UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0199664493

PHYSICS **0625/61**

Paper 6 Alternative to Practical **October/November 2010**

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 in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

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1	
2	
3	
4	
5	
Total	

This document consists of **10** printed pages and **2** blank pages.

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1 A student is determining the position of the centre of mass of an object using a balancing method.

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Fig. 1.1 shows the apparatus used.

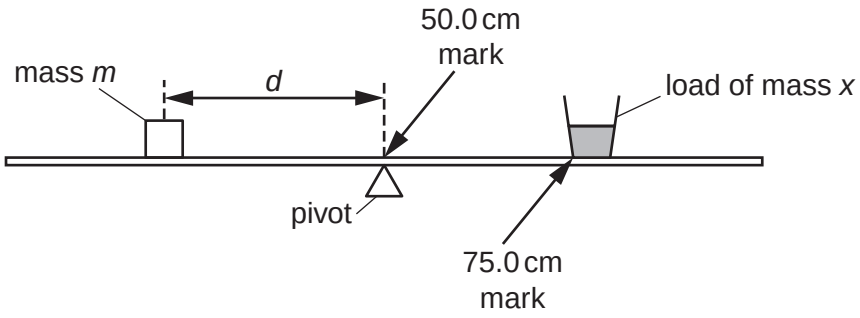


Fig. 1.1

A load of mass *x* is taped to the metre rule so that one side of the base is exactly on the 75.0 cm mark. The student places a mass *m* of 30 g on the rule and adjusts its position so that the rule is as near as possible to being balanced with the 50.0 cm mark exactly over the pivot, as shown in Fig. 1.1.

The student records the distance *d* from the centre of the 30 g mass to the 50.0 cm mark on the rule. He then repeats the procedure using different masses. The readings are shown in Table 1.1.

Table 1.1

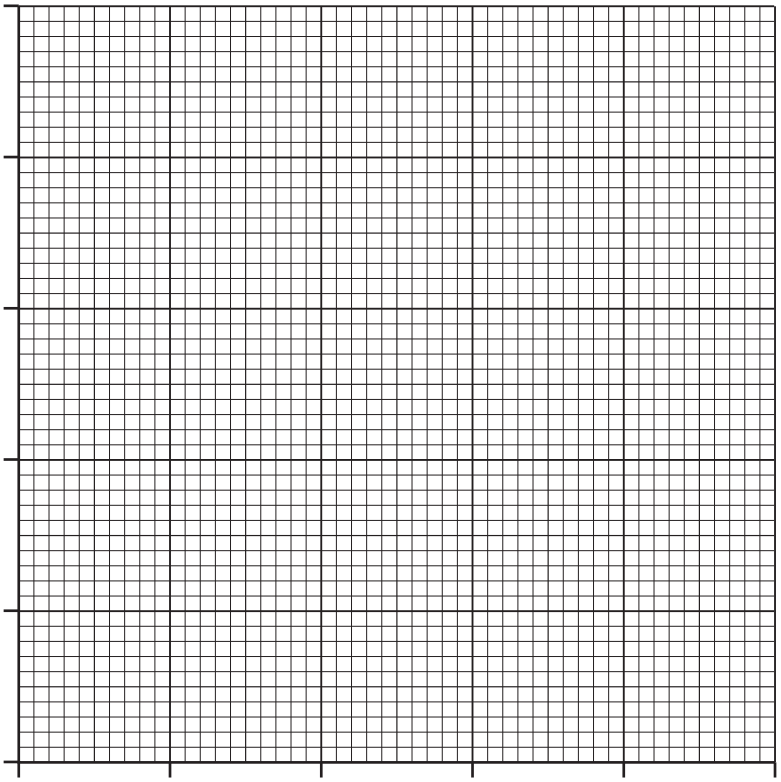
m/g	*d*/cm	$\frac{1}{d}\Big/\frac{1}{\text{cm}}$
30	45.0	
40	34.0	
50	27.0	
60	22.5	
70	19.3	

(a) For each value of *d*, calculate 1/*d* and enter the values in the table. [2]

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(b) Plot a graph of m/g (y-axis) against $\frac{1}{d} \Big/ \frac{1}{\text{cm}}$ (x-axis).

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[4]

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

G = ...[2]

(d) Determine the horizontal distance z from the 75.0 cm mark on the rule to the centre of mass of the load using the equation

$$z = \frac{G - k}{x},$$

where k = 1250 g cm and x = 50 g.

z = ... [2]

[Total: 10]

2 The IGCSE class is investigating the rate of heating and cooling of a thermometer bulb.

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The apparatus used is shown in Fig. 2.1.

