OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE

PHYSICS A 2823/03/TEST

Practical Test (Part B)

Thursday **16 MAY 2002** Morning 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Electronic Calculator
Candidate's Plan (Part A of the Practical Test)

Candidate Name	Centre Number	Candidate Number

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** questions.
- Write your answers in the spaces on the question paper.

INFORMATION FOR CANDIDATES

- In this part of the Practical Test you will be assessed on the Experimental and Investigative Skills:
  Skill I Implementing
  Skill A Analysing evidence and drawing conclusions
  Skill E Evaluating
- You are advised to spend the first few minutes reading through the whole paper before starting to answer any questions.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
Planning	**16**	
1	**28**	
2	**16**	
TOTAL	**60**	

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

Registered Charity Number:1066969
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It is recommended that you spend about 1 hour on this question.

1 In this question you will investigate the relationship between the angle θ turned through by a metre rule and the number n of paper clips suspended at one end of the rule. You will use the results of your experiment to determine the mass of an object M.

(a) A rule with a protractor attached at the centre has been mounted on a pin in a clamp. Attach a plumbline to the pin and add small pieces of Blu-tack to one side of the rule until it rests in horizontal equilibrium as shown in Fig. 1.1.

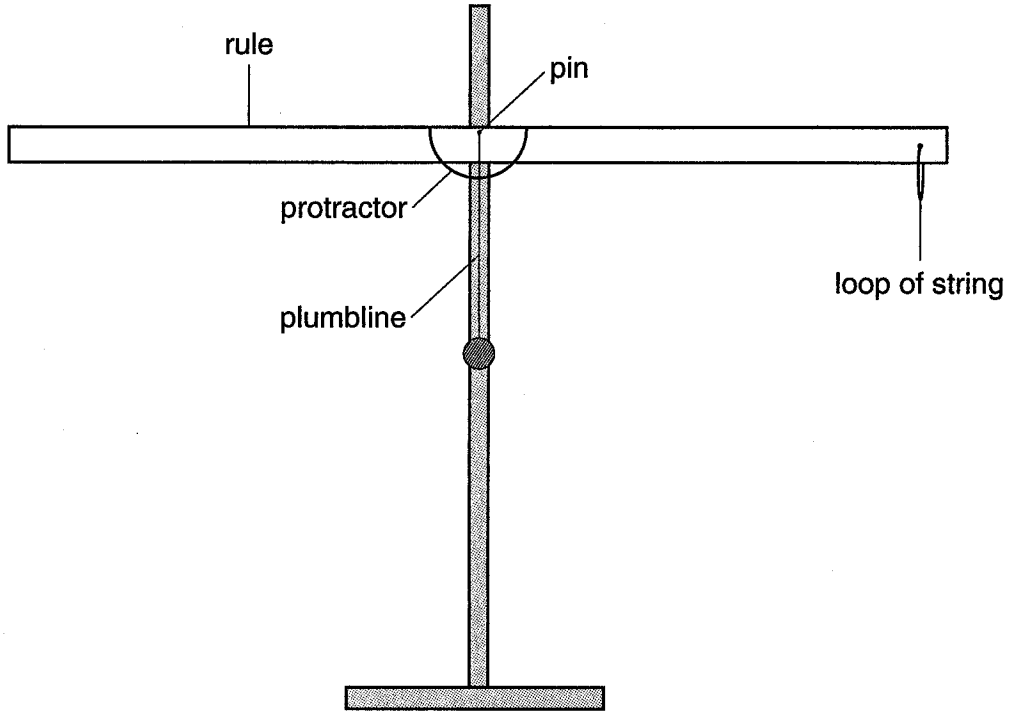


Fig. 1.1

(b) (i) Attach a paper clip to the string loop at the end of the rule.

(ii) Wait for the rule to become stationary. Measure and record the angle θ turned through by the rule. See Fig. 1.2.

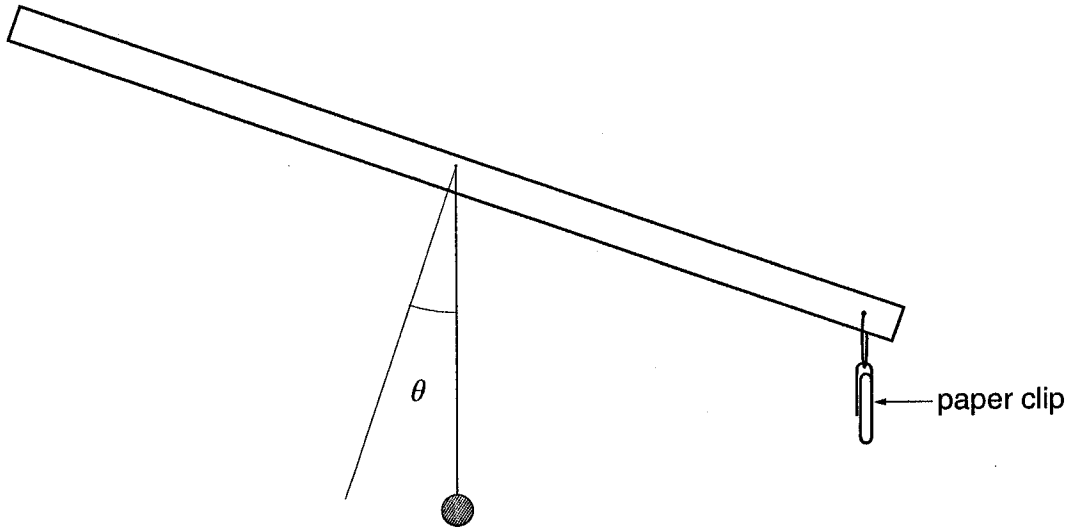


Fig. 1.2

θ = ...

