OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE

PHYSICS A 2823/03/TEST

Practical Examination 1 (Part B – Practical Test)

Wednesday **18 MAY 2005** 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 10 printed pages and 2 blank pages.

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Answer **all** the questions.

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

1 In this experiment you will determine the resistance of an unknown resistor and the e.m.f. of a cell using a set of resistors of known resistance and a milliammeter of negligible resistance.

(a) Connect the circuit shown in Fig. 1.1. **X** is a resistor of unknown resistance. Initially use **one** of the known resistors for **R**. Subsequent values of **R** may be made using a combination of known resistors. The value of the resistance of each of the known resistors is written on a card. [2]

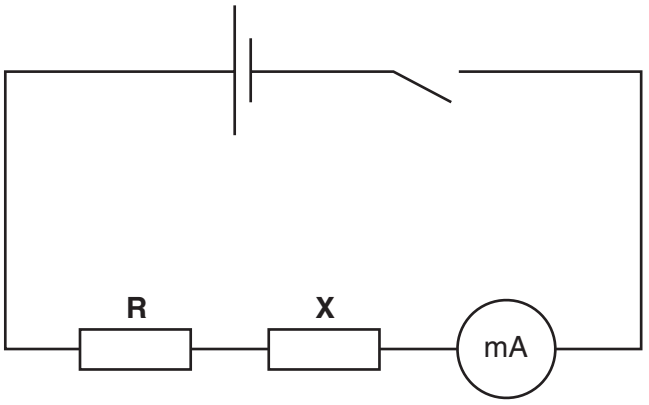

Fig. 1.1

(b) **(i)** Close the switch.

(ii) Record the reading of the current I from the milliammeter.

I = ... mA [1]

(iii) Open the switch.

(iv) Record the value of R.

(c) Change **R** by using different arrangements of the known resistors. You may use series or parallel arrangements of resistors, or a combination of the two. For each arrangement calculate the value of its resistance R. Repeat **(b)** until you have six sets of readings for R and I, where $R \neq 0$. Include values of $\frac{1}{I}$ in your table of results.

You may find the following formulae useful.

Resistors in series, $R = R_1 + R_2 + \ldots$ and resistors in parallel $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$

[8]

(d) (i) Plot a graph of $\frac{1}{I}$ (y-axis) against R (x-axis).

(ii) Draw the best straight line through the points.

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

gradient = ...

y-intercept = ...

[9]

(e) Justify the number of significant figures that you have given for $\frac{1}{I}$ in your table.

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.....[2]

(f) Theory shows that for a cell of negligible internal resistance the relationship between I and R is

