THIS IS A LEGACY SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

PHYSICS A

2826/03/TEST

Practical Examination 2 (Part B – Practical 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)

Thursday 27 May 2010
Afternoon

Duration: 1 hour 30 minutes

OCE/22852

2826033

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 current through a silicon diode is related to the potential difference across it.

(a) Set up the circuit shown in Fig. 1.1. Ensure that the diode is connected with the correct polarity. Initially the switch **S** should be open. **[2]**

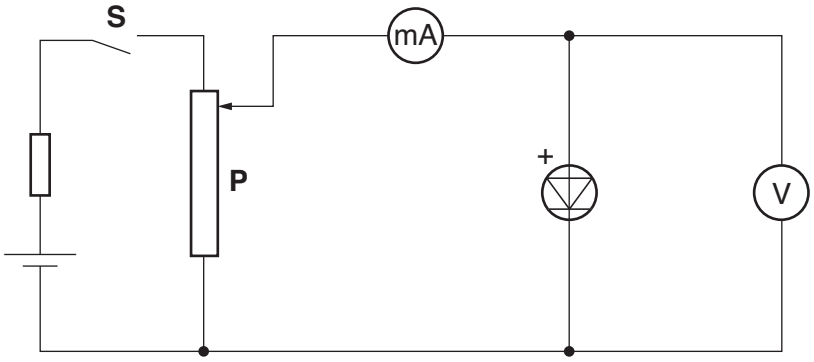


Fig. 1.1

(b) (i) Close switch **S** and adjust the potential divider **P** so that the potential difference *V* across the diode is a maximum.

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

V = ... V *I* = ... mA

(iii) Change the setting of the potential divider and repeat **(ii)** until you have six sets of readings of V and I for values of I in the range from about 0.10 mA to the maximum which you obtained in **(ii)**. Include values of ln(I/mA) in your table of results.

[8]

(c) **(i)** Plot a graph of ln(I/mA) (y-axis) against V (x-axis) and draw the best straight line through the points. **[4]**

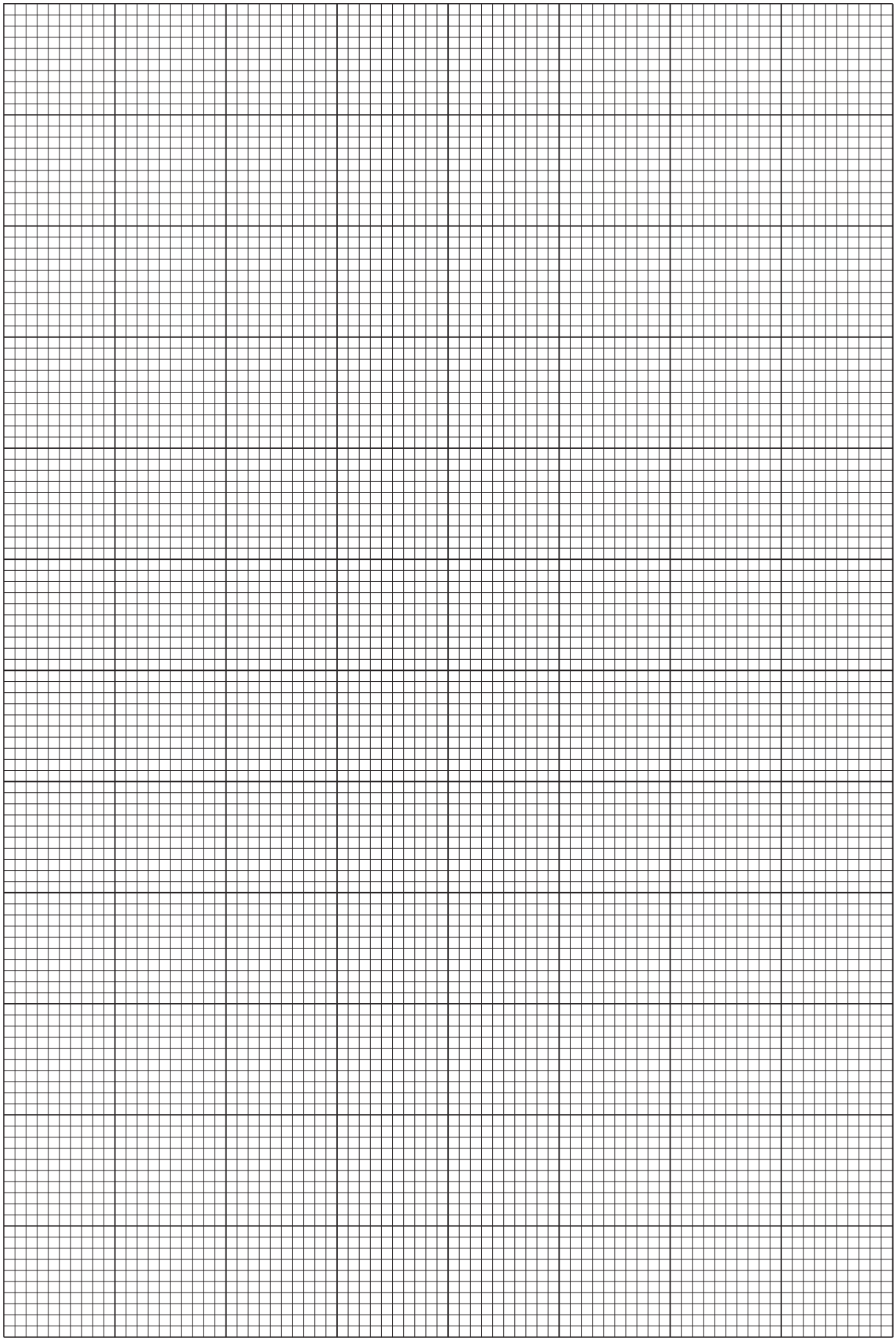
(ii) Determine the gradient and y-intercept of the line. You need not be concerned with the units of these quantities.

