OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE

PHYSICS A 2823/03/TEST

Practical Examination 1 (Part B – Practical Test)

Monday **17 JANUARY 2005** Afternoon 1 hour 30 minutes

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

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** the questions.
- Write your answers in the spaces provided on the question paper.
- Read the instructions and questions carefully.

INFORMATION FOR CANDIDATES

- In this 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 evidence and procedures.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- You will be awarded marks for the quality of written communication where this is indicated in the question.

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

This question paper consists of 10 printed pages and 2 blank pages.

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Answer **all** the questions.

It is recommended that you spend about 1 hour on this question.

1 A half-metre rule suspended from one end will be displaced by a horizontal force *F* applied to its lower end. In this question, you will investigate how the angle θ between the vertical and the rule varies with the force *F*.

(a) **(i)** Suspend the half-metre rule from a pin as shown in Fig. 1.1. The pin has been pushed into a cork for ease of clamping.

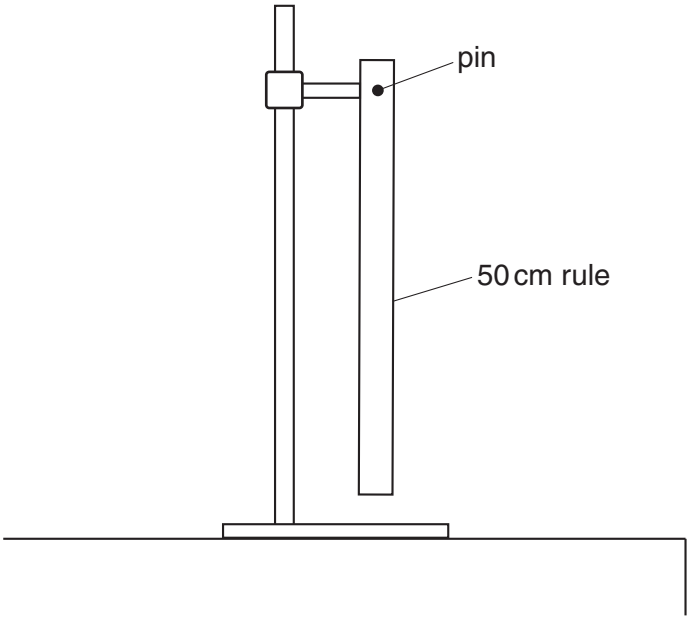

Fig. 1.1

(ii) Attach a thread to the rule using the small hole at the bottom of the rule and pass the thread over a pulley mounted at the edge of the benchtop. Attach a 10 gram mass holder to the thread and allow the rule and mass to come to equilibrium. Lower the clamp holding the pin in order to make the thread horizontal. Suspend a plumbline from the pin. The arrangement should now be as shown in Fig. 1.2.

