

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
TOTAL	



General Certificate of Education
Advanced Subsidiary Examination
June 2012

Physics

(Specifications A and B)

PHA3/B3/XPM1

Unit 3 Investigative and Practical Skills in AS Physics
Route X Externally Marked Practical Assignment (EMPA)

Section A Task 1

For this paper you must have:

- a calculator
- a pencil
- a ruler.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Show all your working.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for Section A Task 1 is 16.

Section A Task 1

Follow the instructions given below.

Provide the information required in the spaces provided.

No description of the experiment is required.

1 You are to make measurements on a 10p coin.

1 (a) Use the micrometer screw gauge to determine d , the diameter of the 10p coin.

.....

.....

$d =$

(2 marks)

1 (b) You have been provided with a piece of carbon paper, the dimensions of which are the same as the rectangular box, shown by the dotted outline below. Place the carbon paper over the rectangular box, with the inked side of the carbon paper facing downwards.

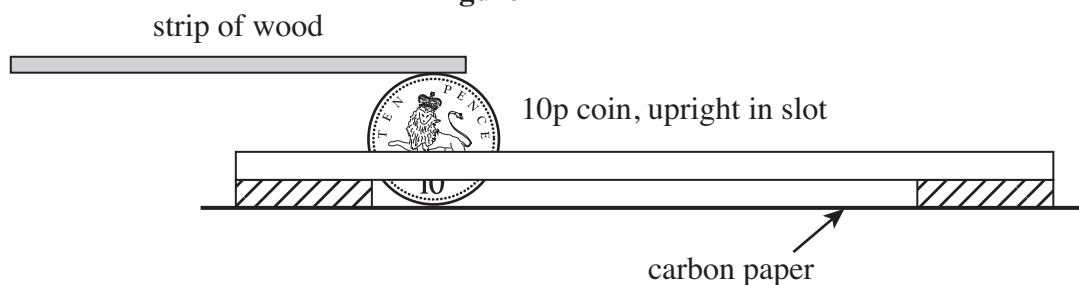


You have been provided with two strips of wood that have been joined together so that a narrow slot is formed between them. The width of the slot is just wider than the thickness of the 10p coin.

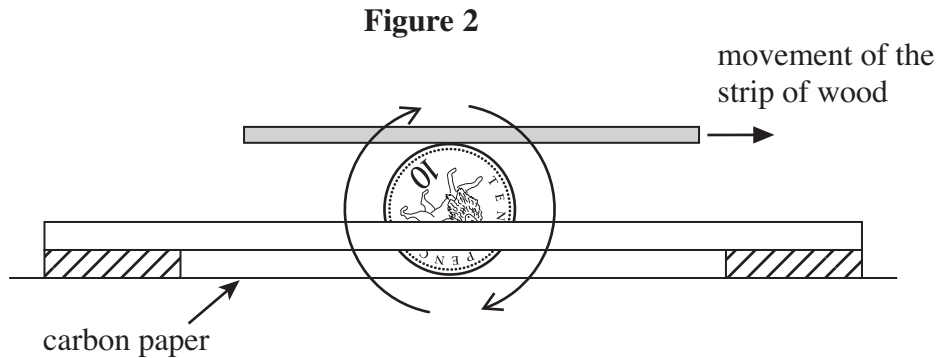
Position the slot over the carbon paper so that the direction of the slot is parallel to the longer edges of the paper.

Place the 10p coin in the slot at one end and hold the short strip of wood in contact with the rim of the coin, as shown in **Figure 1**.

Figure 1



Applying gentle downwards pressure to the strip of wood, push the coin along the slot so that it rotates without slipping, as shown in **Figure 2**.



When the carbon paper is removed, an imprint of the ridges around the rim of the coin is left on the page of your answer book.
You may move the slot and repeat the procedure until you have obtained a satisfactory result.

- 1 (b) (i)** Use the 300 mm ruler to make suitable measurements to determine the separation, s , of the ridges on the coin.
You may use the hand lens to assist you with making this measurement.

.....
.....
.....

