UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **5054/42**

Paper 4 Alternative to Practical **May/June 2013**

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 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.

This document consists of **8** printed pages.

UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

1 A student determines the focal length of a lens.

The apparatus is set up as shown in Fig. 1.1.

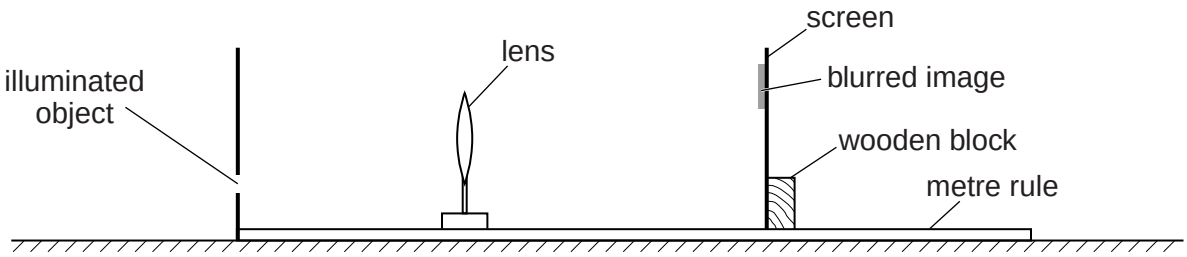


Fig. 1.1 (not to scale)

The illuminated object is fixed at the 0 cm mark on the metre rule.
The perpendicular distance *u* of the object from the lens is fixed at 15.0 cm.

(a) On Fig. 1.1, mark *u* and label it 15.0 cm. [1]

(b) The image on the screen is not clear and the centre of the image is above the centre of the lens.
Explain how the apparatus is adjusted

(i) to produce a focussed image on the screen,

.....

..... [1]

(ii) so that the centre of the image is level with the centre of the lens.

.....

..... [1]

(c) The image on the screen is in focus.
The student measures the distance from the object to the screen.
Fig. 1.2 shows an enlarged view of part of the screen and the metre rule.

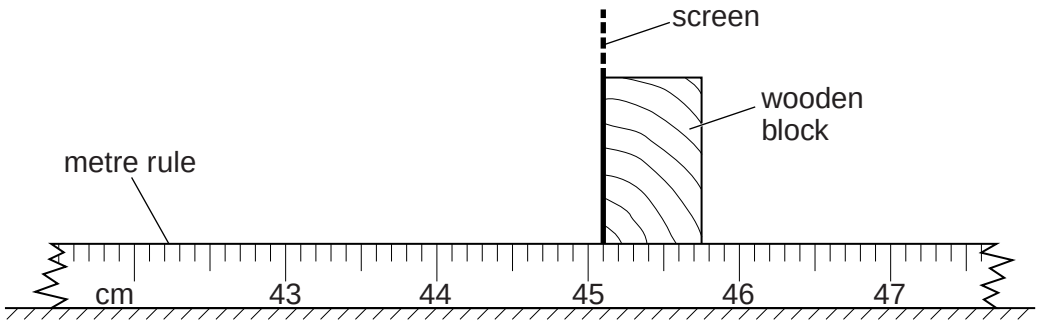


Fig. 1.2

(i) State the reading on the metre rule at the position of the screen.

reading = ... [1]

(ii) Use your answer to **(c)(i)** to calculate the distance v of the image from the lens.

v = ... [1]

