UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0625/53**

Paper 5 Practical Test **October/November 2013**

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.
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.

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1	
2	
3	
4	
Total	

This document consists of **11** printed pages and **1** blank page.

DC (CW/SW) 65166/4

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International Examinations

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1 In this experiment, you will measure the capacity of a drinks cup by three methods. The capacity of a cup is the **maximum** volume of liquid that it will hold in normal use.

You have been supplied with a cup on which the maximum level **MAX** is marked both inside and out, as shown in Fig. 1.1. Do not fill the cup beyond this level.

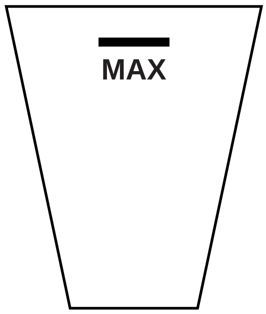

Fig. 1.1

(a) Method 1
In Method 1, the capacity V_1 is determined from the mass of water in the cup.

(i) Fill the cup to the marked level with water.

(ii) Place the cup, containing the water, on the balance.

Read and record its mass m.

m = ... g [1]

(iii) Leave the water in the cup for the next experiment.

(iv) Calculate a value for the capacity V_1, using your reading from **(a)(ii)** and the equation $V_1 = \frac{m}{\rho}$, where $\rho = 1.00\,\text{g/cm}^3$.

V_1 = ... [2]

(b) Method 2
In Method 2, the capacity V_2 is measured directly from the volume of water in the cup.

(i) Carefully tip the water into the measuring cylinder.

(ii) Read and record the volume V_2 of the water in the measuring cylinder.

V_2 = ... [1]

(c) Method 3

In Method 3, the capacity V_3 is estimated using the average diameter of the cup and considering the cup as an approximate cylinder.

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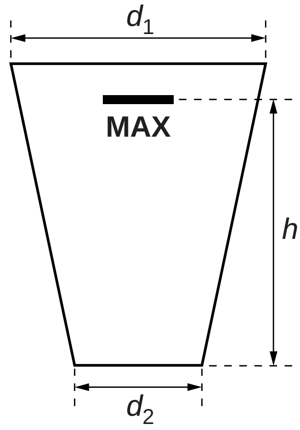

Fig. 1.2

(i) Measure and record the diameter d_1 of the top of the cup, as shown in Fig. 1.2.

d_1 = ... cm

(ii) Measure and record the diameter d_2 of the base of the cup.

d_2 = ... cm

(iii) Measure and record the height h from the base to the marked level **MAX**.

h = ... cm
[1]

(iv) Calculate the average diameter D using your readings from **(c)(i)** and **(c)(ii)**, and the equation $D = \frac{(d_1 + d_2)}{2}$.

D = ...

(v) Calculate an approximate value for the capacity V_3, using your results from **(c)(iii)** and **(c)(iv)** and the equation $V_3 = \frac{\pi D^2 h}{4}$.

V_3 = ...
[2]

(d) State a possible practical source of inaccuracy in **Method 2** and a possible practical source of inaccuracy in **Method 3**.

Method 2 ....

....

Method 3 ....

....
[2]

(e) State an additional measurement which could be taken to give a more accurate result in **Method 1**.

....

....[1]

[Total: 10]

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2 In this experiment, you will investigate methods of preventing loss of thermal energy.

You are provided with two beakers labelled **A** and **B**. Beaker **A** has a layer of insulation. Do not remove this insulation. Beaker **B** has a lid but no insulation. You are also provided with a supply of hot water.

Carry out the following instructions, referring to Fig. 2.1.

