OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE

PHYSICS A 2823/03/TEST

Practical Test (Part B)

Monday **13 JANUARY 2003** Morning 1 hour 30 minutes

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

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** questions.
- Write your answers in the spaces on the question paper.

INFORMATION FOR CANDIDATES

- In this part of 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
- You are advised to spend the first few minutes reading through the whole paper before starting to answer any questions.
- 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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It is recommended that you spend about 1 hour on this question.

1 A light-emitting diode (LED) is an efficient device for converting electrical energy into light energy since little heat is generated in the LED when it glows. In this experiment you will investigate how the electrical power consumed by a yellow LED is related to its resistance.

(a) (i) Construct the circuit shown in Fig. 1.1. Connections to the LED may be made using the crocodile clips provided. The 100 Ω series protective resistor is to prevent damage to the LED caused by large currents. Adjust the variable resistor so that the LED is at minimum brightness.

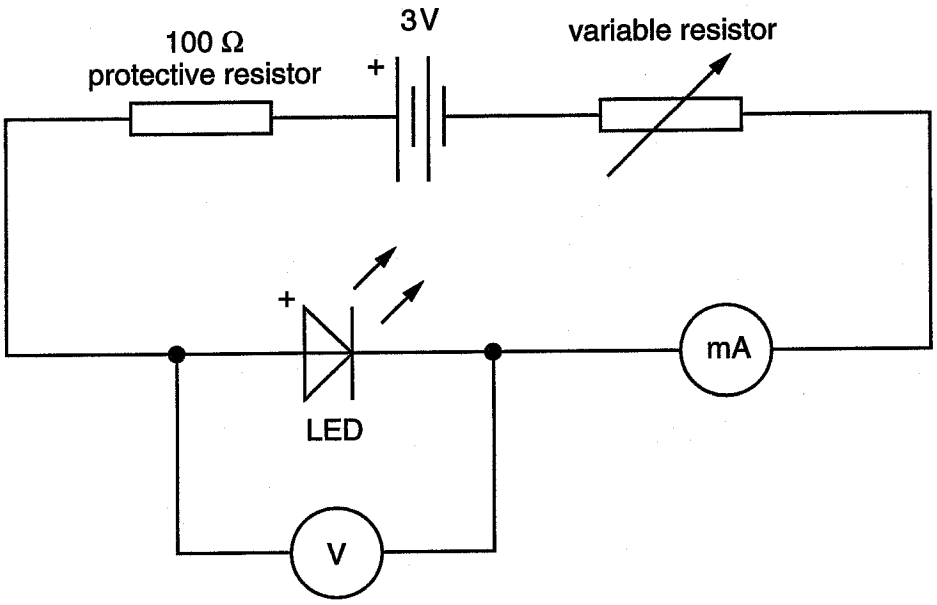

Fig. 1.1

(ii) Measure and record the potential difference V across the LED and the current I.

V = ... V

I = ... mA

(b) Change the setting of the variable resistor and repeat **(a) (ii)** until you have five more sets of readings for V and I. Values of I should be in the range $0 < I \leqslant 10$ mA. In your table of results include all six values for V and I together with corresponding deduced values for the power P and $\frac{1}{R}$ where R is the resistance of the LED.