$$\frac{1}{I} = \left(\frac{1}{E}\right)R + \frac{X}{E}$$

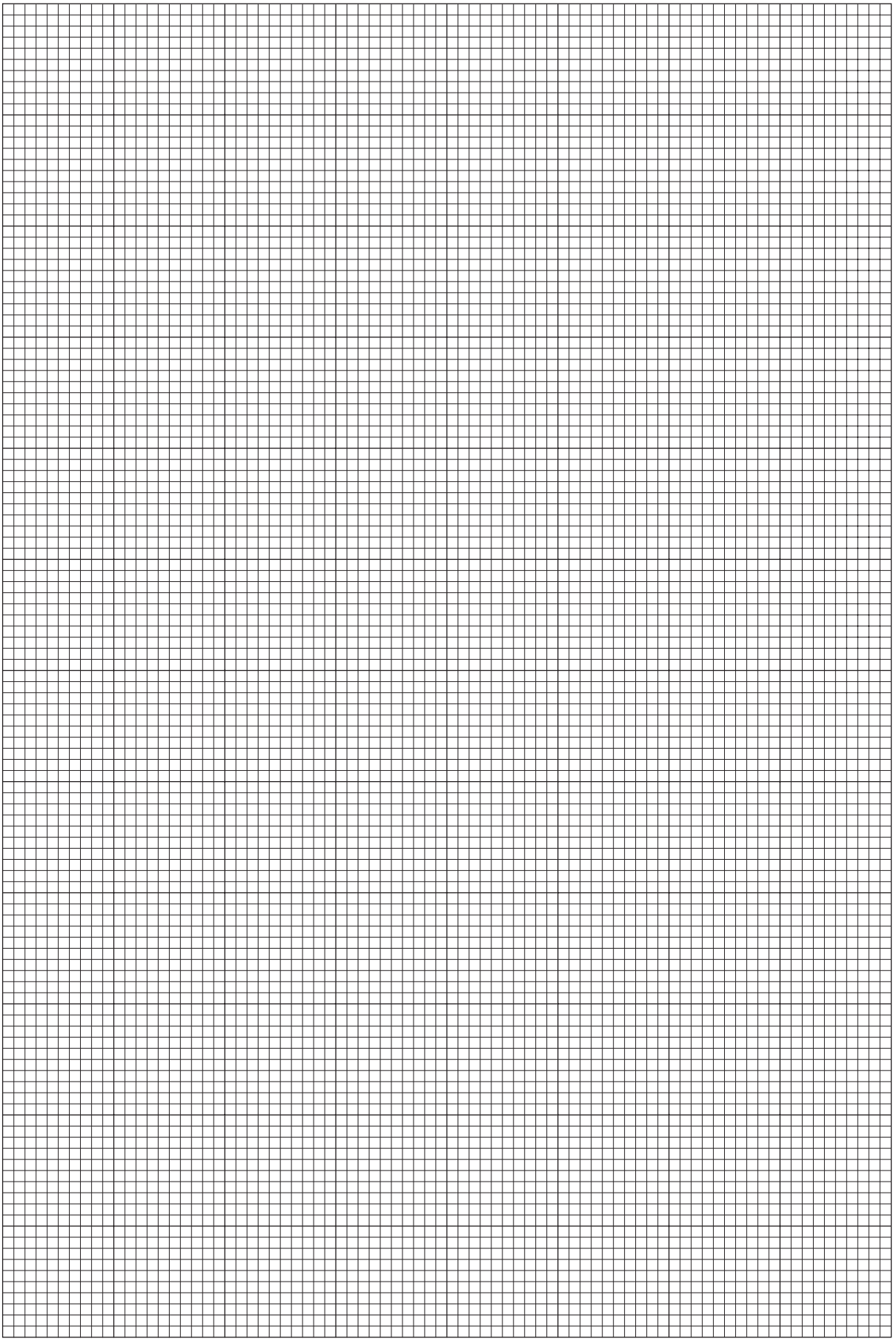
where E is the e.m.f. of the power supply and X is the unknown resistance.
Use your answers from **(d) (iii)** to determine a value for E and a value for X.

E = ...

X = ...

[6]

[Total: 28]



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

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

2 A designer of swimming pools wishes to build a series of diving boards of different heights above the water at one end of the pool. The designer is concerned that the water may not be deep enough to prevent the diver from hitting the bottom of the pool. In this experiment you will model the behaviour of a diver by releasing a pencil from different heights above a water surface. You will measure the maximum depth to which the pencil sinks.

(a) Thread the cotton through a small metal loop in a cork fixed by a clamp. Hold the other end of the cotton so that the pencil is suspended at a height *h* above a container of water as shown in Fig. 2.1. The initial value of *h* should be no more than about 8 cm.