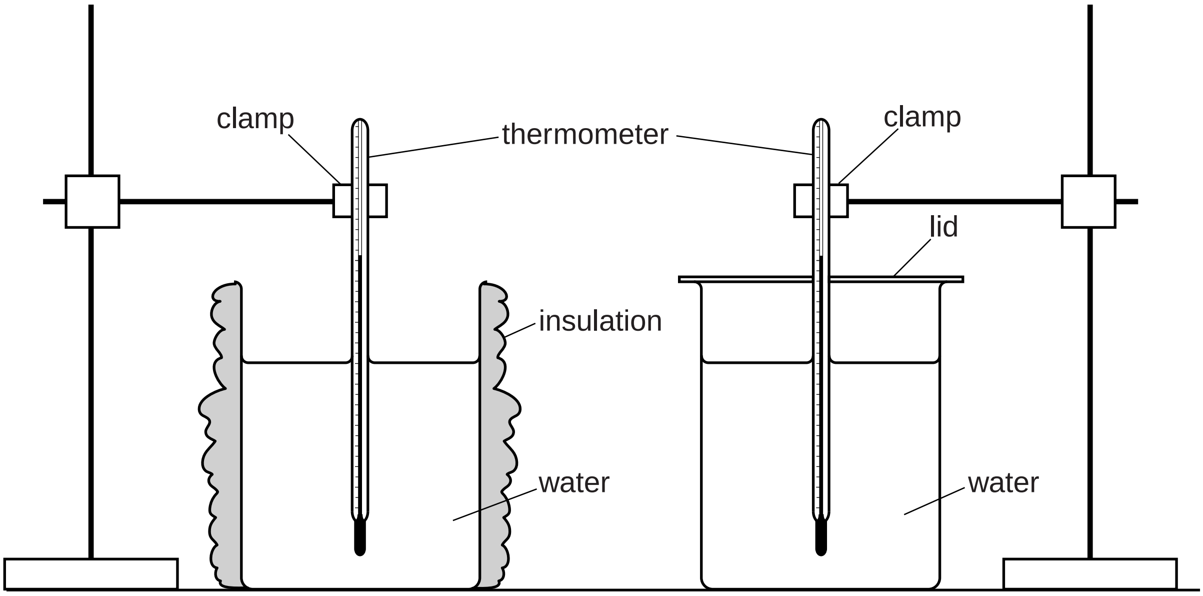

Fig. 2.1

(a) (i) Pour approximately 200 cm^3 of hot water into beaker **A**.

(ii) Place the thermometer into the water. When the reading has stopped rising, measure the initial temperature of the hot water in the beaker and, at the same time, start the stopclock.
Record this temperature at time t = 0 s in the first row of Table 2.1.

(iii) Measure, and record in the table, the temperature of the hot water at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s.

(iv) Remove the lid from beaker **B** and pour approximately 200 cm^3 of hot water into the beaker. Replace the lid.

(v) Repeat steps **(a)(ii)** and **(a)(iii)** for beaker **B**.

(vi) Complete the column headings and enter the values of *t* in the table.

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Table 2.1

	beaker **A**	beaker **B**
t /	θ /	θ /

[5]

(b) State from which beaker, if any, the rate of loss of thermal energy is the greater. Justify your answer by referring to your results.

beaker ....

justification ....

....

....
[2]

(c) State one condition that should be controlled to ensure that the comparison between beaker **A** and beaker **B** is a fair one.

....

.... [1]

(d) A student points out that the experiment does not test the effectiveness of insulation in reducing thermal energy loss.

Suggest a change to this experiment which could be made so that the effect of insulation could be investigated. Explain why this change would help.

suggestion ....

....

explanation ....

....

....
[2]

[Total: 10]

3 In this experiment, you will investigate the current and potential difference in an electrical circuit.

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The circuit has been set up for you.

Carry out the following instructions, referring to Fig. 3.1.

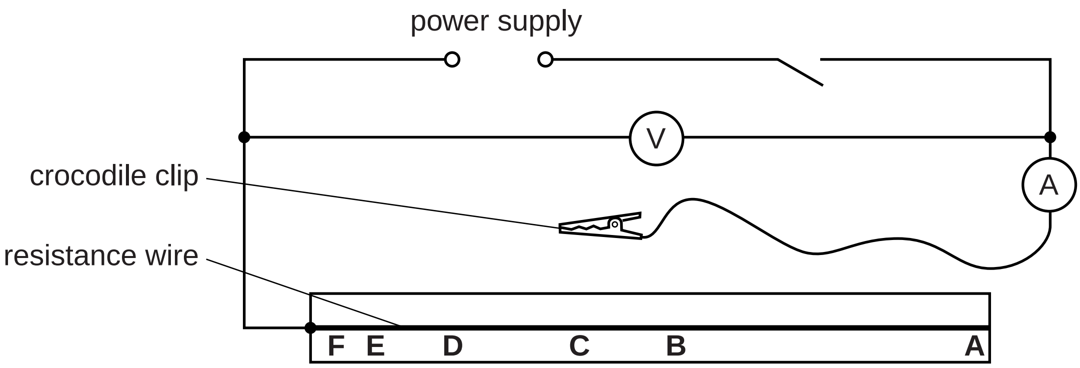

Fig. 3.1

(a) **(i)** Connect the crocodile clip to the resistance wire at the position labelled **A**.

(ii) Switch on.
Read and record in Table 3.1, the potential difference *V* and the current *I*.
Switch off.

(iii) Repeat step **(a)(ii)** with the crocodile clip at positions **B**, **C**, **D**, **E** and **F**.

Table 3.1

position	*V* / V	*I* / A
A		
B		
C		
D		
E		
F		

[2]

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(b) Plot a graph of *V* / V (*y*-axis) against *I* / A (*x*-axis).

[4]

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

M = ... [2]

(ii) The gradient *M* is numerically equal to the resistance *R* of the power supply.

Write down the resistance *R* to a suitable number of significant figures for this experiment.

R = ... [2]

[Total: 10]

4 In this experiment, you will investigate the reflection of light by a plane mirror.

Carry out the following instructions, referring to Fig. 4.1.