(iii) Estimate the percentage uncertainty in this value of θ.

percentage uncertainty = ...

(c) **(i)** Add another paper clip to the loop. Measure and record the new value of θ.

(ii) Repeat **(i)** until you have 6 sets of readings for θ and the number n of paper clips suspended from the loop. Include values of tan θ in your table of results.

M

(d) θ and n are related by the equation

$$\tan \theta = kn$$

where k is a constant.

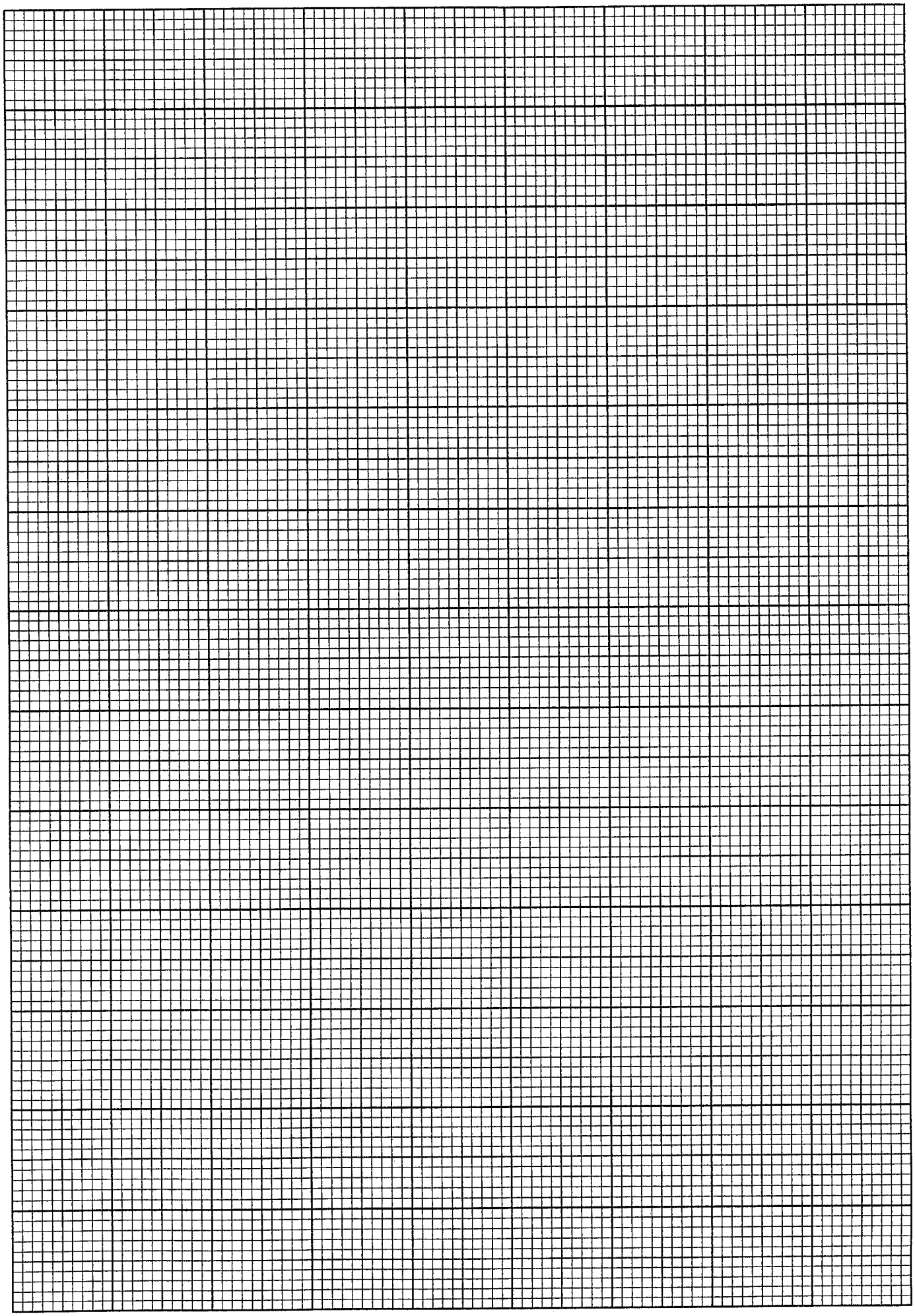
R

(i) Plot a graph of tan θ (y-axis) against n (x-axis).

(ii) Determine the gradient of the best fit line.