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

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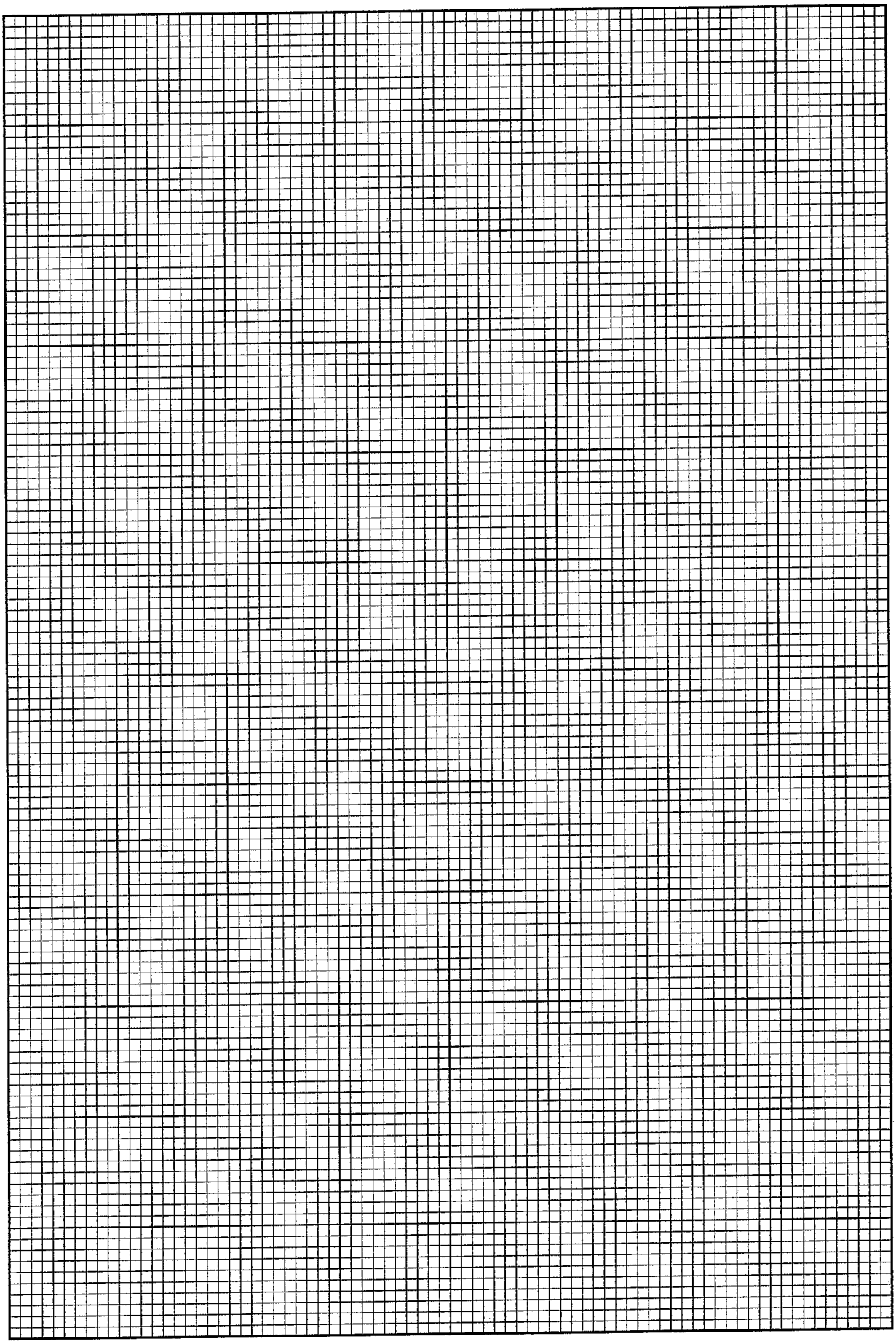
(d) Plot a graph of P (y-axis) against $\frac{1}{R}$ (x-axis) and draw the best straight line through your points.

For Examiner's Use



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For Examiner's Use

(e) Determine the gradient of the best straight line of your graph.

gradient = ...

(f) It is suggested that the power is related to the resistance according to the equation

$$P = \frac{k}{R} + c$$

where k and c are constants.

State the value of k and give an appropriate unit with your value.

k = ... unit .....

(g) Discuss the extent to which your results support the suggestion that P is inversely proportional to R.

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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 (e).

2 Two students are having a discussion about the mass flow rate of salt passing through a hole in a salt pot. The first student suggests that the rate will not depend on the amount of salt in the container, but the second student thinks that the rate will decrease if there is less salt in the container. In this question you will investigate how the mass flow rate of salt passing through the hole in a funnel depends on the mass of salt in the funnel.

