UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME											
CENTRE NUMBER							CANDIDATE NUMBER				

0903074458

PHYSICS **0625/51**

Paper 5 Practical Test **October/November 2010**

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: As listed in the Confidential Instructions

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.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **9** printed pages and **3** blank pages.

UNIVERSITY *of* CAMBRIDGE International Examinations

1 In this experiment, you are to determine the position of the centre of mass of an object using a balancing method.

Carry out the following instructions referring to Fig. 1.1.

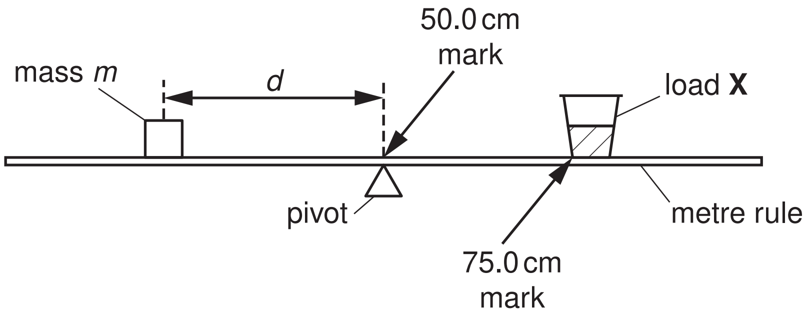

Fig. 1.1

The load **X** has been taped to the metre rule so that one side of the base is exactly on the 75.0 cm mark. Do not move this load.

(a) Place a mass *m* of 30 g on the rule and adjust 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.

(i) Record in Table 1.1 the distance *d* from the centre of the 30 g mass to the 50.0 cm mark on the rule.

(ii) Repeat step **(i)** using masses of 40 g, 50 g, 60 g and 70 g to obtain a total of five sets of readings. Record the readings in the table.

(iii) For each value of *d* calculate $\frac{1}{d}$ and enter the values in the table.

Table 1.1

m/g	d/cm	$\frac{1}{d} \Big/ \frac{1}{\text{cm}}$
30		
40		
50		
60		
70		

[2]

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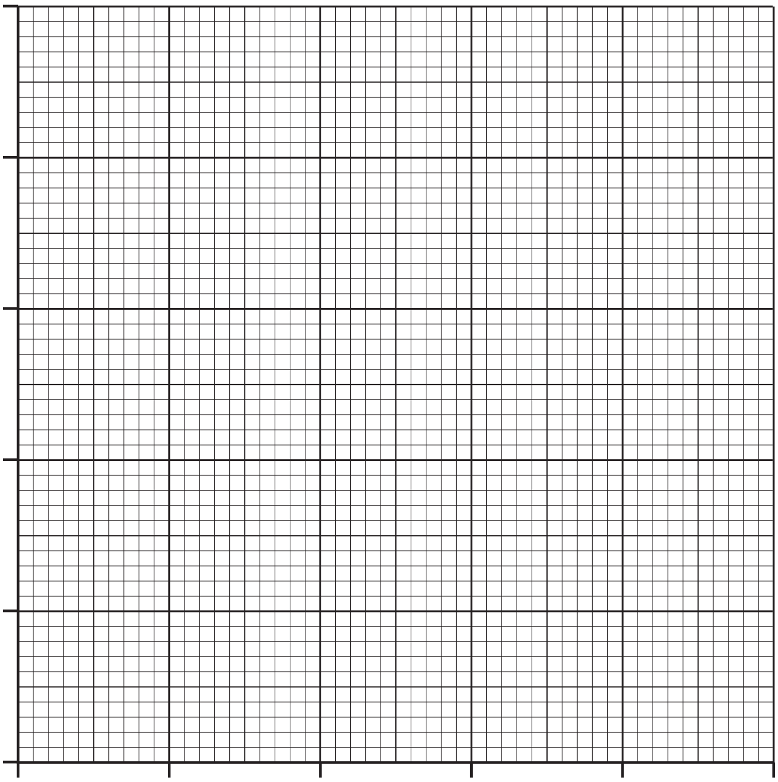
(b) Plot a graph of m/g (y-axis) against $\frac{1}{d}\Big/\frac{1}{\text{cm}}$ (x-axis).



