Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7177366145

PHYSICS **0625/61**

Paper 6 Alternative to Practical **May/June 2014**

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 **12** printed pages.

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1 The IGCSE class is investigating the motion of a mass hanging on a spring.

Fig. 1.1 shows the apparatus

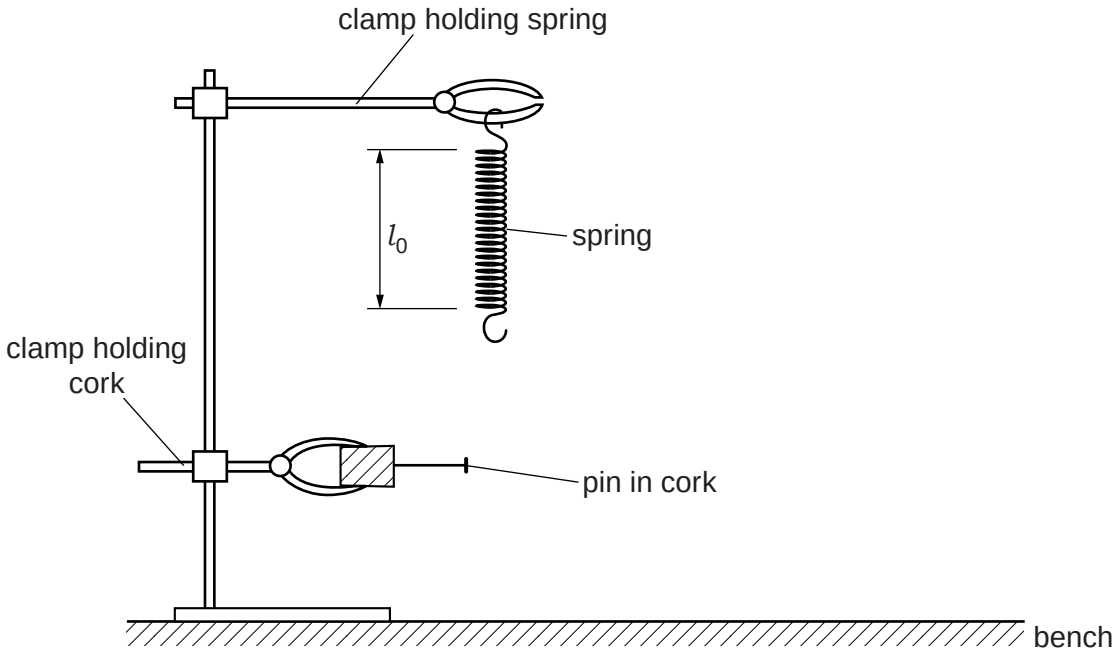


Fig. 1.1

(a) On Fig. 1.1, measure the length l_0 of the unstretched spring, in mm.

l_0 = ... mm [1]

(b) The diagram is drawn one tenth of actual size. Write down the actual length L_0 of the unstretched spring, in mm.

L_0 = ...mm [1]

A student hangs a 300 g mass on the spring and measures the new length L of the spring.

L = 255 mm .....

(i) Calculate the extension e of the spring using the equation $e = (L - L_0)$.

e = ...mm

(ii) Calculate a value for the spring constant k using the equation $k = \frac{F}{e}$, where F = 3.0 N. Include the appropriate unit.

k = ...
[2]

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(c) The student adjusts the position of the lower clamp so that the pin is level with the bottom of the mass when the mass is not moving. She pulls the mass down a short distance and releases it so that it oscillates up and down. Fig. 1.2 shows one complete oscillation.

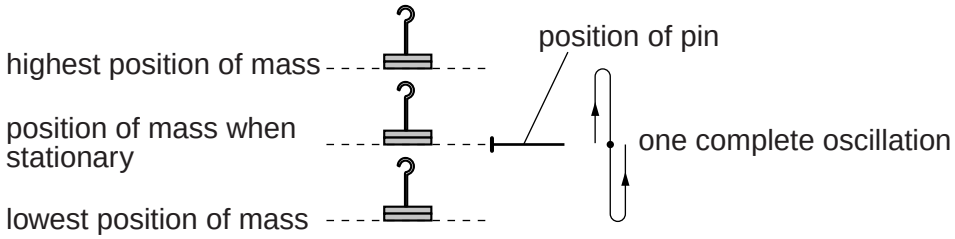


Fig. 1.2

She measures the time *t* taken for 20 complete oscillations.

t = 26.84 s

Calculate the time *T* taken for one complete oscillation.

