	Centre Number	Candidate Number
Candidate Name ______________________________		

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Joint Examination for the School Certificate and General Certificate of Education Ordinary Level

PHYSICS 5054/4

PAPER 4 Alternative to Practical

OCTOBER/NOVEMBER SESSION 2002

1 hour

Candidates answer on the question paper.
No additional materials.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

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	
5	
TOTAL	

This question paper consists of 11 printed pages and 1 blank page.

SPA (CW/PW) S23403/2

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

1 In a lens experiment, a converging lens is used to produce a real image of a bright object. The object distance *u* and image distance *v* are measured using a metre rule. The apparatus used is shown in Fig. 1.1.

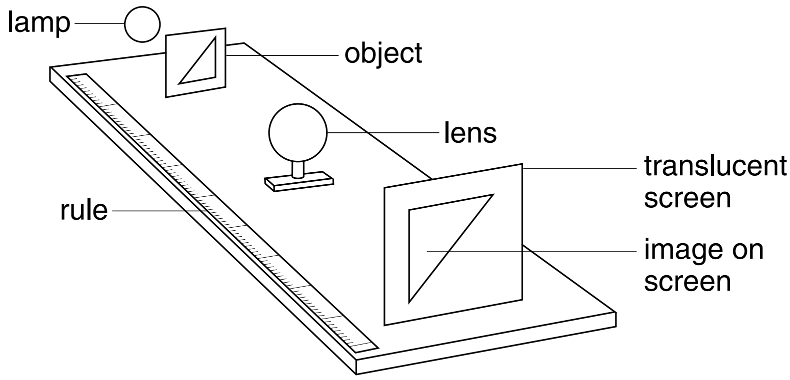

Fig. 1.1

(a) (i) Explain how you would use a set-square to help you take the measurements. If you wish, you may draw a diagram below or on Fig. 1.1 above.

....

....

....

....

(ii) What error is avoided by using the set-square?

....

[3]

(b) Determine the distance between the dots A and B in Fig. 1.2. You are to use the scale labelled MR and your set-square. Draw on Fig. 1.2, to show where you placed your set square so as to make the measurements. Show your arithmetical working.

