UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

1090378840

PHYSICS **9702/34**

Paper 3 Advanced Practical Skills 2 **October/November 2012**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **both** questions.
You will be allowed to work with the apparatus for a maximum of one hour for each question.
You are expected to record all your observations as soon as these observations are made, and to plan the presentation of the records so that it is not necessary to make a fair copy of them.
You may lose marks if you do not show your working or if you do not use appropriate units.

Additional answer paper and graph paper should be submitted only if it becomes necessary to do so.
You are reminded of the need for good English and clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] after each question or part question.

For Examiner's Use	
1	
2	
Total	

This document consists of **9** printed pages and **3** blank pages.

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You may not need to use all of the materials provided.

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1 In this experiment, you will investigate the variation of current in a circuit for different contact positions on a wire loop.

(a) (i) Assemble the circuit of Fig. 1.1.

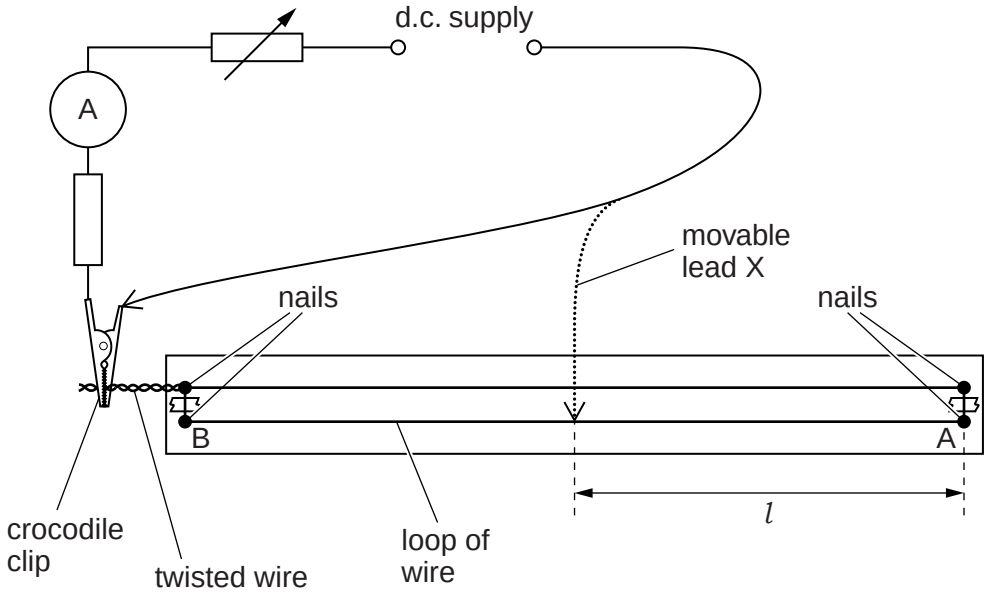


Fig. 1.1

(ii) With lead X pressed on to the crocodile clip as shown in Fig. 1.1, adjust the rheostat until the ammeter reading is in the range 160–190 mA.

(iii) Record the ammeter reading I_0 when the lead X is pressed on to the crocodile clip.

I_0 = ... [1]

(b) Move lead X and press it on to the wire approximately half way between A and B. Record its distance l from A and record the ammeter reading I.

l = ...

I = ...
[1]

(c) Repeat **(b)** with the lead X at different distances from A until you have six sets of values of l and I.
Include values of $\frac{1}{I}$ and l^2 in your table.

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[10]