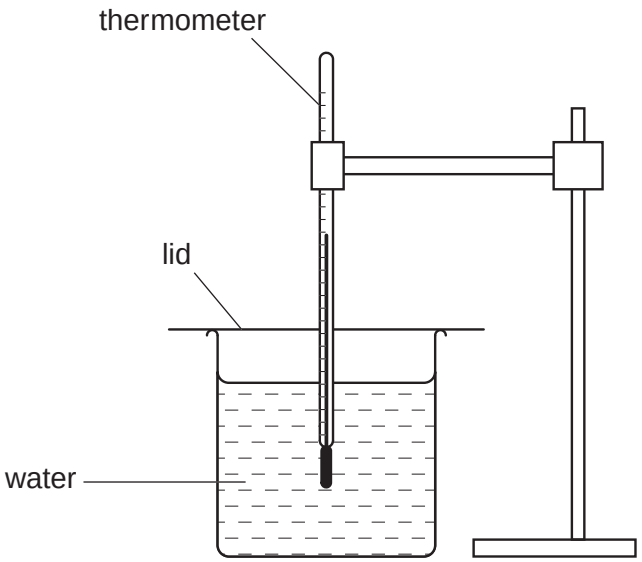
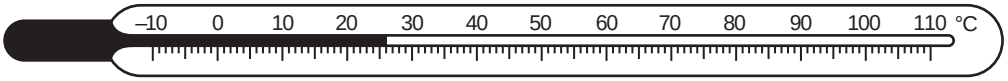


Fig. 2.1

(a) Record the room temperature θ_r shown on the thermometer.



θ_r = ... [1]

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(b) For the cooling experiment, a student places the thermometer into hot water as shown in Fig. 2.1. When the temperature shown on the thermometer stops rising, she records the temperature θ at time t = 0 s. She removes the thermometer from the water, immediately starts a stopclock, and records the temperature shown on the thermometer at 30 s intervals. The readings are shown in Table 2.1.

For the heating experiment, the student takes another thermometer and records the temperature θ shown on the thermometer at time t = 0 s. She places the thermometer in the beaker of hot water, immediately starts the stopclock, and records the temperature shown by the thermometer at 10 s intervals. The readings are shown in Table 2.2.

Table 2.1

t/	θ/
0	74
30	60
60	52
90	45
120	39
150	35
180	33

Table 2.2

t/	θ/
0	25
10	69
20	80
30	81
40	81
50	82
60	82

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

(ii) Estimate the time that would be taken in the cooling experiment for the thermometer to cool from the reading at time t = 0 s to room temperature θ_r.

estimated time = ... [1]

(c) State in which table the initial rate of temperature change is the greater. Justify your answer by reference to your readings.

The initial rate of temperature change is greater in Table .....

justification .....

.....[1]

(d) If one of these experiments were to be repeated in order to determine an average temperature for each time, it would be important to control the conditions. Suggest two such conditions that should be controlled.

1. .....

2. .....[2]

[Total: 6]

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3 The IGCSE class is investigating the current in a circuit when different resistors are connected in the circuit.

The circuit is shown in Fig. 3.1. The circuit contains a resistor **X**, and there is a gap in the circuit between points **A** and **B** that is used for adding extra resistors to the circuit.

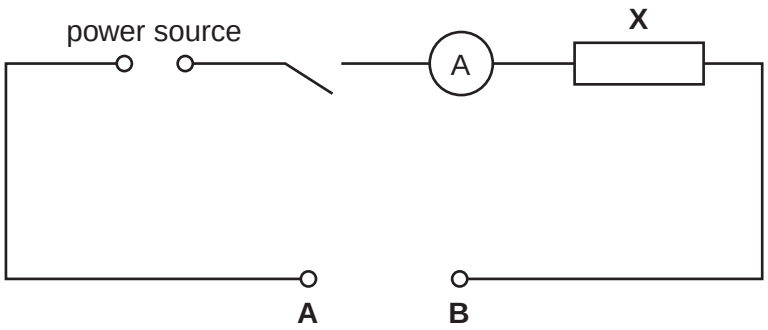


Fig. 3.1

(a) A student connects points **A** and **B** together, switches on and measures the current I_0 in the circuit.

The reading is shown on the ammeter in Fig. 3.2.