For Examiner's Use

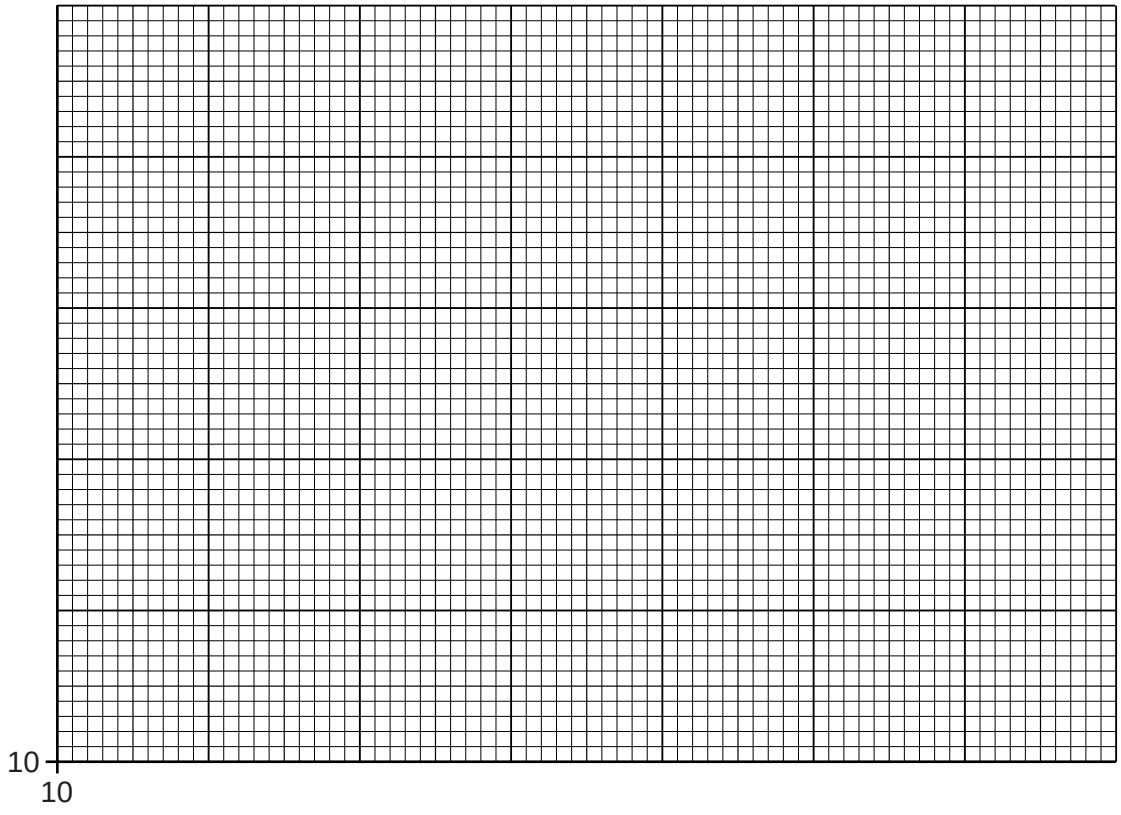
(d) The student repeats the experiment for increasing values of u. The results are recorded in Fig. 1.3.

u / cm	v / cm
20.0	19.8
25.0	16.5
30.0	15.1
35.0	14.2
40.0	13.3

Fig. 1.3

(i) In the spaces in Fig. 1.3, write your value of v from **(c)(ii)** and the corresponding value of u. [1]

(ii) On Fig. 1.4, plot the graph of v / cm on the y-axis against u / cm on the x-axis.
Start your graph from v = 10 cm and u = 10 cm.
Draw a curved line of best fit.



[4]

Fig. 1.4

(e) Suggest two practical techniques that the student uses to make the readings for v as accurate as possible.

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1. .....

.....

2. .....

.....
[2]

(f) When $u = v$, theory shows that the focal length f of the lens is given by $f = u/2$.

Use your graph to determine a value for f.

f = ... [1]

2 A student walks to school. He sketches a distance-time graph of his journey.
Fig. 2.1 shows the first part of the journey.