T = ... [1]

(d) She replaces the 300 g mass with a 500 g mass. She repeats the timing as described in part **(c)**.

t = 34.48 s

(i) Calculate the time *T* taken for one complete oscillation.

T = ...

(ii) The student suggests that the time taken for the oscillations of the spring should not be affected by the change in mass.

State whether her results support this suggestion and justify your answer by reference to the results.

statement .....

justification .....

.....

.....

[2]

(e) Explain briefly how you avoid a line-of-sight (parallax) error when measuring the length of a spring in this type of experiment. You may draw a diagram.

.....

.....

.....[1]

[Total: 8]

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2 A student carries out an experiment to compare how quickly thermal energy is conducted along rods made from different metals. Each rod is heated at one end with a Bunsen burner flame.

Each rod carries a marker held on the rod with a little wax. When the wax melts, the marker falls.

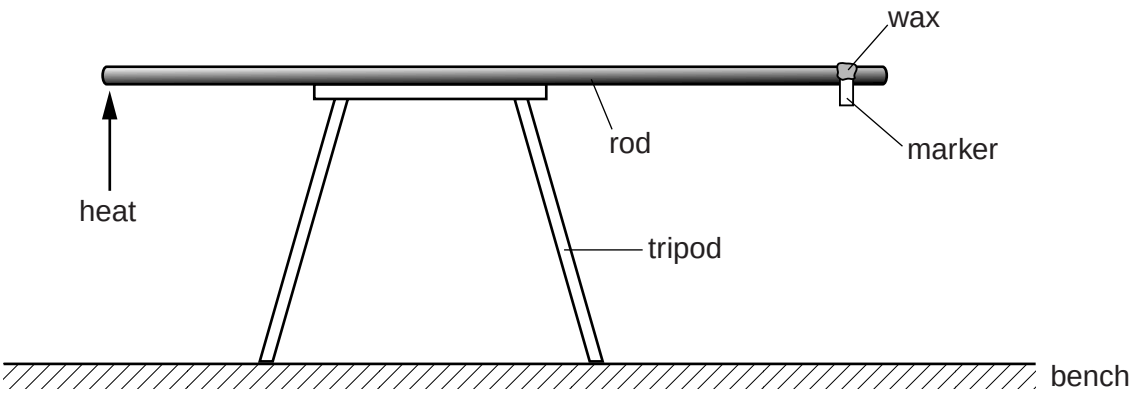


Fig. 2.1

(a) One other piece of equipment is required to compare how quickly thermal energy is conducted. Name this piece of equipment.

.....[1]

(b) Suggest **three** possible variables that the student should keep constant in order to make a fair comparison between the different metals.

1. .....

2. .....

3. .....

[3]

(c) Another student suggests that it would be helpful to measure the temperatures at both ends of the rod. He suggests using a liquid-in-glass thermometer, normally used for measuring the temperature of hot water.

Suggest two reasons why a liquid-in-glass thermometer is **not** suitable.

1. .....

2. .....

[2]

[Total: 6]

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[Turn over

3 The IGCSE class is investigating the cooling of a thermometer bulb under different conditions.

A student places a thermometer in a beaker of hot water, as shown in Fig. 3.1.

