OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

PHYSICS A

Practical Examination 2 (Part B – Practical Test)

2826/03/TEST

Candidates answer on the question paper

OCR Supplied Materials:
- None

Other Materials Required:
- Candidate's Plan (Part A of the Practical Examination)
  Electronic calculator
- Ruler (cm/mm)

Wednesday 20 May 2009
Morning

Duration: 1 hour 30 minutes

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- 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.
- This document consists of **12** pages. Any blank pages are indicated.

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

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Answer **all** the questions.

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

1 In this question you will investigate how the period of oscillation of the pendulum system shown in Fig. 1.1 varies with the distance *d* between the supports.

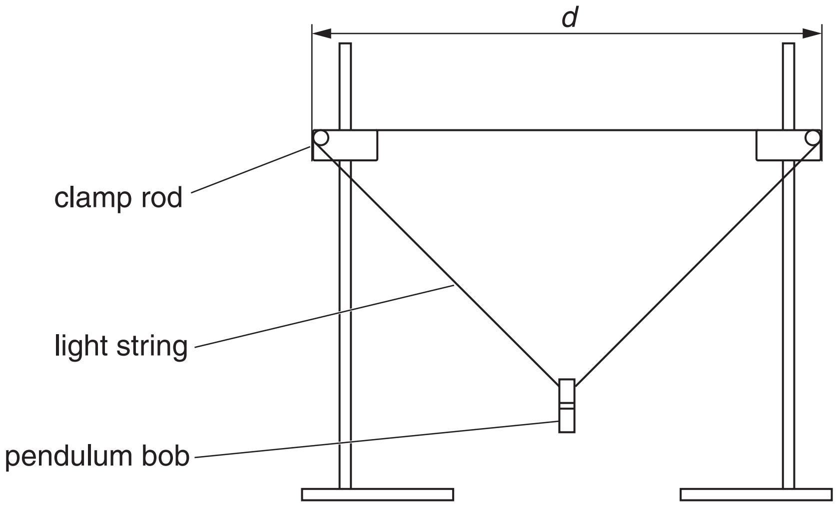

Fig. 1.1

(a) The apparatus is set up as shown in Fig. 1.1. The length *L* of the loop of string is written on a card. Write down the value of *L*.

L = ... m

(b) (i) By moving the stands, adjust *d* to be about 0.20 m. Measure and record this length *d*.

d = ... m

(ii) Displace the bob so that it performs small oscillations perpendicular to the plane of the loop. The oscillations should have an amplitude of no more than a few centimetres. Make and record measurements to determine the period *T* of these oscillations.

T = ... s

[2]

(iii) Justify the number of significant figures you have used for *T*.

....

.... **[1]**

Turn over

(c) Move the stands further apart to increase the value of d. Repeat the procedure in **(b)(ii)**. Carry on increasing d and measuring T until you have six sets of results in the range $0.20\,\text{m} \leq d \leq 0.50$ m. Include in your table of results values for T^4.

[9]

(d) (i) Plot a graph of T^4 (y-axis) against d (x-axis). Draw the line of best fit. **[4]**

(ii) Determine the gradient and y-intercept of the line. You need not be concerned with the units of these quantities.

gradient = ...

y-intercept = ...

[4]

(e) Theory suggests that

$$T^4 = \frac{4\pi^4 L}{g^2}\ K - \frac{8\pi^4 L}{g^2}\ d$$

where g is the gravitational field strength and K is a constant.

Use the equation and your answers for **(d)(ii)** to determine values for g and K. Give the units for your answers.

g = ... unit ....

K = ... unit ....

[5]

(f) Suggest a value for the percentage uncertainty in your measurements of T, showing your working. Hence estimate the percentage uncertainty in T^4.

percentage uncertainty in T = ... %

percentage uncertainty in T^4 = ... %

[3]

[Total: 28]

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 (f).

2 In this question you will investigate the expansion of a wire as current is passed through it.

(a) Clamp a length of resistance wire between two stands, as shown in Fig. 2.1. To do this, clamp the connectors at each end of the resistance wire. The clamps are then secured to the clamp stands with bosses. The length of wire between the connectors should be about 70 cm. Secure the clamp stands to the bench with G-clamps or weight the bases with heavy masses to prevent movement. The wire should be horizontal and reasonably taut.