$s =$ (2 marks)

- 1 (b) (ii)** Use your results for s and d to determine the number of ridges around the rim of the 10p coin.

.....
.....
.....

number of ridges = (2 marks)

6

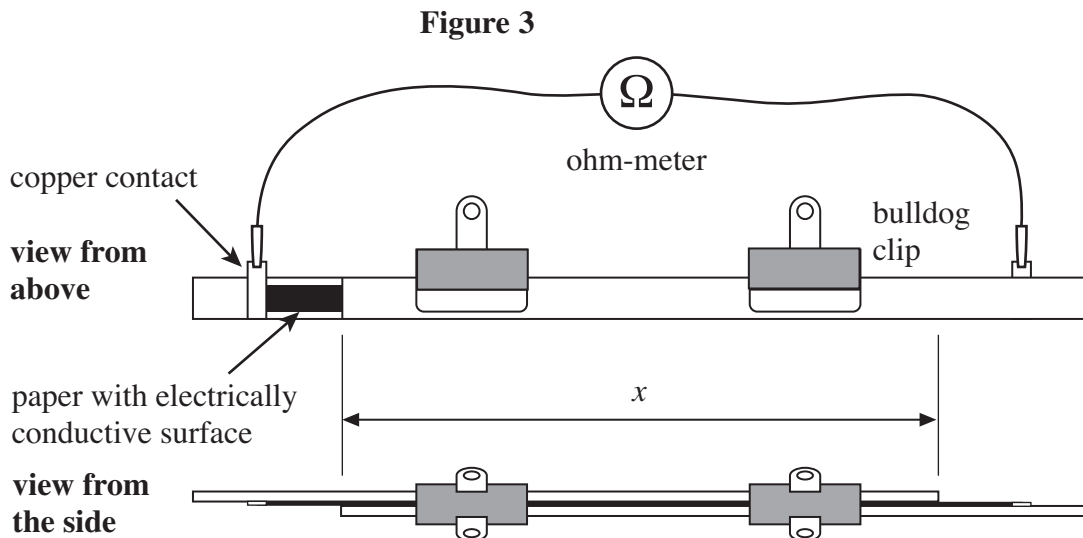
Turn over for the next question

Turn over ►

- 2 You are provided with a resistor made from two rectangular pieces of paper that have electrically-conductive surfaces.

The pieces of paper have identical dimensions and are mounted on strips of wood. The conductive surfaces of the paper are in contact with each other. The strips are secured using bulldog clips.

The resistance is measured with an ohm-meter, connections to which are made through the copper contacts joined to one end of each of the pieces of paper. Views of the resistor from above and from the side are shown in **Figure 3**.



The resistance of the resistor will be changed by altering x , the length of the conductive surfaces which are in contact.

You are to investigate how R , the resistance of the resistor, depends on x .

- 2 (a) The resistor has already been assembled and the ohm-meter set to a suitable range. **Note that the ohm-meter shows the resistance in $k\Omega$.**

2 (a) (i) Measure x and read R from the ohm-meter.

2 (a) (ii) Remove the bulldog clips and rearrange the two parts of the resistor so that x is reduced.

Reattach the bulldog clips then read R corresponding to the new value of x .

2 (a) (iii) Repeat the procedure until you have a total of six values of R and x .

The maximum value of x should not exceed 35.0 cm.