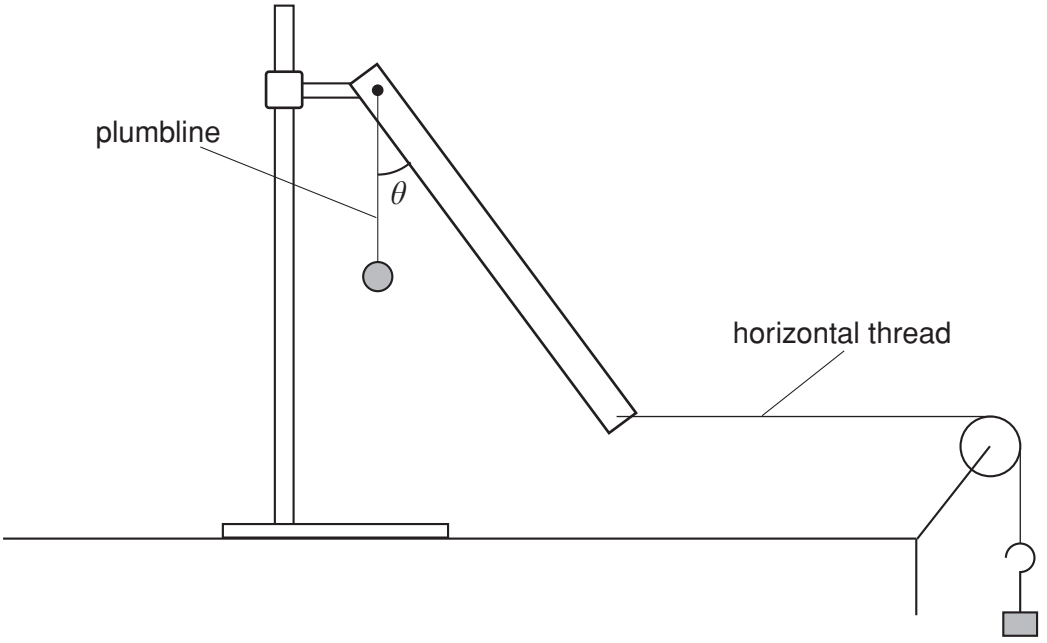

Fig. 1.2

(iii) Briefly describe how you ensured that the thread attached to the lower end of the rule is **horizontal**.

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(b) **(i)** Measure and record the value of θ (the angle between the plumbline and the lower edge of the rule).

θ = ...°

(ii) Calculate the force *F* acting on the rule due to the weight of the suspended 10 gram mass holder. You may assume that *g*, the acceleration of free fall, has the value 9.8 m s^{-2}.

F = ... unit .....

(iii) What assumption have you made about the pulley in determining this value of *F*?

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(c) Change the value of *F* by adding a 10 gram mass to the holder. Calculate the new force acting on the rule and measure the new angle θ. Repeat the process until you have six sets of readings for θ and *F*. You should ensure when you are taking readings that the thread is horizontal and that the rule has come to rest.

Include all six values of tan θ in your table of results.

(d) Suggest one improvement that you might make to your experiment that would reduce the percentage uncertainty in the value of tan θ.

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(e) **(i)** Plot a graph of tan θ (*y*-axis) against *F* (*x*-axis) and draw the best straight line through the points.

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

gradient = ...

(f) It is suggested that the relationship between θ and F is

$$\tan\theta = \frac{2F}{mg} + k$$

where m is the mass of the rule and k is a constant.

Use your answer from **(e)(ii)** to determine a value for m.

m = ...

(g) **(i)** Remove the rule from the pin and thread. Use the top pan balance to find a second value for the mass of the rule.

mass of rule = ... g

(ii) Comment on the two values that you have obtained.

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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 Water waves travel faster in deep water than in shallow water. It is suggested that the relationship between the speed v of the waves and the depth d of the water is

$$v = k\sqrt{d}$$

where k is a constant.

In this experiment, you will measure the speed of water waves in different depths of water and comment on the validity or otherwise of the suggested relationship.

(a) **(i)** Pour a quantity of water into the tray supplied so that d is approximately 1 cm.

Measure and record the value of d.

d = ... mm

(ii) Describe how you made this measurement.

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(b) Gently raise and then lower one end of the tray. Observe that a water wave travels across the tray and is reflected several times. By making suitable measurements using the apparatus provided, determine the speed v of this wave.

v = ... $m\,s^{-1}$

(c) Determine the percentage uncertainty in v.

percentage uncertainty in v = ...

(d) Add the same amount of water again to give approximately double the depth. Measure and record the new depth.

d = ... mm

(e) Determine the new speed of the wave by repeating **(b)**.

v = ... $m\,s^{-1}$

(f) Do the results of your experiment support the suggested relationship between v and d? You should explain your reasoning clearly.

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In this question, two marks are available for the quality of written communication.

(g) Write an evaluation of the procedure that you have followed to investigate the relationship between *v* and *d*. You should include some of the limitations of the procedure and suggest ways in which the experiment may be improved, giving reasons for your suggestions.

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Quality of Written Communication

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