You are supplied with two small beakers containing salt. The mass of salt in container A is 30 g and the mass of salt in container B is 60 g.

(a) Mount the funnel in a stand and clamp and place a beaker underneath as shown in Fig. 2.1.

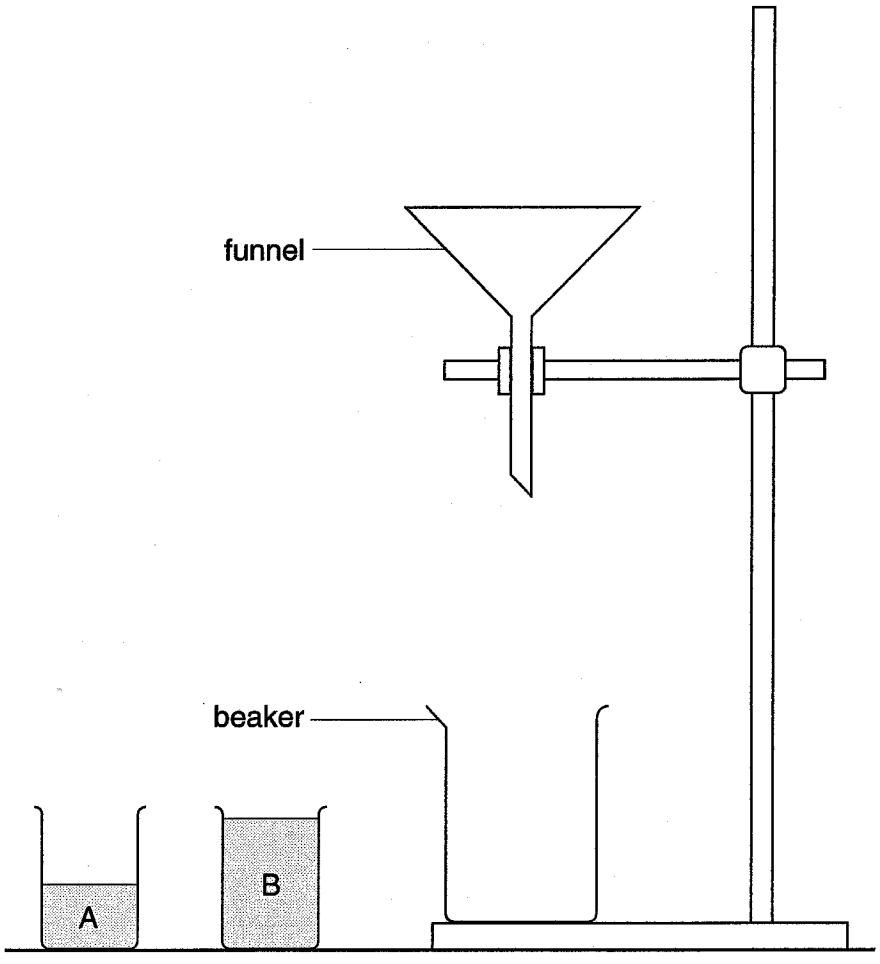

Fig. 2.1

(b) (i) Place your finger over the hole at the bottom of the funnel and pour the salt from container A into the funnel.

(ii) Move your finger away from the hole and at the same time start a stopwatch. Make and record measurements to find the time t_A for all of the salt to leave the funnel.

t_A = ... s

(iii) Repeat the procedure for the salt in container B.

t_B = ... s

(c) Estimate the percentage uncertainty in t_B, showing your working.

% uncertainty in t_B = ...

For Examiner's Use

(d) **(i)** Calculate the mass flow rate in each case by dividing the mass of salt by the time taken for it to pass through the hole in the funnel.

mass flow rate$_A$ = ...

mass flow rate$_B$ = ...

(ii) Use your answer in **(i)** to comment on whether the mass of salt in the funnel affects the rate at which salt passes out of the funnel.

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For Examiner's Use

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

Write an evaluation of the procedure which you have followed to find the mass flow rate. 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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