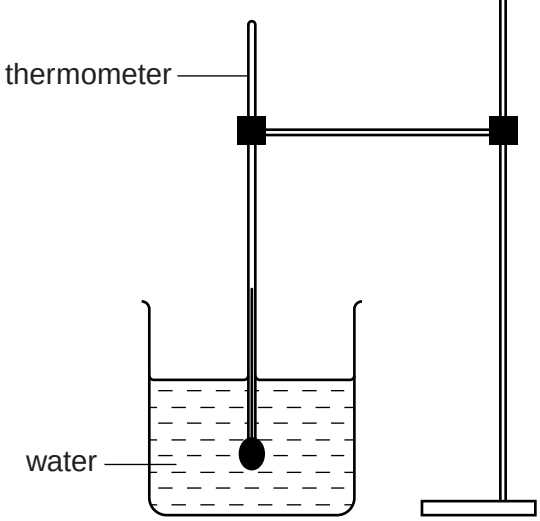


Fig. 3.1

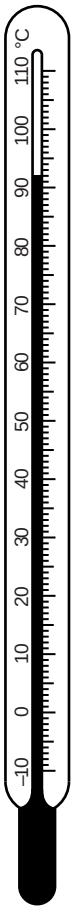


Fig. 3.2

(a) Write down the temperature θ_H of the hot water, as shown on the thermometer in Fig. 3.2.

θ_H ..... [1]

(b) The student removes the thermometer from the beaker of water. He immediately starts a stopclock. He records the temperature θ every 30 s. The readings are shown in Table 3.1.

Table 3.1

	without insulation	with insulation
t/	θ/	θ/
30	78	84
60	71	79
90	67	76
120	65	74
150	63	73

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He replaces the thermometer in the beaker of hot water and records its temperature.

θ_H ..... 90 °C

He removes the thermometer from the beaker of hot water and places it in a beaker containing only dry cotton wool. The thermometer bulb is completely surrounded by cotton wool. He immediately starts a stopclock, and records the temperature θ every 30 s. The readings are shown in Table 3.1.

(i) Complete the column headings in the table. [1]

(ii) State whether the cotton wool insulation increases, decreases, or has no significant effect on the rate of cooling of the thermometer bulb, compared with the rate of cooling with no insulation. Justify your answer by reference to the results.

statement .....

justification .....

.....

[2]

(c) Suggest two conditions that should be kept constant when this experiment is repeated.

1. .....

.....

2. .....

.....

[2]

[Total: 6]

4 The IGCSE class is investigating the resistance of a lamp filament.

The circuit is shown in Fig. 4.1.

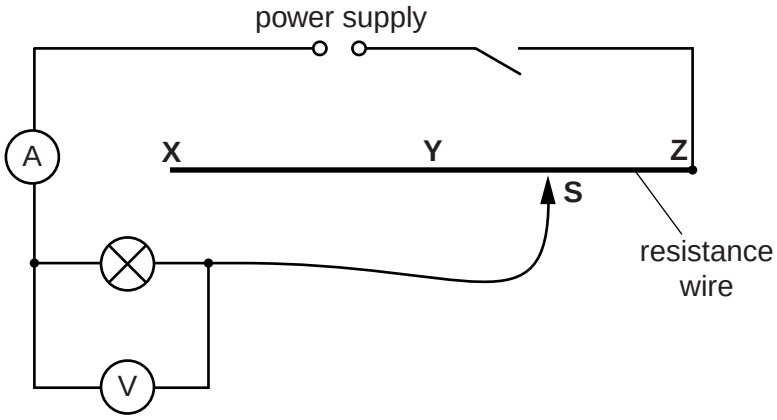


Fig. 4.1

(a) A student connects the sliding contact **S** to point **X** in the circuit. She measures the potential difference *V* across the lamp and the current *I* in the circuit. The meters are shown in Fig. 4.2.

