UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **5054/03**

Paper 3 Practical Test **May/June 2008**

2 hours

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 on all the work you hand in.
Write in dark blue or black pen.
You may use a soft 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.
For each of the questions in Section A, you will be allowed to work with the apparatus for a maximum of 20 minutes. For the question in Section B, you will be allowed to work with the apparatus for a maximum of 1 hour.
You are expected to record all your observations as soon as these observations are made.
An account of the method of carrying out the experiments is **not** required.

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 **8** printed pages and **4** blank pages.

Section A

Answer **all** questions in this section.

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1 *In this experiment you will make measurements on 5 coins in order to determine the density of the material from which the coins are made.*

You have been provided with 5 coins and a 30 cm rule.

(a) (i) Determine the mean thickness t of a coin.

t = ...

(ii) Determine the mean diameter d of the coins.

d = ...

(iii) Explain how you ensured that your answers to **(i)** and **(ii)** were as accurate as possible.

.....

.....

.....

[3]

(b) Calculate the density of the material from which the coins are made using

$$\text{density} = \frac{4m}{\pi d^2 t}$$

where m is the mass of 1 coin, which is given on the card.

density = ... [1]

(c) Explain why your answer in **(b)** is only approximate.

.....

.....

..... [1]

[Total: 5]

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Please turn over for question 2.

2 *In this experiment you will investigate the mixing of hot water with water at room temperature.*

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You have been provided with an empty 100 cm^3 beaker labelled A, a 250 cm^3 beaker containing water at room temperature, a supply of hot water, a 100 cm^3 measuring cylinder, a plastic stirrer, a thermometer and a stand, boss and clamp to hold the thermometer.

(a) (i) Measure the temperature θ_1 of the water at room temperature.

θ_1 = ...

(ii) Pour 50 cm^3 of the water at room temperature into the measuring cylinder.

(iii) Pour hot water into beaker A until the water level reaches the 50 cm^3 mark.

(iv) Place the thermometer in the hot water as shown in Fig. 2.1.

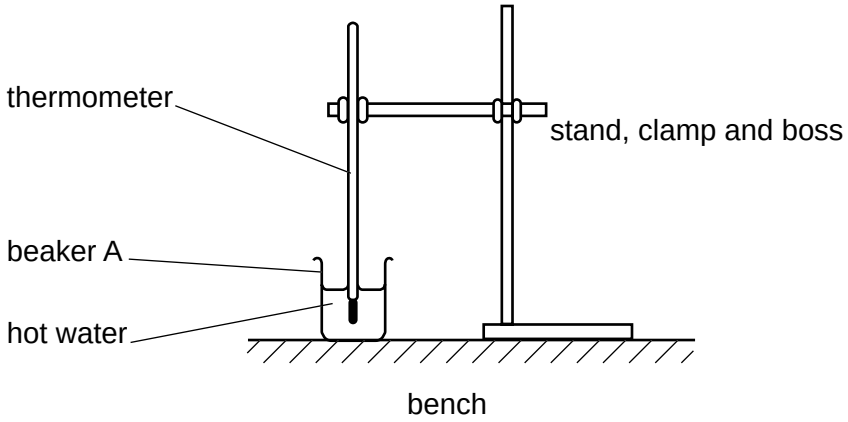

Fig. 2.1

Stir the water. Record the maximum temperature θ_2 shown on the thermometer before the temperature starts to fall.

θ_2 = ...

(v) Immediately pour the 50 cm^3 of water from the measuring cylinder into beaker A. Stir the mixture. The reading on the thermometer will fall quickly at first and then at a slower rate. As soon as it starts to fall at the slower rate, record the temperature θ_3 of the mixture.

θ_3 = ...
[3]

(b) The mass of 50 cm^3 of water is 50 g.
Thermal energy is transferred from the hot water to the water at room temperature.
The amount of the thermal energy transferred is given by the equation
Thermal energy = mass × specific heat capacity × change in temperature.
The specific heat capacity of water = 4.2 J/(g K).

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Calculate

(i) the thermal energy transferred from the hot water,

energy transferred = ...

(ii) the thermal energy transferred to the water that was initially at room temperature.

energy transferred = ...
[1]

(c) Explain why your answers in **(b)** are different.

.....

.....

..... [1]

[Total: 5]

[Turn over

3 *In this experiment you will determine the focal length of a converging lens.*

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You have been provided with a converging lens in a holder, an illuminated cross-wire object, a screen and a metre rule.