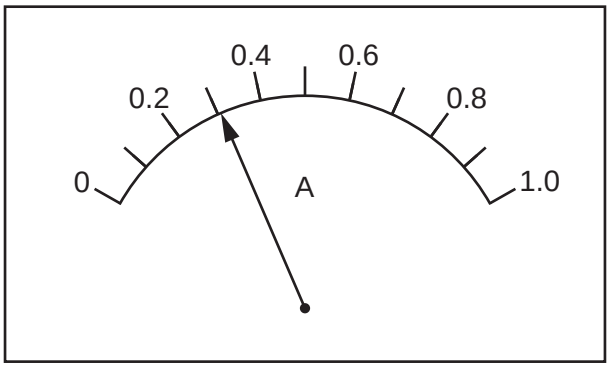


Fig. 3.2

Write down the ammeter reading.

I_0 = ...[1]

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(b) The student connects a 3.3 Ω resistor between points **A** and **B**, switches on and records the current I. He repeats the procedure with a 4.7 Ω resistor and then a 6.8 Ω resistor.

Finally he connects the 3.3 Ω resistor and the 6.8 Ω resistor in series between points **A** and **B**, and records the current I.

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

R /	I /
3.3	0.23
4.7	0.21
6.8	0.18
	0.15

(ii) Write the combined resistance of the 3.3 Ω resistor and the 6.8 Ω resistor in series in the space in the resistance column of the table. [1]

(c) Theory suggests that the current will be 0.5 I_0 when the total resistance in the circuit is twice the value of the resistance of resistor **X**. Use the readings in the table, and the value of I_0 from **(a)**, to estimate the resistance of resistor **X**.

estimate of the resistance of resistor **X** = ...[2]

(d) On Fig. 3.1 draw two resistors in parallel connected between **A** and **B** and also a voltmeter connected to measure the potential difference across resistor **X**. [3]

[Total: 8]

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[Turn over

4 The IGCSE class is investigating the reflection of light by a mirror as seen through a transparent block.

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Fig. 4.1 shows a student's ray-trace sheet.