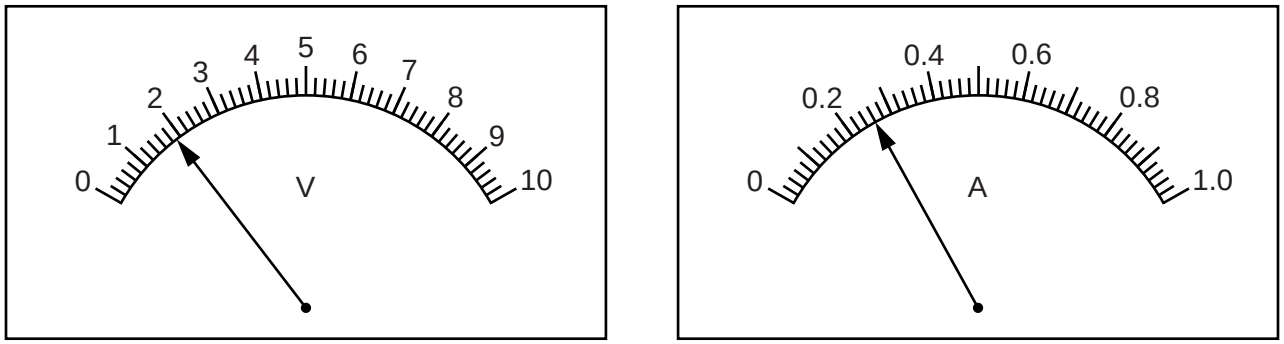


Fig. 4.2

(i) Write down the readings shown on the meters in Fig. 4.2.

V = ...

I = ...
[2]

(ii) Calculate the resistance *R* of the lamp filament using the equation $R = \frac{V}{I}$.

R = ... [2]

(b) The student repeats the steps in **(a)** with the sliding contact **S** at point **Y** and then at point **Z**.

Comment on the effect, if any, on the brightness of the lamp that you would expect to see when the sliding contact is moved from **X** to **Y** to **Z**.

.....

.....[1]

(c) The student moves the sliding contact **S** back to point **X**.

Suggest one practical reason why the new meter readings might be slightly different from those shown in Fig. 4.2.

.....

.....[1]

(d) Another student carries out the experiment using a different lamp. He takes readings using various lengths of resistance wire in the circuit. He plots a graph of V/V against I/A.

Fig. 4.3 is a sketch of the graph.

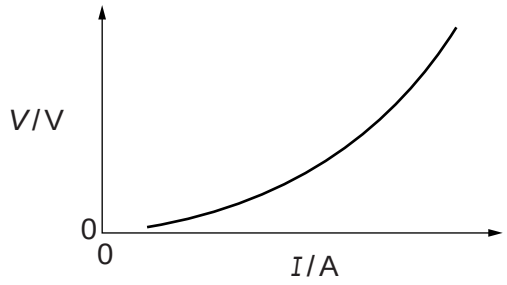


Fig. 4.3

State whether the graph shows that the resistance increases, decreases or remains constant as the current increases. Justify your conclusion by reference to the graph.

The resistance ..... .

justification .....

.....
[2]

[Total: 8]

5 The IGCSE class is investigating reflection using a plane mirror.

Fig. 5.1 shows a student's ray-trace sheet with a line **MR** drawn on it. In the experiment the reflecting face of a mirror is placed vertically on the line **MR**. The additional dashed line shows a second mirror position.