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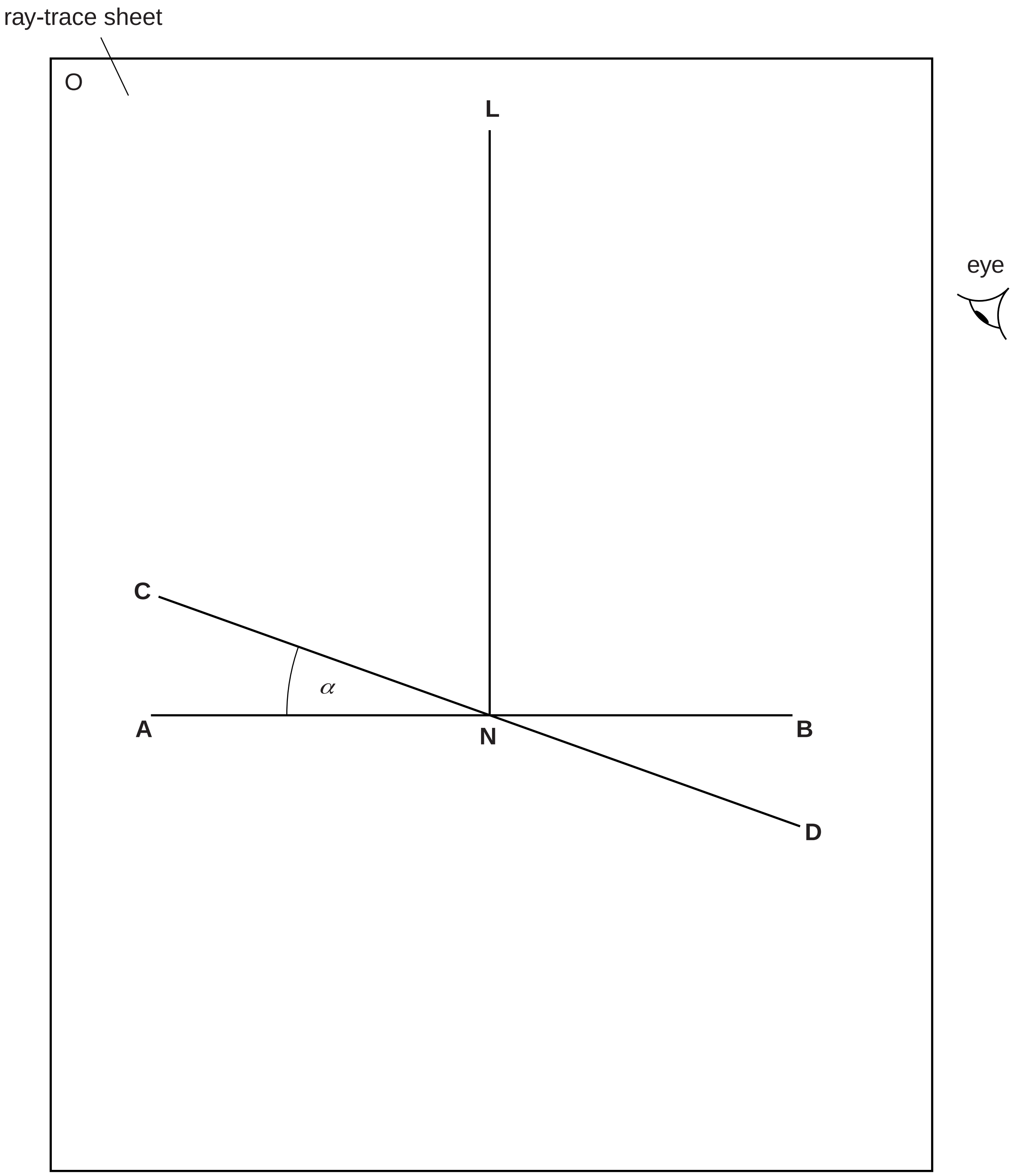

Fig. 4.1

For Examiner's Use

(a) Draw a line about 8 cm from the bottom of your ray-trace sheet. Label this line **AB**.
Mark a point **N**, near the centre of **AB**.
Draw a normal to **AB** at point **N**. Label the other end of this normal **L**.

(b) Draw a line **CD** passing through **N** and at an angle α to **AB** where $\alpha = 20°$.

(c) Place two pins P_1 and P_2 some distance apart on line **LN**.
Label the positions of P_1 and P_2.

(d) Place the mirror on line **CD** and view the images of P_1 and P_2 from the direction indicated by the eye in Fig. 4.1.

Place two pins P_3 and P_4 some distance apart so that the images of P_1 and P_2, and the pins P_3 and P_4, all appear exactly one behind the other.
Label the positions of P_3 and P_4.

(e) Remove the mirror and the pins.
Repeat steps **(b)**, **(c)** and **(d)** for an angle $\alpha = 30°$, replacing pins P_1 and P_2 in their original positions in step **(c)**.

(f) Remove the mirror and the pins.

(g) Draw a line passing through the first P_3 and P_4 positions and reaching **AB**.

(h) Measure, and record in Table 4.1, the angle θ between this line and the normal **NL**.

(i) Repeat steps **(g)** and **(h)** for the second set of P_3 and P_4 positions.

Table 4.1

α / °	θ / °
20	
30	

[1]

(j) A student suggests that θ should always be equal to 2α.

State whether your experimental results support this idea. Justify your answer with reference to the results.

statement ....

....

justification ....

....

....

[2]

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(k) Suggest two precautions that could be taken to ensure accurate results from this experiment.

1. ....

....

2. ....

.... [2]

Tie your ray-trace sheet between pages 10 and 11. [5]

[Total: 10]