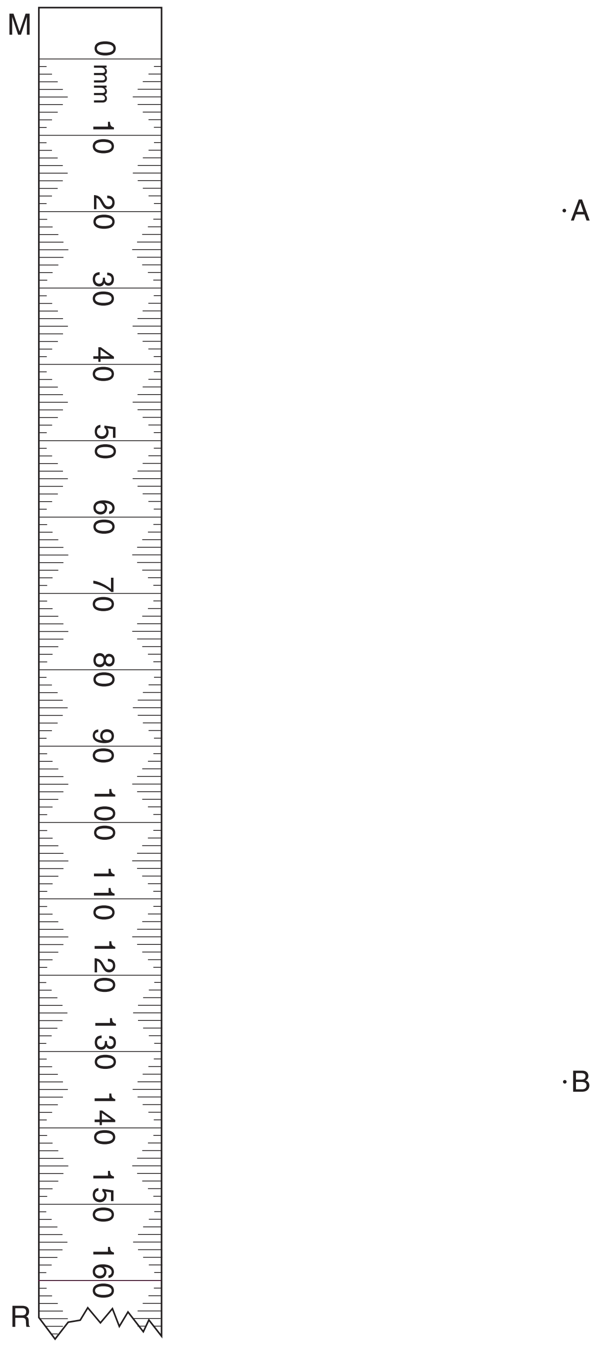

Fig. 1.2

distance AB = ...[3]

2 In food stores, frozen food is kept in refrigerated cabinets. The deep-freeze is often an open cabinet and so does not have a lid. A student is asked to investigate whether a lid helps to keep frozen the contents of a lagged container. The design of the student's experiment includes the apparatus shown in Fig. 2.1.

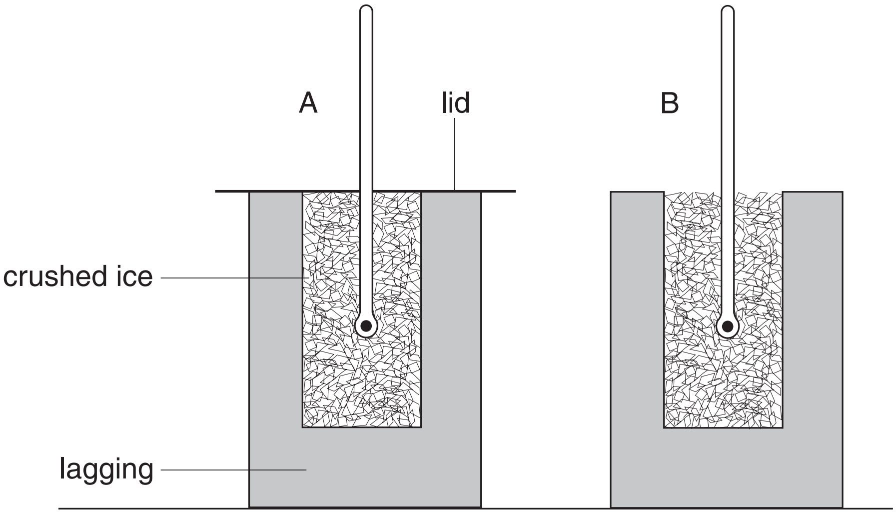

Fig. 2.1

The student places equal masses of crushed ice in two similar containers. Both containers are lagged. A lid is placed on one container, labelled A. The other is labelled B. Both are left standing on the same laboratory bench for the same time period of 100 min. The temperature of the crushed ice in both containers is taken at the beginning and the end of the experiment. Some ice melts in each container; the amount is determined at the end of the experiment. Some of the measurements are given in Fig. 2.2.

mass of ice in each container = 200 g		time for the experiment = 100 min	
container	initial temperature / °C	final temperature / °C	mass of ice melted in container /g
A with lid	0	0	70
B	0	0	81

Fig. 2.2

(a) The title the student used for this experiment is *"Does a lid help to keep the contents of a lagged container frozen?"*

Using the information given in Fig. 2.2, write a conclusion for this experiment. Include a reason for your conclusion. Your answer should refer to the final temperatures and the mass of ice melted.

Conclusion ....

....

....

Reason ....

....

....[4]

(b) State why it was good experimental procedure to use the same mass of ice in each container.

....

....[1]

(c) Suggest a reason why the ice does **not** melt in a deep-freeze cabinet.

....

