OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE **2826/03/TEST**

PHYSICS A

Practical Examination 2 (Part B – Practical Test)

WEDNESDAY 21 MAY 2008 Morning

Time: 1 hour 30 minutes

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

CUP/T40055

Candidate Forename | Candidate Surname

Centre Number | Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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.

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 experiment you will take readings of the current I for different values of voltage V across a filament bulb. You will use these results to investigate how the resistance of the bulb varies with the power developed in the bulb. You will also be able to estimate the temperature of the hot filament.

(a) Connect the circuit as shown in Fig. 1.1.

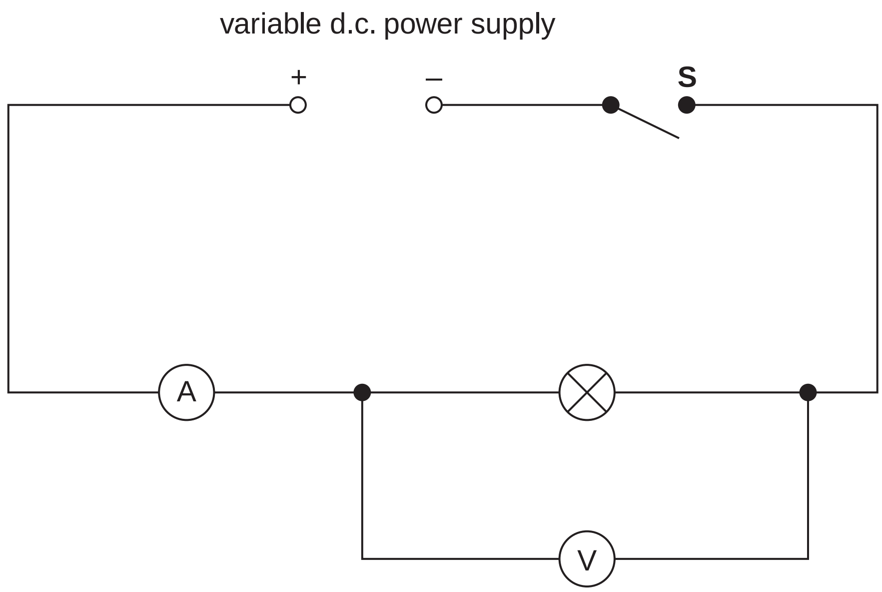

Fig. 1.1

(b) (i) Close the switch **S**. Adjust the voltage so that V is about 2V. Record the readings of voltage V and current I. Open **S**.

V = ... V $\qquad$ I = ... A

(ii) Use the formula $R = \frac{V}{I}$ to calculate the resistance R of the bulb.

R = ... Ω

The value for the resistance R_0 of the bulb at room temperature is written on a card. Write down this value and the value for $R - R_0$ below.

R_0 = ...Ω $\qquad$ $R - R_0$ = ...Ω

(iii) Use the formula $P = VI$ to calculate the power output P of the bulb.

P = ... W

(iv) Close the switch. Carry out **(b)(i)**, **(ii)**, and **(iii)** for different voltages in the range $2\text{V} \leqslant V \leqslant 10\text{V}$ until you have six sets of readings of *V, I, R,* and *P* in your table of results. Also include in your table values of $R - R_0$, lg(*P*/W) and $\lg((R - R_0)/\Omega)$. **S should be opened immediately after taking each set of readings.**
Repeat readings are not expected.

[9]

(v) Estimate the largest percentage uncertainty in your measurements of *I*.

largest percentage uncertainty in *I* = ... % [3]

(c) **(i)** Plot a graph of lg(*P*/W) (y-axis) against $\lg((R - R_0)/\Omega)$ (x-axis). Draw the best fit line through the points. [4]

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

gradient = ... [2]

y-intercept = ... [2]

(d) **(i)** It is suggested that the formula which relates the power P and resistance R is

$$P = k\,(R - R_0)^n \quad \text{where } k \text{ and } n \text{ are constants}$$

Use your answers to **(c) (ii)** to determine values for n and k. You need **not** be concerned with the units of these quantities.

n = ...

k = ...
[3]

(ii) To what extent do the results of your experiment support the suggested relationship given in **(d)(i)**?