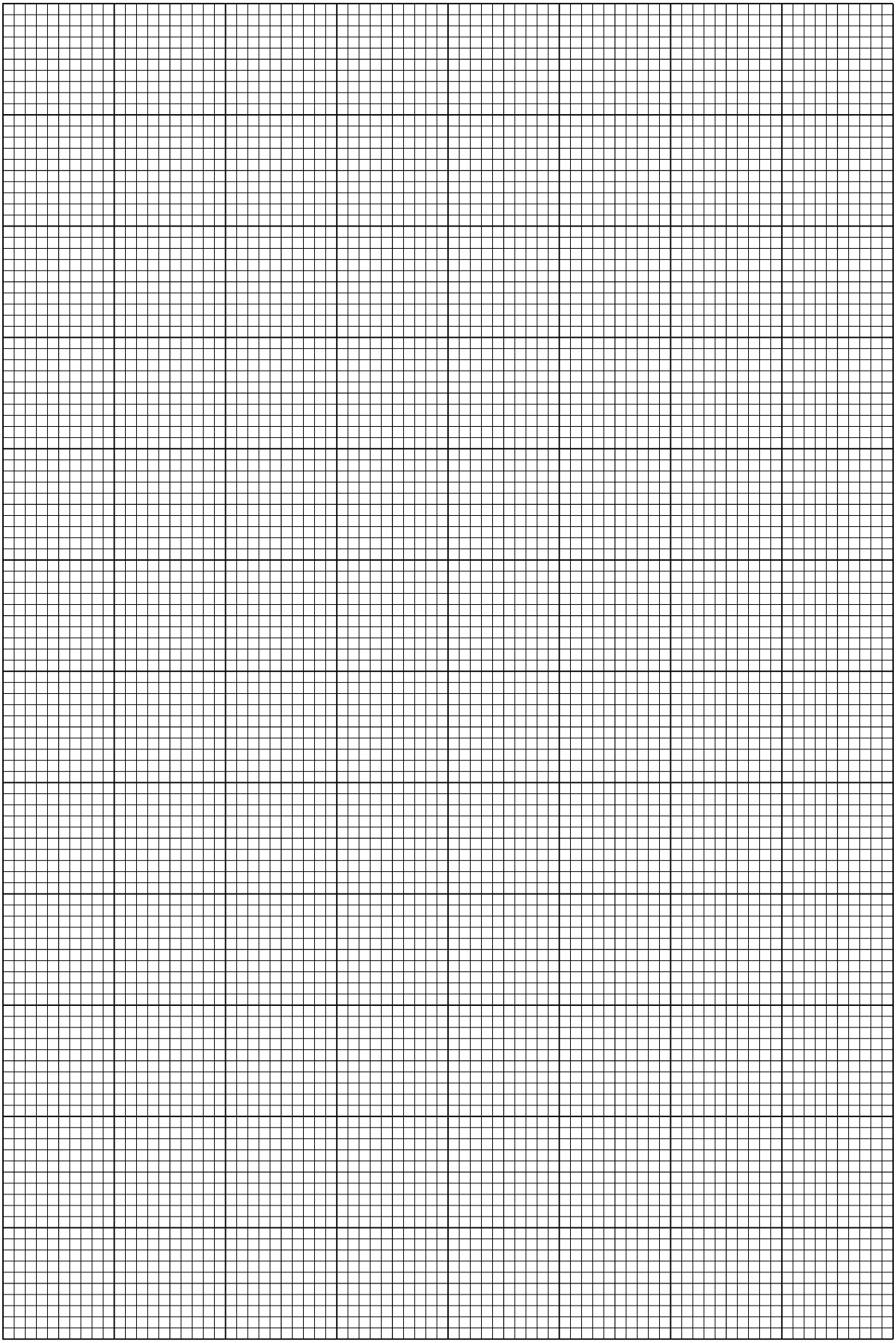
(d) **(i)** Plot a graph of $\frac{1}{I}$ on the *y*-axis against l^2 on the *x*-axis. [3]

(ii) Draw the straight line of best fit. [1]

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

gradient = ...

y-intercept = ...
[2]



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(e) The quantities I and l are related by the equation

$$\frac{1}{I} = al^2 + b$$

where a and b are constants.

Using your answers from **(d)(iii)**, determine the values of a and b.
Give appropriate units.

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a = ...

b = ...

[2]

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2 In this experiment, you will investigate the time taken for a ball to roll a fixed distance down an inclined track.

(a) You are provided with a straight track with two marks A and B as shown in Fig. 2.1.