....[1]

[Turn over

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3 A mass of 100 g is attached to a wooden rule that is clamped horizontally, as shown in Fig. 3.1.

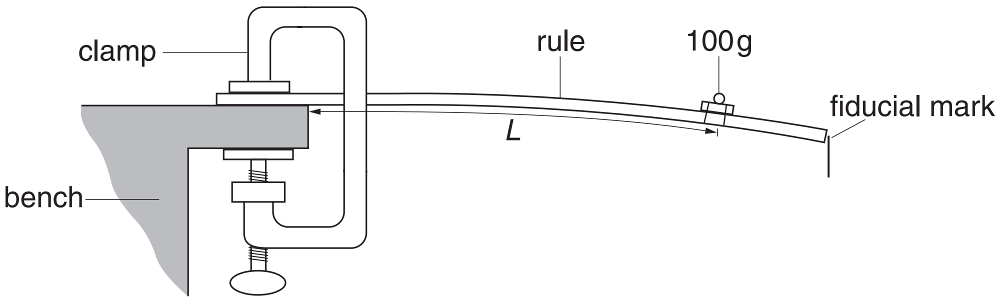

Fig. 3.1

The rule is made to vibrate with vertical oscillations. It is found that the time for one oscillation depends upon the position of the mass on the rule.
The mass is first attached to the rule so that the distance *L* shown in Fig. 3.1 is 0.70 m. A stopwatch is used to obtain observations from which the time *T* for one oscillation may be determined. The value of *T* is found to be 0.61 s.

(a) What observations should a student make in order to determine the value for *T*? How is *T* determined from these observations? You may draw a diagram if you wish.

....

....

....

....

....

....[3]

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(b) Explain why the fiducial mark is used in the position shown in Fig. 3.1. You may draw a diagram if you wish.

....

....

....[1]

(c) Explain how a student could reduce inaccuracies in determining such a small value as $T = 0.61$ s.

....

....

....

....[2]

4 Using the circuit shown in Fig. 4.1, a student investigates how the potential difference V across a resistance wire depends upon its length x.

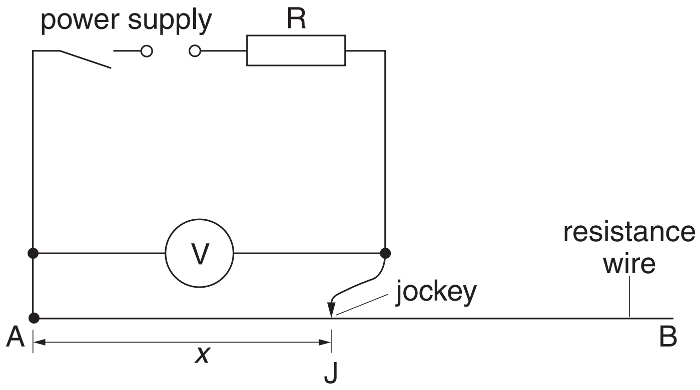

Fig. 4.1

The student places the jockey on the wire at a point J. The voltmeter reading V and the length x of resistance wire are recorded. The student repeats the experiment with different values for x. All the readings are recorded.

Fig. 4.2 is a graph obtained from the readings taken during the experiment.