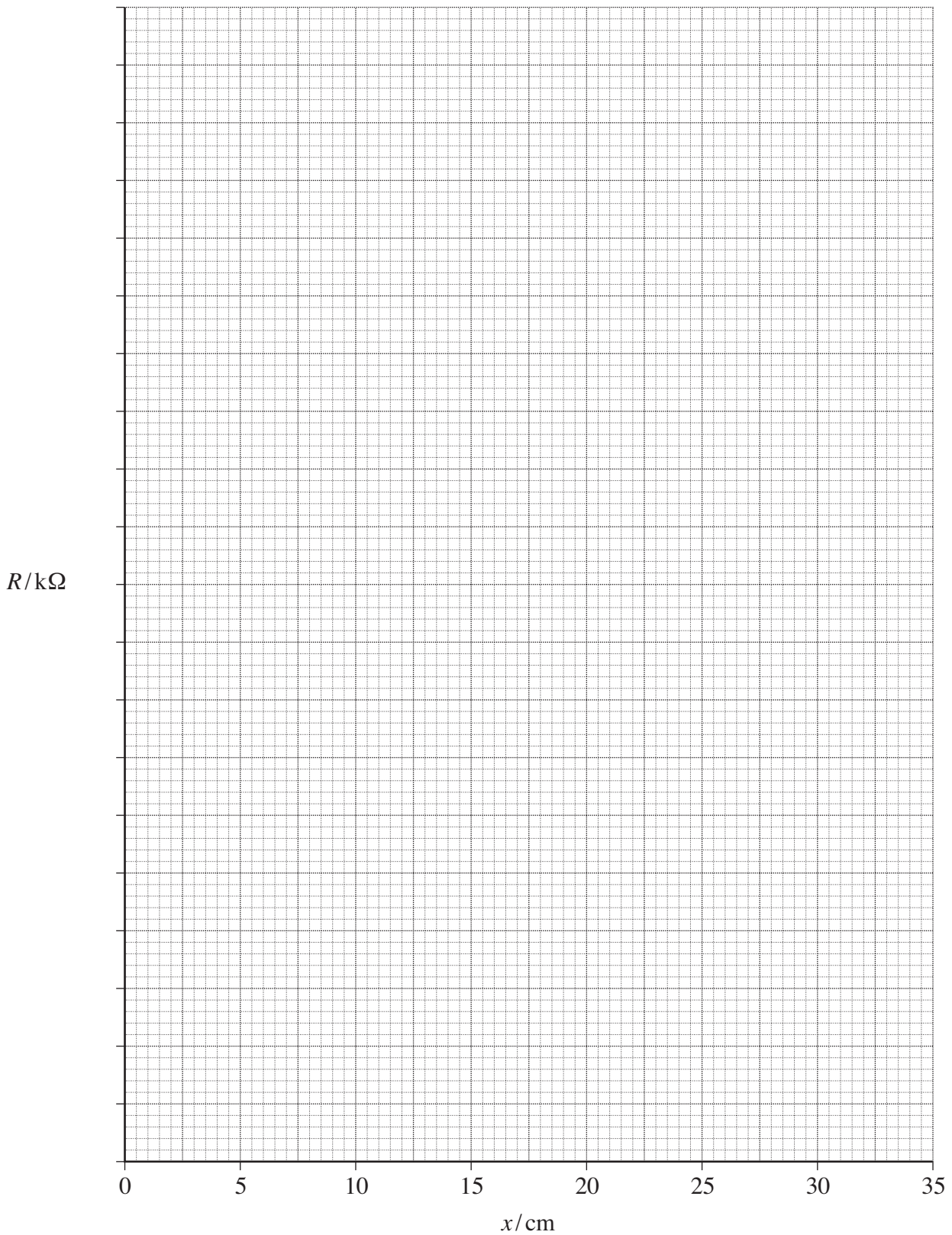
Record all your data in the table below.

x/cm						
$R/k\Omega$						

(2 marks)

- 2 (b) Adding a suitable vertical scale, plot, on the grid below, a graph to show how R varies with x .

(2 marks)



Turn over ►

2 (c) (i) Circle the term below that best describes the relationship between R and x illustrated by your graph.

directly proportional linear inversely proportional none of these

(1 mark)

2 (c) (ii) Explain your answer to part (c)(i).

.....
.....
.....
.....
.....

(2 marks)

2 (d) Suppose that you were to repeat the experiment with a resistor constructed using two pieces of conductive paper of the same resistivity and length as in your experiment, but of **smaller width**.

2 (d) (i) State and explain the effect this change would produce on your measurement of R for a given value of x .

.....
.....
.....
.....
.....

(2 marks)

2 (d) (ii) State the effect, if any, this change would produce on the gradient of your graph.

.....
.....

(1 mark)

END OF QUESTIONS

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**