OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced GCE

PHYSICS A 2826/03/TEST

Practical Examination 2 (Part B – Practical Test)

Wednesday **24 MAY 2006** Morning 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 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 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 11 printed pages and 1 blank page.

For Examiner's Use

Answer **all** the questions.

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

1 A vibrating mass has a card attached to it. You are to investigate, after an initial displacement of 10.0 cm, how the amplitude of oscillation of the mass after **twenty** oscillations depends on the area of the card.

(a) **(i)** Suspend a 300 g mass from a spring using a stand, boss and clamp. The lower end of the spring has a pin attached which may be used as a pointer.

(ii) Determine the area *A* of the card.

A = ... cm^2 [1]

(iii) Determine the percentage uncertainty in your value of *A*.

percentage uncertainty in *A* = ...[3]

(iv) Attach the card to the bottom of the mass using a small piece of Blutack. The centre of the card should coincide with the centre of the mass.

(v) Mount a rule next to the spring. The pin should be aligned with the zero mark on the rule. The arrangement should now be as shown in Fig. 1.1.

A diagram has been removed due to third party copyright restrictions

Details: A diagram of some apparatus, showing a spring attached to a clamp with a weight hanging off the spring. There is a piece of card under the spring and a ruler is also attached to the clamp

Fig. 1.1

(b) (i) Raise the mass until the vertical displacement of the pin is 10.0 cm. Release the mass. Measure and record the amplitude X_{20} after twenty oscillations of the mass.

X_{20} = ... cm [1]

(ii) The precise measurement of X_{20} is difficult in this experiment. Give one reason for this and suggest one way in which this measurement could be improved.

difficulty

....

....[1]

improvement

....

....[1]

(c) (i) Remove the card from the mass. Reduce the side length by 2.0 cm using the scissors to give a smaller card area as shown in Fig. 1.2.

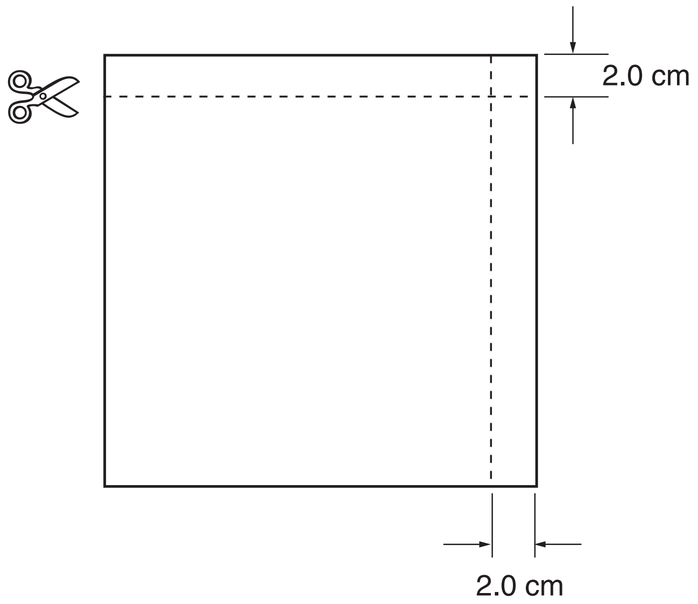

Fig. 1.2

(ii) Make measurements to determine the new area of the card.

A = ... cm^2 [1]

(iii) Re-attach the card to the bottom of the mass using Blutack.

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For Examiner's Use

(d) Repeat **(b)(i)** and **(c)** until you have six sets of values of A and X_{20}. You may need to adjust the position of the rule to ensure that the pin is at the zero mark every time you re-attach the card to the mass. In your table of results include all the values of ln (X_{20}/cm). [7]

(e) **(i)** Plot a graph of ln (X_{20}/cm) (y-axis) against A (x-axis).

(ii) Draw the line of best fit.

(iii) Determine the gradient and the y-intercept of the line of best fit.

gradient = ...

y-intercept = ...[7]

For Examiner's Use

[Turn over

For Examiner's Use

(f) The relationship between X_{20} and A is

$$X_{20} = X_0 e^{-kA}$$

where X_0 and k are constants.

(i) Use your answers from **(e) (iii)** to determine values for X_0 and k. Include an appropriate unit in each case.

X_0 = ...

k = ...[5]

(ii) Suggest one alteration that could be made to the experiment that may give a larger value of k.

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....[1]

[Total: 28]

For Examiner's Use

It is recommended that you spend about 30 minutes on question 2.

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

2 In this experiment, you will investigate how the angle θ at which a burette is inclined to the vertical affects the time taken for 25 cm^3 of water to leave the burette.

A burette has been mounted vertically near a plumbline as shown in Fig. 2.1.

A diagram has been removed due to third party copyright restrictions

Details: A diagram of apparatus. The diagram shows a burette that has been mounted vertically near a plumbline

Fig. 2.1

(a) (i) Use the funnel to fill the burette with water to the top graduation mark.

(ii) Gently rotate the clamp until the burette is inclined at an angle of $\theta = 15°$ to the vertical. Explain how you measured this angle.

....

....

....[1]

(iii) Place the beaker under the end of the burette. Open the tap fully, and at the same time start a stopwatch.

(iv) Measure and record the time t for 25 cm^3 of water to leave the burette.

t = ... s [1]

For Examiner's Use

(b) **(i)** Refill the burette to the top graduation mark.

(ii) Increase the angle at which the burette is inclined to the vertical to $\theta = 65°$.

(iii) Repeat **(a) (iii)** and **(a) (iv)**.

$t =$ .... s [1]

(c) It is suggested that t is directly proportional to sin θ. Do the results of your experiment support this suggestion? Justify your answer.

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....

....[3]

For Examiner's Use

(d) In this section, two marks are available for the quality of written communication.

Write an evaluation of the procedure which you have followed to investigate how t is related to the angle of inclination of a burette to the vertical. You should include some of the limitations of this procedure and suggest ways in which the experiment may be improved, giving reasons for your suggestions.

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Quality of Written Communication [2]

[Total: 16]

END OF QUESTION PAPER