(a) Place the illuminated cross-wire object at one end of the metre rule and the screen at the other end. Place the lens between the object and the screen. The arrangement is shown in Fig. 3.1.

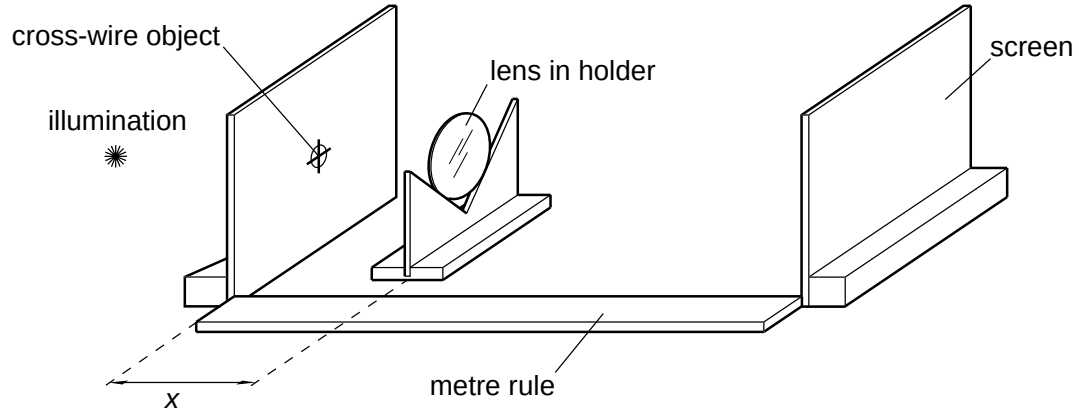

Fig. 3.1

Adjust the position of the lens until a magnified, focussed image of the object is formed on the screen. Measure the distance *x* between the object and the lens.

x = ... [1]

(b) **(i)** State, using your observations, whether the image is upright or inverted.

.....

(ii) Describe the observations that you made.

.....

.....

[1]

(c) Keeping the object and the screen in the same position, move the lens until a diminished, focussed image of the object is formed on the screen. Measure the distance *y* between the object and the lens.

y = ... [1]

(d) Calculate the focal length *f* of the lens using;

$$f = \frac{D^2 - d^2}{4D}$$

where *D* is the distance between the object and the screen and $d = y - x$.

f = ... [2]

[Total: 5]

Section B

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4 *In this experiment, you will investigate how the resistance of a light emitting diode depends on the current in the diode.*

You have been provided with the apparatus shown in Fig. 4.1, together with three resistors whose values are marked on them.

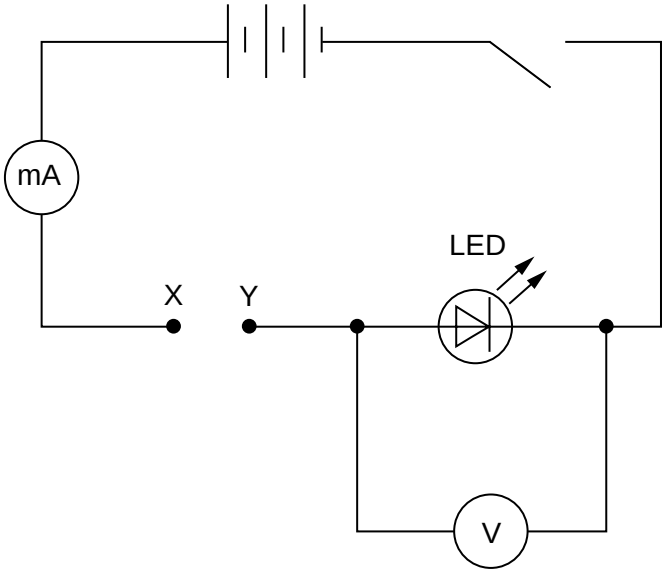


Fig. 4.1

(a) (i) Connect a resistor of resistance R = 270 Ω in the gap between points X and Y.

(ii) Complete the circuit by closing the switch. Measure the current I in the circuit and the potential difference V across the light emitting diode (LED). Open the switch.

I = ...

V = ...
[2]

(b) Calculate the resistance R_{LED} of the LED by using

$$R_{LED} = \frac{V}{I}$$

R_{LED} = ... [2]

(c) Repeat **(a) (ii)** and **(b)** using;

(i) the 330 Ω resistor,

(ii) the 470 Ω resistor,

(iii) different series combinations of the 270 Ω, 330 Ω and 470 Ω resistors, connected between X and Y.