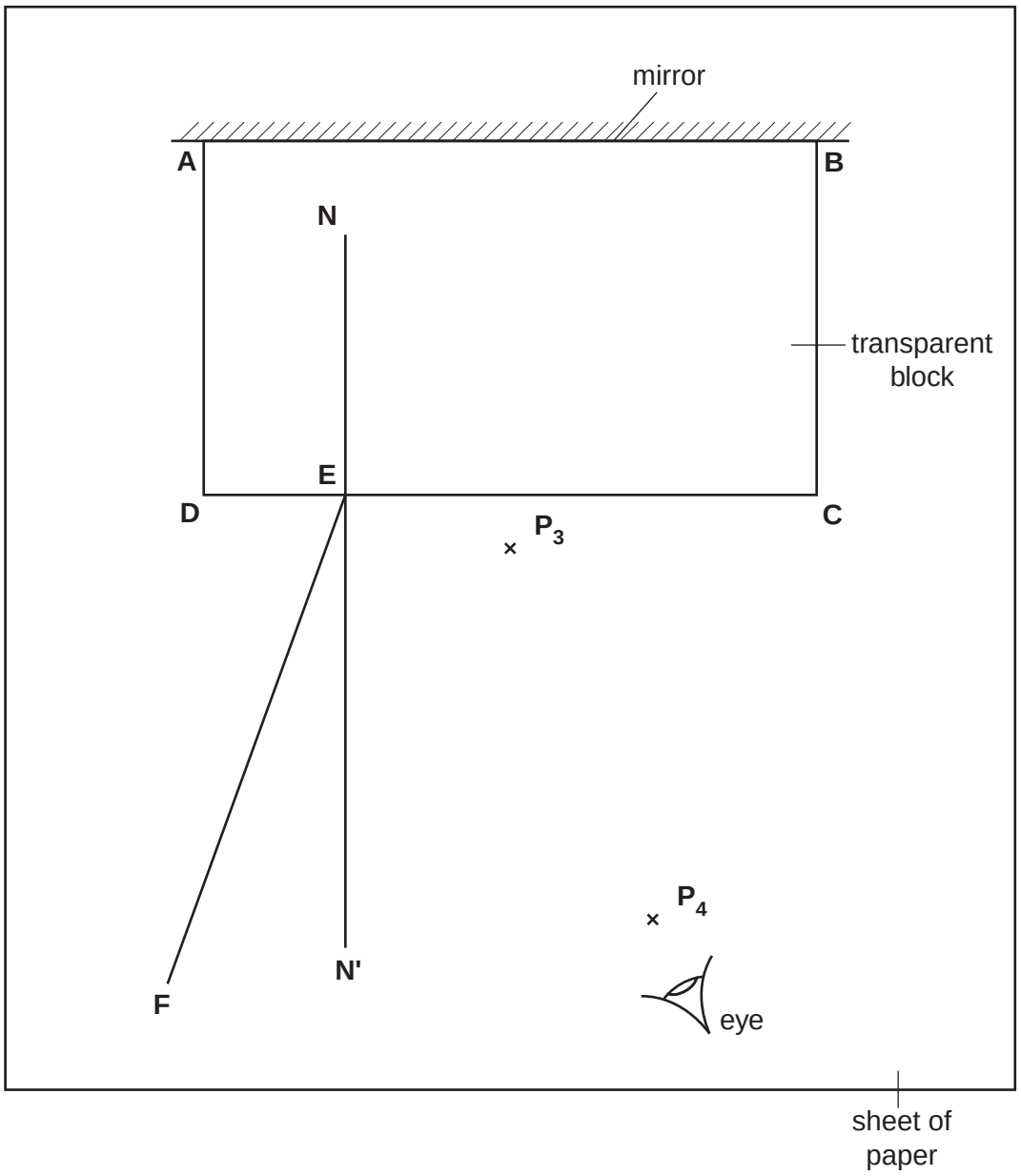


Fig. 4.1

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(a) A student draws the outline of the transparent block **ABCD** on the ray-trace sheet. He draws the normal **NN'** to side **CD**. He draws the incident ray **EF** at an angle of incidence i = 20°. He pushes two pins $\mathbf{P_1}$ and $\mathbf{P_2}$ into line **EF** and places the block on the sheet of paper. He then observes the images of $\mathbf{P_1}$ and $\mathbf{P_2}$ through side **CD** of the block from the direction indicated by the eye in Fig. 4.1 so that the images of $\mathbf{P_1}$ and $\mathbf{P_2}$ appear one behind the other. He pushes two pins $\mathbf{P_3}$ and $\mathbf{P_4}$ into the surface, between his eye and the block, so that $\mathbf{P_3}$, $\mathbf{P_4}$ and the images of $\mathbf{P_1}$ and $\mathbf{P_2}$, seen through the block, appear in line. (The plane mirror along side **AB** of the block reflects the light.)

The positions of $\mathbf{P_3}$ and $\mathbf{P_4}$ are marked on Fig. 4.1.

(i) On line **EF**, mark with neat crosses (x) suitable positions for the pins $\mathbf{P_1}$ and $\mathbf{P_2}$.

(ii) Continue the line **EF** so that it crosses **CD** and extends as far as side **AB**.

(iii) Draw a line joining the positions of $\mathbf{P_4}$ and $\mathbf{P_3}$. Continue the line so that it crosses **CD** and extends as far as side **AB**. Label the point **G** where this line crosses the line from $\mathbf{P_1}$ and $\mathbf{P_2}$. [4]

(iv) Measure the acute angle θ between the lines meeting at **G**.

θ = ...

(v) Calculate the difference $(\theta - 2i)$.

$(\theta - 2i)$ = ... [2]

(b) The student repeats the procedure using an angle of incidence i = 30° and records the value of θ as 62°.

(i) Calculate the difference $(\theta - 2i)$.

$(\theta - 2i)$ = ...

(ii) Theory suggests that $\theta = 2i$. State whether the results support the theory and justify your answer by reference to the results.

statement .....

justification .....

.....[3]

(c) To place the pins as accurately as possible, the student views the bases of the pins. Explain briefly why viewing the bases of the pins, rather than the tops of the pins, improves the accuracy of the experiment.

.....

.....

.....[1]

[Total: 10]

5 The IGCSE class is investigating the time taken for ice cubes to melt when placed in water.

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Each student is able to use
- glass beakers,
- a thermometer,
- a stopclock,
- a measuring cylinder,
- an electronic balance,
- a supply of ice cubes of different sizes,
- a supply of cold water,
- a stirrer,
- a method of heating the water

and any other common laboratory apparatus that may be useful.

A student decides to investigate the effect of the mass of ice cubes on the time they take to melt in water.

(a) Suggest three possible variables that should be kept constant in this investigation.

1. .....

2. .....

3. .....[3]

(b) In the table below, write the names of three items of apparatus that are necessary in order to take readings in this investigation. In the second column of the table write the quantity that the item measures.

item of apparatus	quantity measured

[3]

[Total: 6]

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