....

....

....[1]

(e) **(i)** A useful approximation is to assume that the absolute temperature T of the hot filament is directly proportional to the resistance of the filament, so that

$$T = \frac{RT_0}{R_0}$$

where R_0 is the resistance of the filament at room temperature T_0. The values for R_0 and T_0 are written on a card. Write these values below.

R_0 = ...Ω T_0 = …………………. K

(ii) Use the information in **(d) (i)** and **(e) (i)** to estimate the absolute temperature of the filament when the power output is 24 W.

T = ... K [4]

[Total: 28]

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 (f).

2 In this experiment you will investigate the oscillations of a bar magnet in a magnetic field. The magnet will be suspended at different heights above another bar magnet.

(a) Set up the apparatus as shown in Fig. 2.1.

Clamp the thread between the blocks provided, so that the magnet is at least 20 cm from the blocks. Allow the oscillations of the magnet to settle down.

Place another identical bar magnet on the bench top, below and in line with the suspended magnet.

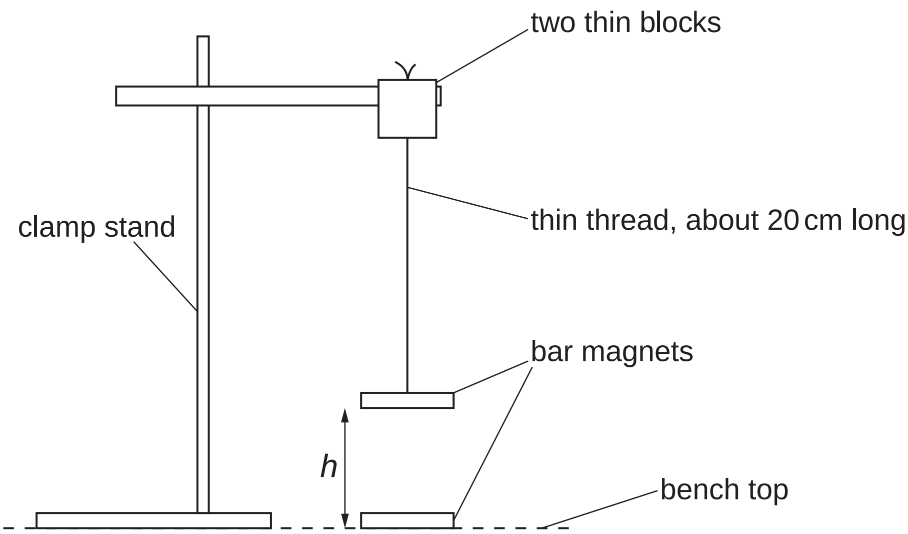

Fig. 2.1

The height h is the distance between the base of the suspended magnet and the base of the other magnet. Adjust the height of the suspended magnet so that h = 6 cm.

(b) **(i)** Gently twist the magnet a small amount **sideways** and release it, as shown in Fig. 2.2. It will perform small oscillations in a horizontal plane.

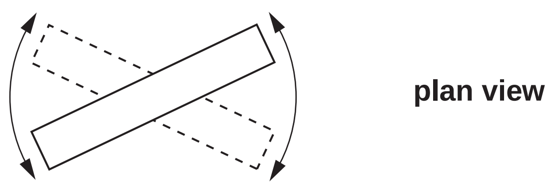

Fig. 2.2

(ii) Make and record measurements in order to determine the period T of these oscillations.

T = ...s [2]

(c) Justify the number of significant figures you have given for T.

....

....

....

.... [1]

(d) Increase the height h to 12 cm, and make measurements to determine a new value for the period of oscillation.

T = ...s [1]

(e) It is suggested that T is directly proportional to h. Do the results of your experiment support this suggestion? Justify your answer.

....

....

....

.... [2]

(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 oscillations of a bar magnet in a magnetic field.

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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....[8]

Quality of Written Communication [2]

[Total: 16]

END OF QUESTION PAPER

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