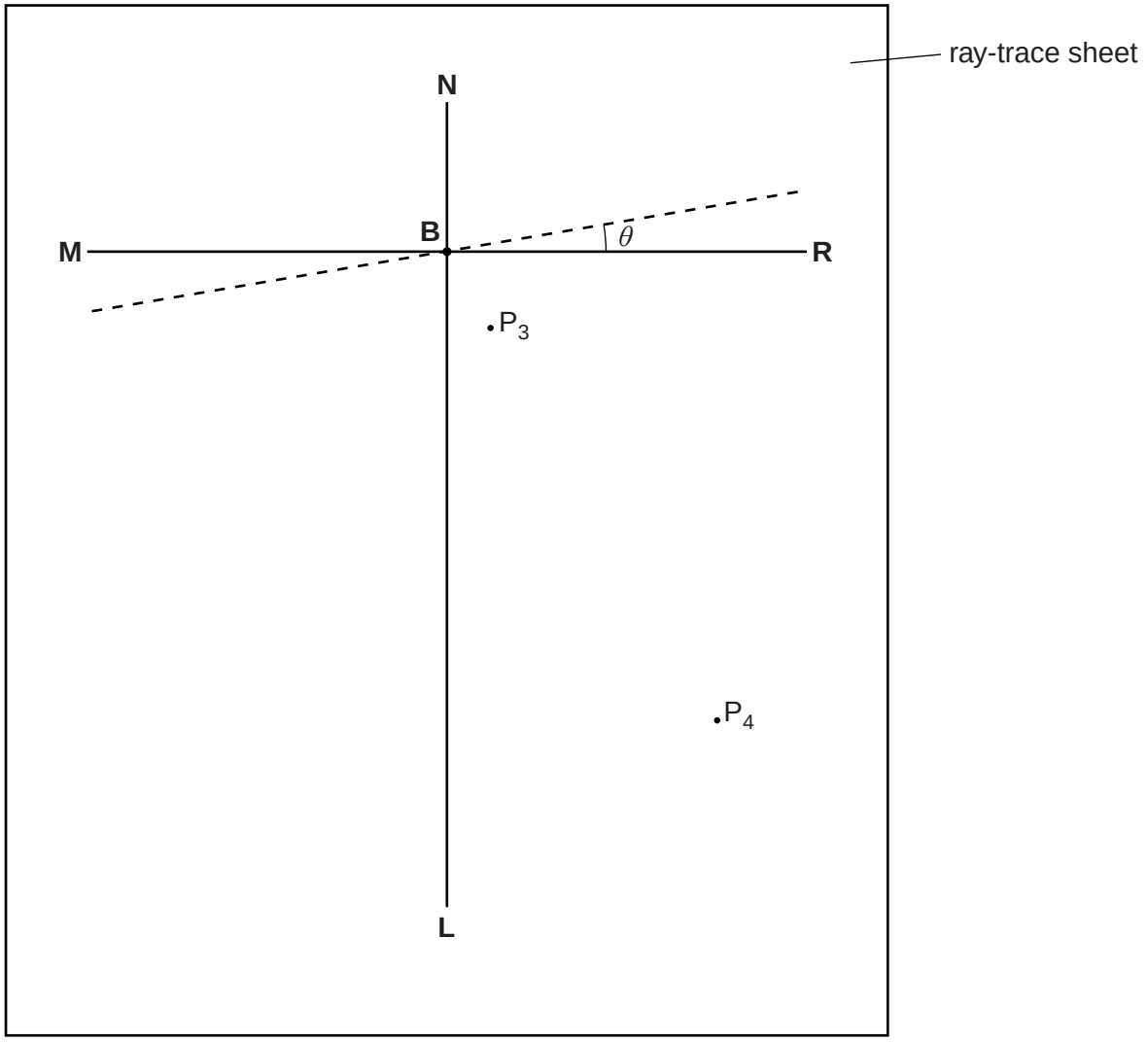


Fig. 5.1

(a) **NL** is a normal to line **MR**. Draw a line 8.0 cm long from **B** at an angle of incidence $i = 30°$ to the normal, below **MR** and to the left of the normal. Label the end of this line **A**. [1]

(b) The student places two pins, P_1 and P_2, on line **AB** a suitable distance apart for this ray tracing experiment. He views the images of pins P_1 and P_2 in the mirror and places two pins P_3 and P_4 so that pins P_3 and P_4, and the images of P_2 and P_1, all appear exactly one behind the other. The positions of P_3 and P_4 are shown in Fig. 5.1.

(i) Draw the line joining the positions of P_3 and P_4. Extend the line until it meets **NL**.

(ii) Measure the angle α_0 between **NL** and the line joining the positions of P_3 and P_4. At this stage the angle θ between the mirror and line **MR** is 0°.

α_0 = ...
[2]

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(c) The student draws lines at angles θ = 10°, 20°, 30°, and 40° to **MR**. The first line, at 10° to **MR**, is shown in Fig. 5.1. He repeats the procedure described in part **(b)**, placing the mirror on each of the new lines in turn. The readings are shown in Table 5.1.

Table 5.1

θ/°	α/°
10	51
20	69
30	90
40	111
50	130

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

[5]

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

G = ... [2]

(e) In this experiment, when the mirror is moved though an angle θ, the reflected ray moves through an angle $(\alpha - \alpha_0)$.

Table 5.2

θ/°	α/°	$(\alpha - \alpha_0)$/°
10	51	
20	69	
30	90	
40	111	
50	130	

(i) Complete Table 5.2.

(ii) Suggest the relationship between $(\alpha - \alpha_0)$ and θ. You may express the relationship in words or as an equation.

.....

.....
[1]

(f) State **one** precaution, to improve accuracy, which you would take in this experiment.

.....

.....[1]

[Total: 12]

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