(iii) State the value of k.

k = ...



G

(e) (i) Remove the paper clips from the loop.

(ii) Suspend the mass labelled M from the loop. Measure and record the angle θ.

θ .....

(iii) Use the results of your experiment, together with the mass of a paper clip (written on a card) to determine the mass of M.

(f) Suggest one improvement which you may make to your experiment if you had access to additional apparatus.

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It is recommended that you spend about 30 minutes on this question.

Approximately half of this time should be spent on the evaluation exercise in part (g).

2 In this question you will measure the resistance R of a sample of conducting putty as the length and cross-sectional area of the putty are changed.

The putty leaves black marks on surfaces with which it comes into contact, and therefore it must be handled using disposable plastic gloves. **You should avoid contact between the putty and your clothes.**

The conducting putty has been moulded into the shape of a cylinder and a metal disc has been attached to each end as shown in Fig. 2.1.

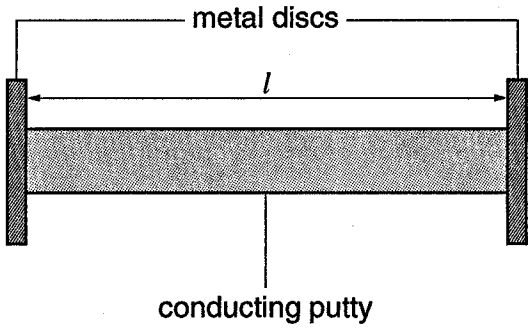

Fig. 2.1

(a) Measure and record the length l of the cylinder of conducting putty.

l = ... cm

(b) Construct the circuit shown in Fig. 2.2. You should use connecting leads with crocodile clips to attach wires to the discs.

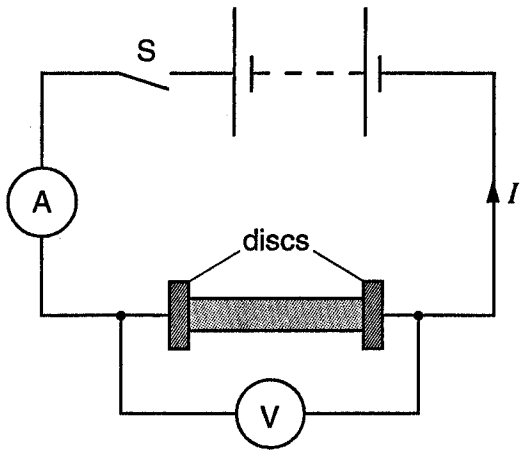

Fig. 2.2

(c) (i) Close switch S.

(ii) Measure and record the current I and the potential difference V.

I = ... A, V =..... V

(iii) Open the switch.

(iv) Calculate the resistance R of the length l of conducting putty.

(d) (i) Carefully remove the discs from the ends of the cylinder.

(ii) Double the length of the cylinder by rolling it between two wooden boards as shown in Fig. 2.3.

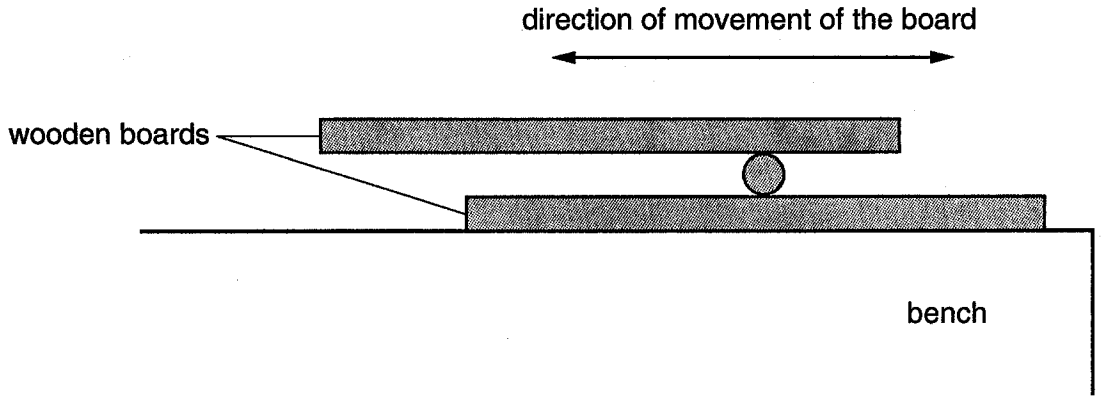

Fig. 2.3

(e) (i) Gently press a metal disc onto each end of the cylinder so that a good electrical contact is made. You should not press too hard or the cylinder will deform.

(ii) Repeat **(a)**, **(b)** and **(c)**.

(f) It is suggested that the resistance R of the conducting putty is directly proportional to the square of the length of the conducting putty (i.e. $R = kl^2$). Discuss whether the results of your experiment would support this suggestion or not.

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(g) Evaluation exercise. *(In this part question two marks are awarded for quality of written communication).*

Write an evaluation of the procedure which you have followed. You should include some of the limitations of your procedure and suggest ways in which the experiment may be improved, giving reasons for your suggestions.

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