[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 **X** using the equation

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

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

z = ... [2]

[Total: 10]

2 In this experiment you will investigate the rate of heating and cooling of a thermometer bulb.

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Carry out the following instructions referring to Fig. 2.1. You are provided with a beaker of hot water.

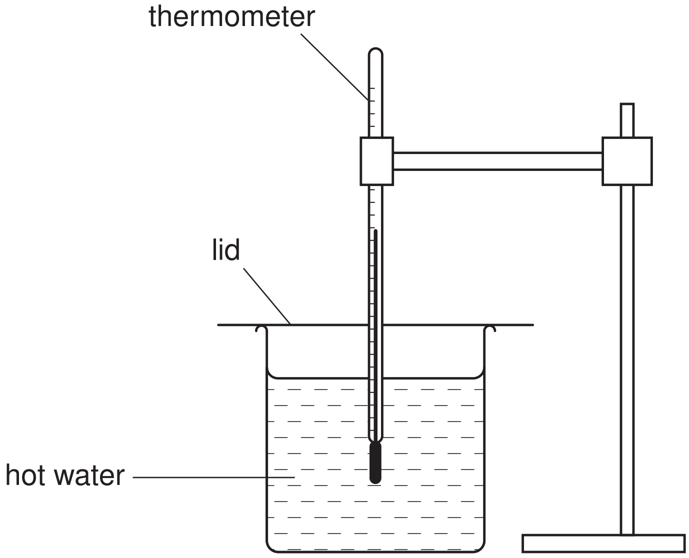

Fig. 2.1

(a) Record the room temperature θ_r.

θ_r = ...[1]

(b) **(i)** Place the thermometer into the water as shown in Fig. 2.1. When the temperature shown on the thermometer stops rising record the temperature θ in Table 2.1 at time $t = 0$ s.

(ii) Remove the thermometer from the beaker of water and immediately start the stopclock. Record in Table 2.1 the temperature shown on the thermometer as it cools in the air. Take readings at 30 s intervals from $t = 30$ s until you have a total of seven values up to time $t = 180$ s. [2]

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(c) **(i)** Set the stopclock back to zero. With the thermometer still out of the beaker, record in Table 2.2 the temperature θ shown on the thermometer at time t = 0 s.

(ii) Replace the thermometer in the beaker of hot water as shown in Fig. 2.1 and immediately start the stopclock. Record in Table 2.2 the temperature shown by the thermometer at 10 s intervals until you have a total of seven values up to time t = 60 s. [2]

Table 2.1

t/	θ/

Table 2.2

t/	θ/

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

(e) Estimate the time that would be taken in part **(b)** for the thermometer to cool from the reading at time t = 0 s to room temperature θ_r.

estimated time = ... [1]

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

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

justification ....

....[1]

(g) If this experiment 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: 10]

3 In this experiment, you will investigate the current in a circuit when different resistors are connected in the circuit.

The circuit provided contains a resistor **X**. There is a gap in the circuit between points **A** and **B** to be used for adding extra resistors, of resistance *R*, to the circuit.

(a) Draw a circuit diagram of the circuit using standard symbols.

[3]

(b) Connect points **A** and **B** together. Switch on. Measure the current I_0 in the circuit.

I_0 = ...

Switch off and separate points **A** and **B**. [1]

(c) **(i)** Connect the 3.3 Ω resistor between points **A** and **B**. Switch on and record in Table 3.1 the current I. Switch off and disconnect the resistor from between **A** and **B**.

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(ii) Repeat the steps in part **(c)(i)** with each of the other two extra resistors.

(iii) Repeat the steps in part **(c)(i)** with the 3.3 Ω and 6.8 Ω resistors connected in series with each other.

(iv) Complete the column headings in the table.

[4]

Table 3.1

R/	I/
3.3	
4.7	
6.8	
10.1	

(d) 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 **X**. Use the readings in the table to estimate the resistance of **X**.

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

[Total: 10]

4 In this experiment you will investigate reflection of light through a transparent block.

Carry out the following instructions referring to Fig. 4.1.