For Examiner's Use

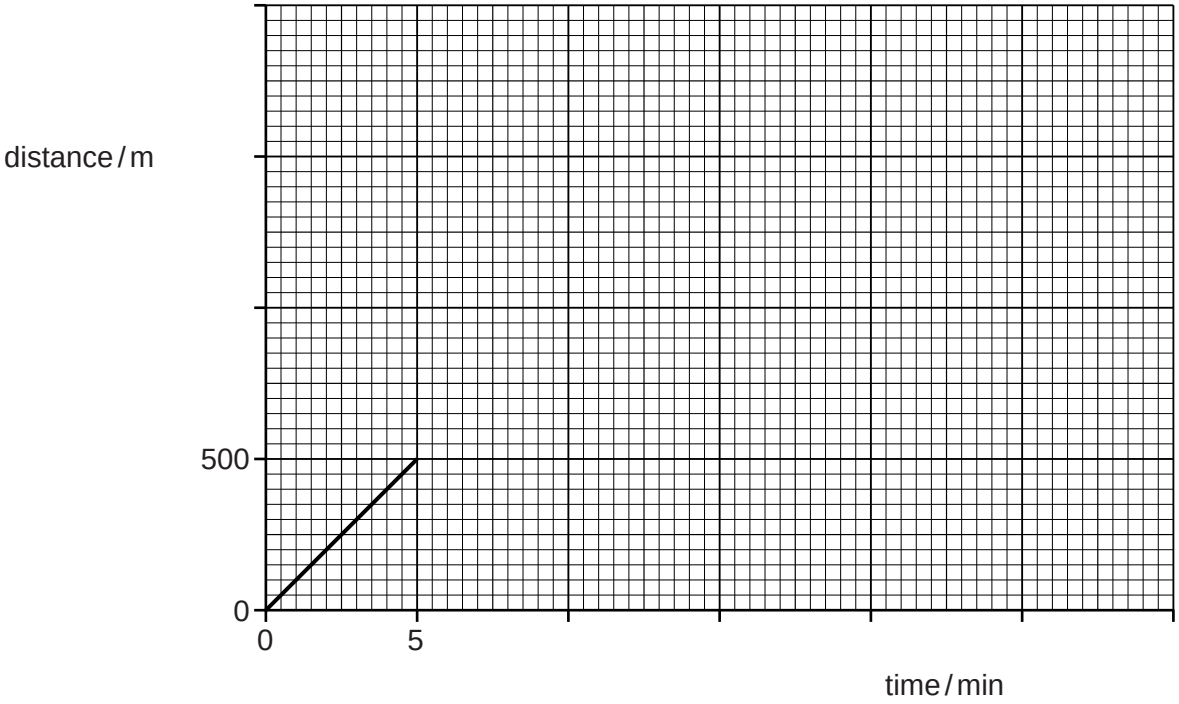

Fig. 2.1

He walks 500 m in the first 5 minutes, as shown on Fig. 2.1.
He then meets a friend and, as they talk, they take 10 minutes to walk the next 500 m at constant speed.
They then stop for 7 minutes to look at some fish in a river. They run at constant speed for the last 500 m so as not to be late for school.
The total journey time of the student is 25 minutes.

(a) (i) On Fig. 2.1, plot the remainder of the journey. [3]

(ii) State the total distance the student travels to school.

distance = ... [1]

(b) Suggest a method of measuring the distance travelled by the student to the school.

.....

.....

..... [1]

(c) Without calculating any values, explain how the graph is used to find his fastest speed.

.....

..... [1]

3 Fig. 3.1 shows a bottle with a solid glass stopper.

For Examiner's Use

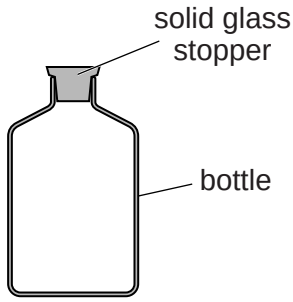

Fig. 3.1

(a) (i) Describe a laboratory experiment to determine the volume of the glass stopper.

In your answer, state clearly

- the equipment used,
- the readings taken,
- how the volume is calculated.

.....

.....

.....

.....

..... [3]

(ii) Describe one way to make the measurement of the volume accurate.

.....

.....

..... [1]

(b) To determine the density of the glass in the stopper, one more quantity must be measured. State the name of this quantity and the instrument used to measure it.

quantity: .....

measuring instrument: .....
[1]

4 A solar cell converts light energy into electrical energy.
A student investigates the maximum e.m.f. produced by a solar cell in the laboratory.

For Examiner's Use

Fig. 4.1 shows the symbol for a solar cell.

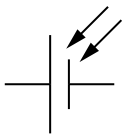

Fig. 4.1

(a) The student uses a voltmeter to measure the e.m.f. produced by the solar cell.

(i) Draw a diagram of the circuit he uses. Include a switch in the circuit.

[1]

(ii) When the student closes the switch, he notices that the voltmeter needle moves backwards, as shown in Fig. 4.2.

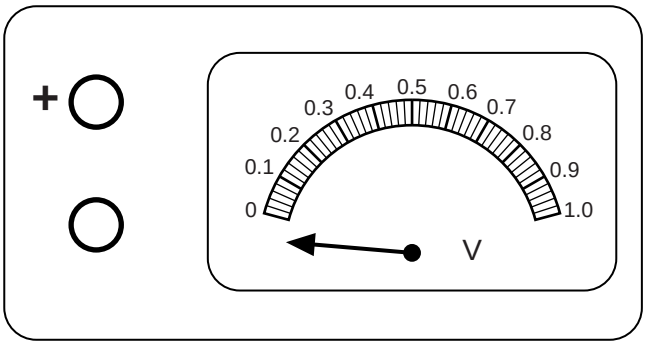

Fig. 4.2

Explain why this happens and how the student can correct this.

.....

..... [2]

(iii) The student corrects the problem and, when the switch is closed, the voltmeter now reads 0.96V.
On Fig. 4.2, mark the new position of the needle. [1]

Question 4 continues on page 8.

(b) To investigate the solar cell, the student uses light entering the laboratory through a window.

For Examiner's Use

When the student moves his head to read the voltmeter, there is a large decrease in the reading.

Suggest a reason for this, and explain how the student can prevent this happening when he moves.

.....

.....

..... [2]