gradient = ... **[2]**

y-intercept = ... **[1]**

(d) Estimate the largest percentage uncertainty in the current I.

percentage uncertainty = ... % **[3]**



(e) (i) The current I in the diode is related to the potential difference V by the expression

$$I = I_0 \, e^{\left(\frac{bV}{T}\right)}$$

where I_0 and b are constants, and T is the temperature measured in kelvin.

The value of the room temperature T is given on a card. Write down this value.

T = ... K

(ii) Use your answers to **(c) (ii)** and the above equation to find values for b and I_0. Include units for your values.

b = ... unit .....

I_0 = ... unit .....

[6]

(f) (i) When a larger current range is used, the graph plotted in **(c) (i)** curves slightly. The diode still functions correctly.

Suggest why the graph curves.

[1]

(ii) How would you expect the graph to curve? Justify your answer.

[1]

[Total: 28]

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

2 In this question you will investigate how the period of torsional oscillation of a disc in a horizontal plane depends on the radius of the disc. A thin copper wire is attached to the middle of the disc.

The radius of the disc is 10.0 cm.

(a) Clamp the wire between two wooden blocks so that the disc is suspended in a horizontal plane 50 cm (± 0.5 cm) below the blocks as shown in Fig. 2.1.

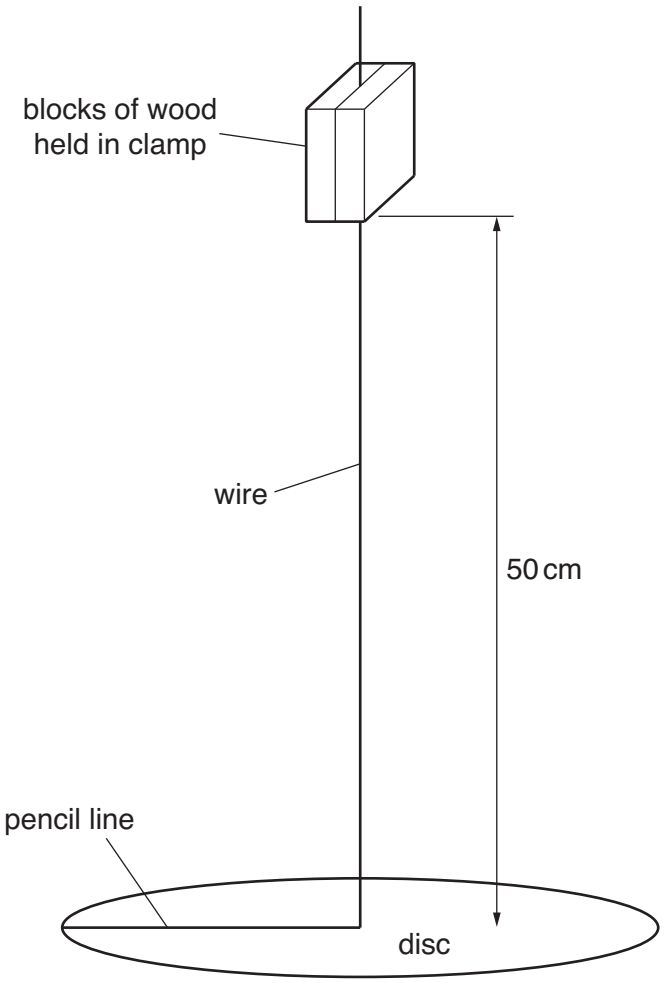


Fig. 2.1

(b) (i) Gently rotate the disc as shown in Fig. 2.2 through an angle $< 90°$ so that the wire is twisted. Release the disc so that it performs torsional oscillations in a horizontal plane.

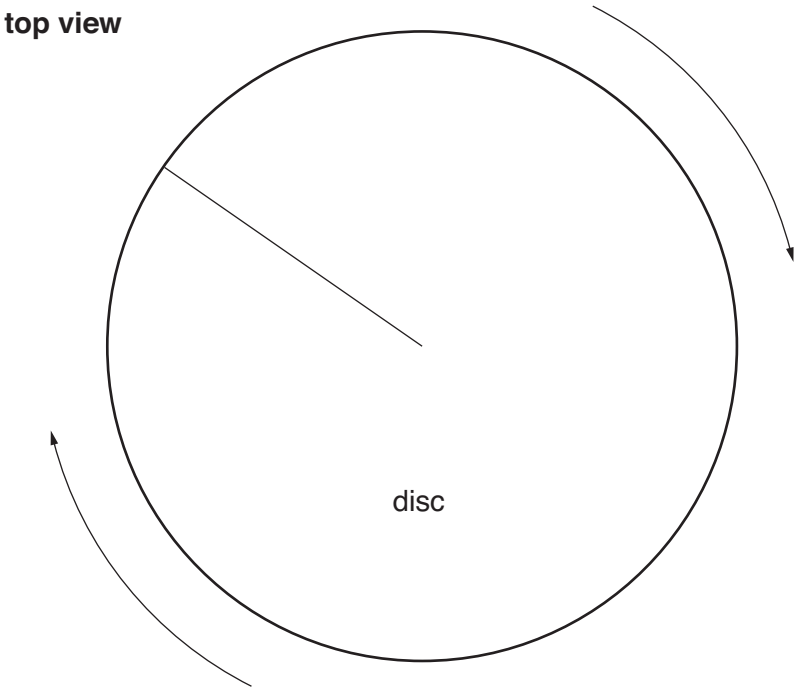


Fig. 2.2

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

T = ... s **[2]**

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

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..... **[1]**

(d) Reduce the radius of the disc to 5 cm using scissors. The circumference of this 5 cm disc has been drawn on the card.

Repeat part **(b)** recording your results in the space below.

T = ... s **[1]**

(e) Do the results of your experiment support the suggestion that *T* is directly proportional to r^2, where *r* is the radius of the disc? Justify your answer.

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..... **[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 torsional oscillations of a disc suspended from a wire.

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]

END OF QUESTION PAPER

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