Record your results in the table below. Include your results from **(a) (ii)** and **(b)** in your table.

[4]

(d) Using the grid on the next page plot a graph of R_{LED}/Ω on the *y*-axis against I / mA on the *x*-axis. Draw the best fit line through your plotted points. [4]

(e) Describe how the resistance of the LED depends on the current.

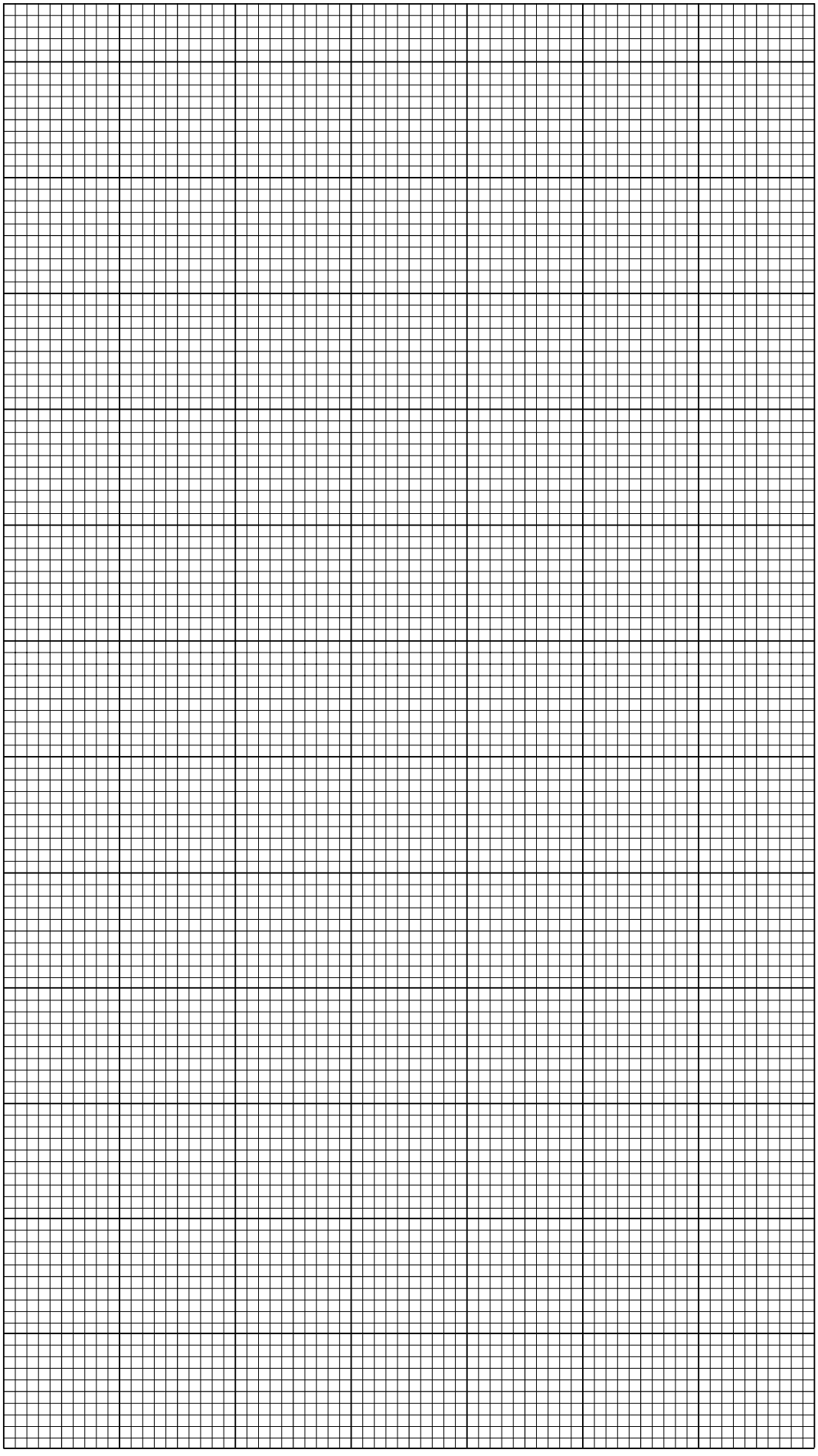
.....

.....

..... [1]

(f) Using the graph, determine the resistance of the LED when the current is 5.0 mA.

resistance = ... [2]



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