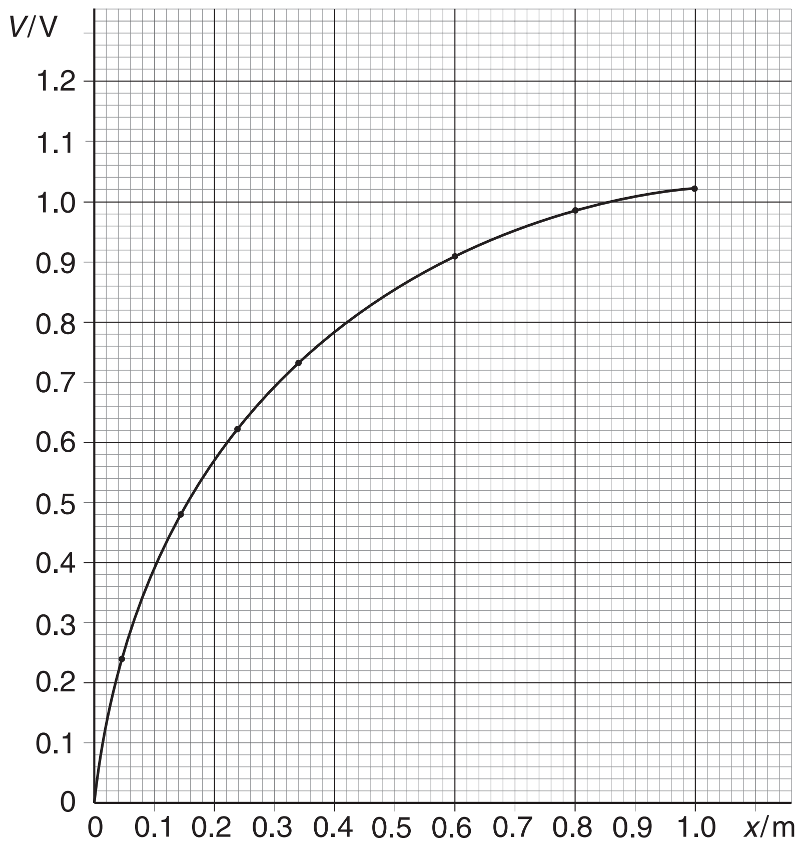

Fig. 4.2

(a) The length AB of wire has a resistance of 10 Ω. The resistance of the fixed resistor R is 2.0 Ω.

(i) What is the total resistance in the series circuit when the jockey is at the point B on the wire?

total resistance = ...[1]

(ii) The graph of Fig. 4.2 is for a clean wire and a clean jockey. In a second experiment, the jockey is dirty and does not make good contact with the wire. On Fig. 4.2, sketch the graph that would be obtained with the dirty jockey. [2]

(iii) How would you clean the dirty jockey?

....

....

....[1]

(b) There are three voltmeters available for use in the experiment.

voltmeter	full scale deflection / V
K	1.5
L	3.0
M	15.0

The voltmeters are similar and each scale is 60 mm in length. Which voltmeter would be the best choice for accurate measurement?

choice of voltmeter ....

Give a reason for your choice.

....

....

....[2]

5 In a lens experiment, a converging lens is used to produce a sharp image of a circular hole, as shown in Fig. 5.1.

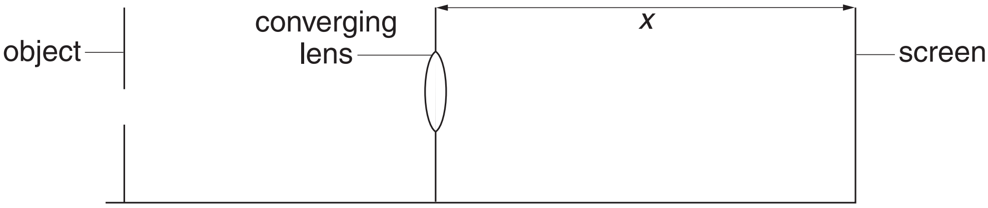

Fig. 5.1

The diameter y of the circular image is measured and recorded. The image distance x is also measured and recorded. The experiment is repeated for a range of values of the object to screen distance s.
The readings obtained for x and y are shown in the table of Fig. 5.2.

value of s / mm	486	390	422	448	529	590
image diameter y / mm	9	21	29	40	56	64
image distance x / mm	152	200	250	299	390	450

Fig. 5.2

(a) On the grid on page 11, plot the graph of y / mm (y-axis) against x / mm (x-axis). Start the x-axis at x = 100 mm. Draw the best straight line through your points. [4]

(b) Determine the gradient G of the line. Mark the graph in such a way as to show what values you used to determine the gradient.

G = ...[2]

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