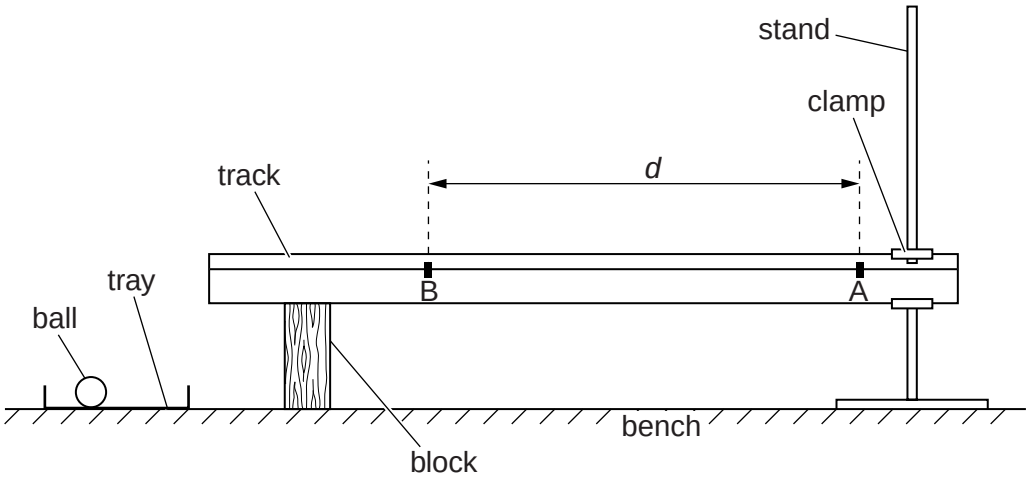


Fig. 2.1

Measure and record the distance *d* between the marks A and B.

d = ...[1]

(b) Place the ball on the track at A and then adjust the clamp to raise that end of the track as shown in Fig. 2.2, until the ball just starts to roll.

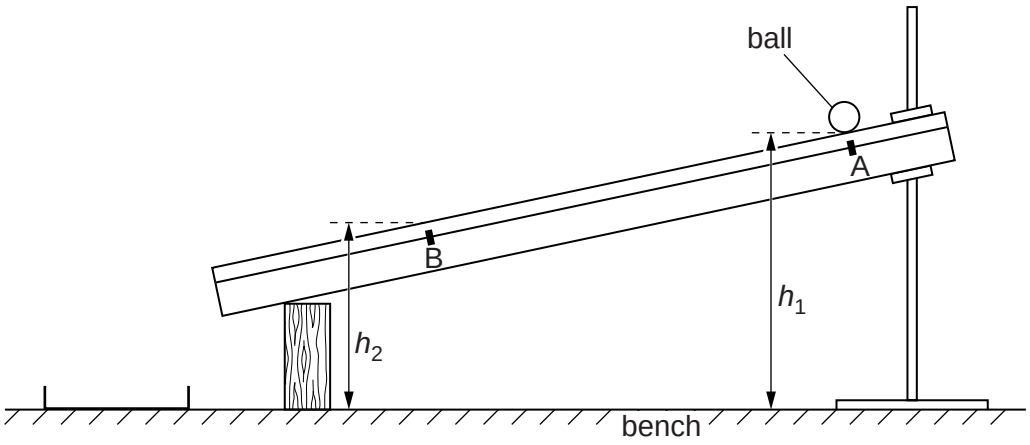


Fig. 2.2

(c) **(i)** Measure and record the height h_1 of the track above the bench at A, and the height h_2 of the track above the bench at B.

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h_1 = ...

h_2 = ...
[1]

(ii) The angle that the track makes with the horizontal is θ.

Calculate the value of sin θ using the relationship

$$\sin\theta = \frac{h_1 - h_2}{d}.$$

sin θ = ...[1]

(d) Justify the number of significant figures you have given for your value of sin θ.

.....

.....

.....[1]

(e) Place the ball on the track at A and take measurements to find the time t taken for the ball to roll from rest to B.

t = ...[2]

(f) Estimate the percentage uncertainty in your value of t.

percentage uncertainty = ...[1]

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(g) **(i)** Adjust the clamp to raise the track so that h_1 increases by approximately 15 mm.

(ii) Repeat **(c)** and **(e)**.

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h_1 = ...

h_2 = ...

sin θ = ...

t = ...

[3]

(h) It is suggested that the relationship between t and θ is

$$t = \frac{k}{\sqrt{\sin \theta}}$$

where k is a constant.

(i) Using your data, calculate two values of k.

first value of k = ...

second value of k = ...

[1]

(ii) Explain whether your results support the suggested relationship.

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.....

.....

.....

.....

[1]

(i) **(i)** Describe four sources of uncertainty or limitations of the procedure for this experiment.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

.....

[4]

(ii) Describe four improvements that could be made to this experiment. You may suggest the use of other apparatus or different procedures.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

.....

[4]

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