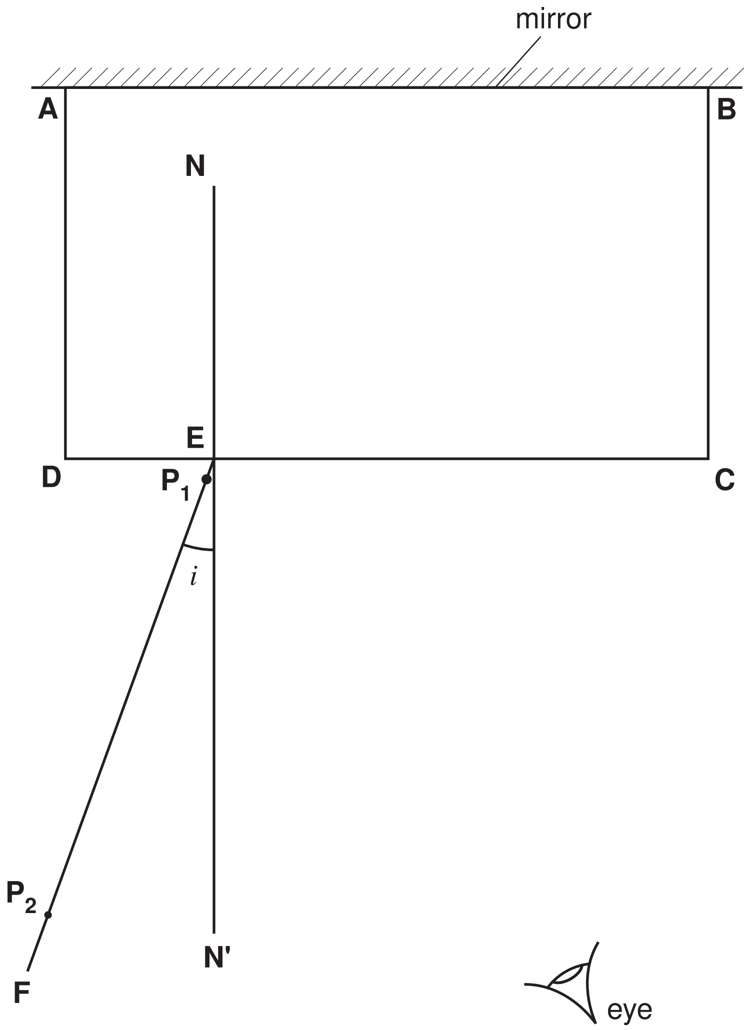

Fig. 4.1

(a) Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be on the top half of the paper. Draw the outline of the block and label it **ABCD**.

(b) Remove the block and draw the normal **NN'** to side **CD** so that the normal is 2.0 cm from **C**. Label the point **E** where **NN'** crosses **CD**.

(c) Draw the line **EF** at an angle of incidence $i = 20°$ as shown in Fig. 4.1.

(d) Place the paper on the pin board. Stand the plane mirror vertically and in contact with face **AB** of the block as shown in Fig. 4.1.

(e) Push two pins $\mathbf{P_1}$ and $\mathbf{P_2}$ into line **EF**. Pin $\mathbf{P_1}$ should be about 1 cm from the block and pin $\mathbf{P_2}$ some distance from the block.

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(f) Replace the block and observe 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.

Push two pins $\mathbf{P_3}$ and $\mathbf{P_4}$ into the surface, between your 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.

Mark the positions of $\mathbf{P_1}$, $\mathbf{P_2}$, $\mathbf{P_3}$ and $\mathbf{P_4}$. Remove the block.

(g) Continue the line joining the positions of $\mathbf{P_1}$ and $\mathbf{P_2}$ so that it crosses **CD** and extends as far as side **AB**.

(h) Draw a line joining the positions of $\mathbf{P_3}$ and $\mathbf{P_4}$. 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 $\mathbf{P_2}$.

(i) Remove the pins, block and mirror from the ray trace sheet. Measure the acute angle θ between the lines meeting at **G**.

θ = ... [1]

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

$(\theta - 2i)$ = ... [1]

(k) Repeat steps **(c)** to **(j)** using an angle of incidence i = 30°.

θ = ...

$(\theta - 2i)$ = ... [1]

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

statement ....

justification ....

....[2]

Tie your ray trace sheet into this Booklet between pages 8 and 9. [5]

[Total: 10]

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