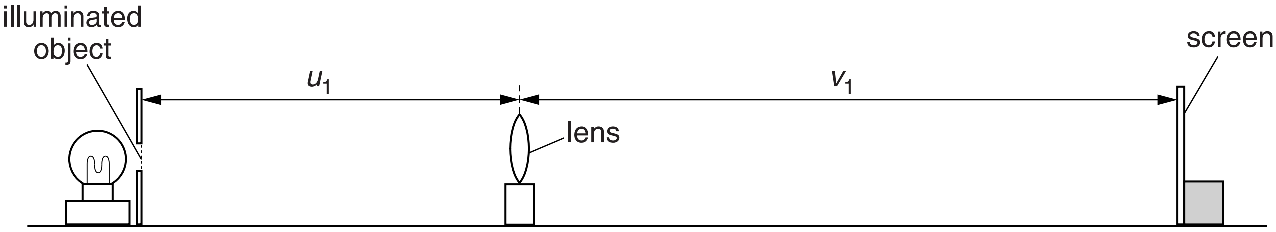

Fig. 4.1

(a) She moves the screen until a sharp image of the illuminated object appears on the screen.

(i) Using Fig. 4.1, measure and record the distance u_1 between the illuminated object and the lens, and the distance v_1 between the lens and the screen.

u_1 = ...

v_1 = ...
[2]

(ii) Calculate a value for the focal length f of the lens, using your results from **(a)(i)** and the equation $f = \frac{u_1 v_1}{(u_1 + v_1)}$.

f = ...[2]

(b) Keeping the illuminated object and screen in the same positions, she moves the lens towards the screen until a second sharp image is seen on the screen. The distances are shown full size.

Fig. 4.2

(i) Using Fig. 4.2, measure and record the new distance u_2 between the illuminated object and the lens.

u_2 = ...

(ii) The student suggests that u_2 and v_1 should be equal.

State whether the lens positions obtained by the student support this suggestion. Justify your statement by reference to the results.

statement ....

justification ....

....

.... [2]

(c) Describe two precautions that should be taken in order to obtain reliable results in this type of experiment.

1. ....

....

2. ....

.... [2]

[Total: 8]

5 Two students are investigating thermal energy transfer.

They are using the apparatus shown in Fig. 5.1.

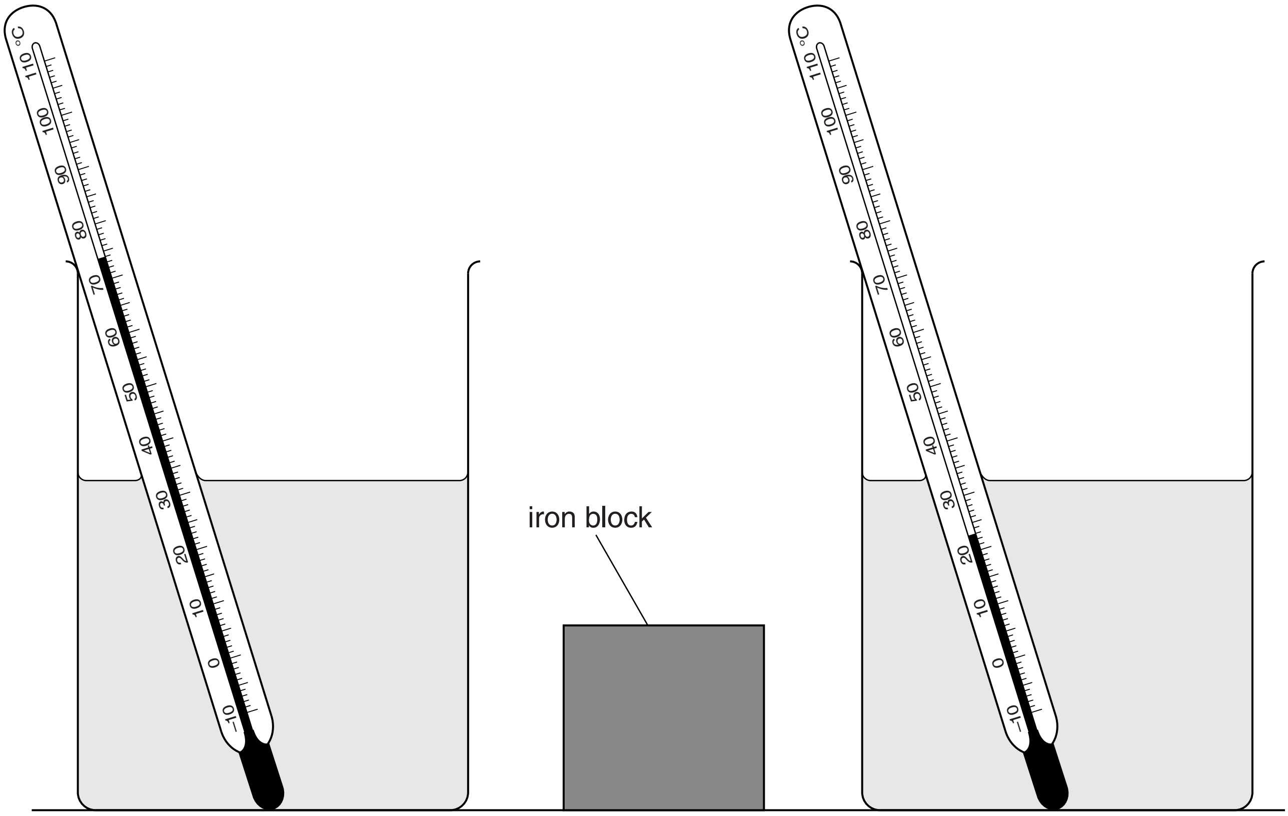

Fig. 5.1

Beaker **A** contains hot water and beaker **B** contains cold water at room temperature.

(a) Record the temperature θ_H of the hot water and the temperature θ_C of the cold water as shown on the thermometers in Fig. 5.1.

θ_H = ...

θ_C = ...
[1]

(b) Using metal tongs, one of the students places the iron block in the hot water in beaker **A** for 30 seconds.

He then removes the block and places it in the cold water in beaker **B**.

The other student then measures the temperature of the water in beaker **B** and finds that it has risen to 35 °C. Their teacher suggests that this value is lower than expected.

(i) The students suggest that, immediately before the iron block was put into the cold water, the temperature of the iron block was not the same as θ_H.

Suggest one reason for this and a possible improvement to the experiment which could make the temperature of the block nearer to θ_H.

reason ....

....

....

improvement ....

....

....
[2]

(ii) The students also think that, when the block cooled in the water, not all of the thermal energy lost by the block raised the temperature of the water.

Suggest one reason for this and a possible improvement to the experiment which would reduce thermal losses.

reason ....

....

....

improvement ....

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....
[2]

[Total: 5]

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