The mass holder provided should then be hung half way along the length of the wire.

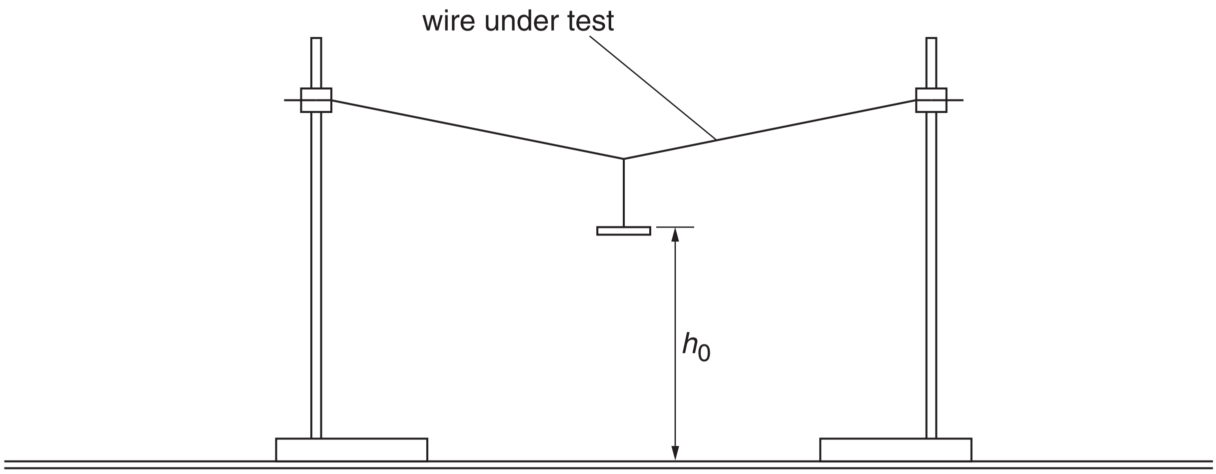

Fig. 2.1

(b) (i) Measure and record the height h_0 of the mass holder above the bench.

h_0 = ... mm

(ii) The wire should then be connected to a variable low-voltage d.c. power supply in series with an ammeter (Fig. 2.2).

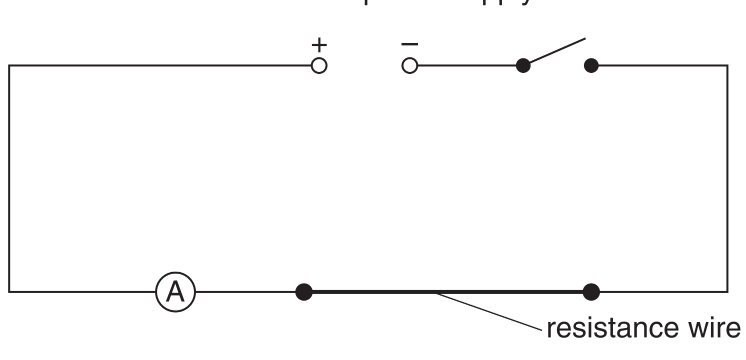

Fig. 2.2

(c) **(i)** Switch on the power supply and adjust the current to 1.50 A. **The wire will become hot and must not be touched.** The hot wire will expand and the mass holder will drop slightly. Measure the new height h_1 of the mass holder above the bench top.

h_1 = ... mm **[1]**

(ii) Calculate the change in height y_1, i.e the difference between h_0 and h_1.

y_1 = ... mm **[1]**

(d) Increase the current to 3.00 A, measure the new height h_2, and hence calculate the change in height y_2 (the difference between h_0 and h_2).

h_2 = ... mm y_2 = ... mm **[1]**

(e) It is suggested that y^2 is proportional to I^3, where I is the current. Do the results of your experiment support this suggestion? Justify your answer.

....

....

....

.... **[3]**

(f) 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 the expansion of a wire when current is passed through it.

Marks are given here for:

- explaining the limitations of the procedure, and the problems encountered
- suggesting, with reasons, ways in which the experiment could be improved.

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Quality of Written Communication **[2]**

[Total: 16]

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