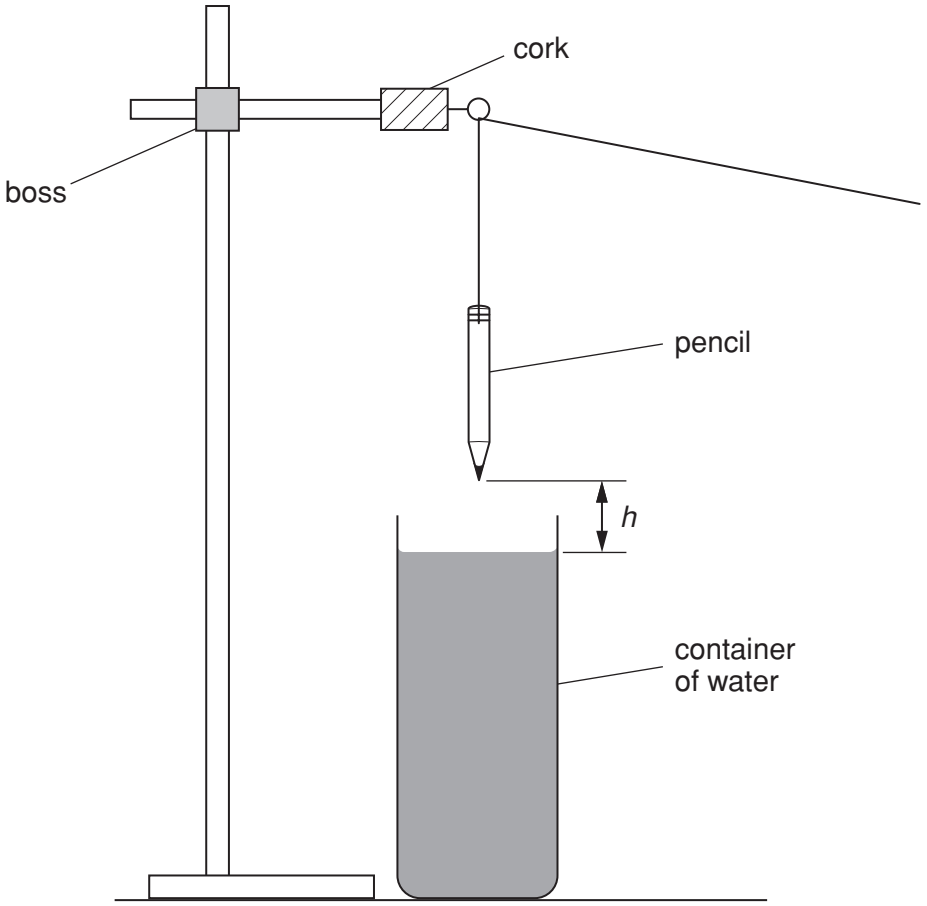


Fig. 2.1

(b) (i) Measure and record the height *h* of the tip of the pencil above the water surface.

h = ... cm

(ii) Release the cotton so that the pencil falls into the water as shown in Fig. 2.2.

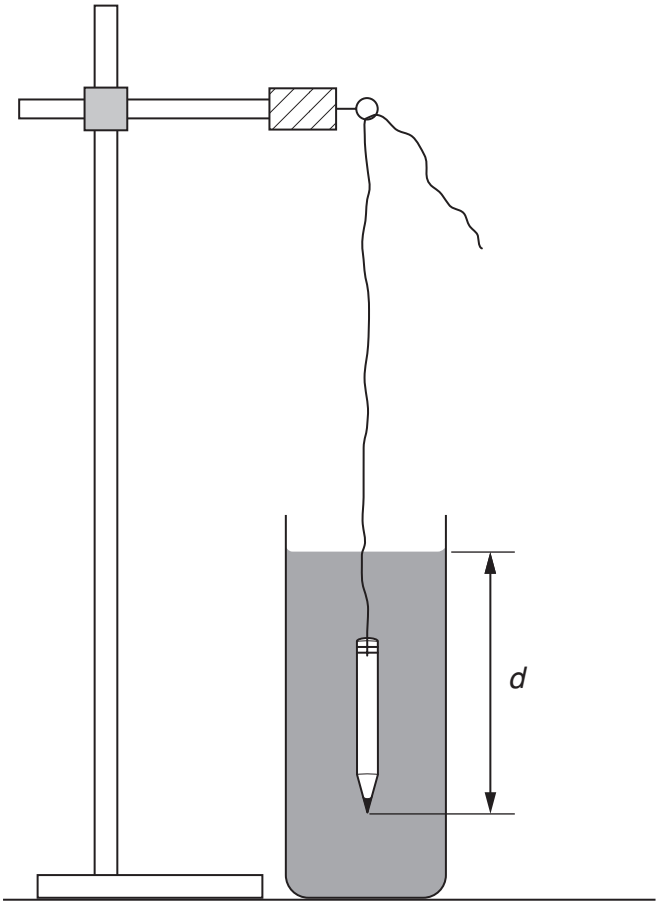


Fig. 2.2

Measure and record the depth *d* to which the tip of the pencil sinks below the water surface.

d = ... cm [1]

(c) Briefly explain how you measured *d*.

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.....[1]

(d) Determine the percentage uncertainty in this value of d.

% uncertainty in d = ...[2]

(e) Reduce the value of h and repeat **(b)**.

h = ... cm

d = ... cm

(f) It is suggested that the relationship between d and h is

$$d = k\sqrt{h} + \frac{5L}{4}$$

where L is the length of the pencil and k is a constant. Determine whether the results of your experiment support this relationship. Explain your reasoning clearly.

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.....[2]

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

(g) Write an evaluation of the procedure that you have followed to investigate the relationship between *d* and *h*. 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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.....[8]

Quality of Written Communication [2]

[Total: 16]

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