Centre Number						Candidate Number				
Surname						Other Names				

Notice to Candidate. The work you submit for assessment must be your own. If you copy from someone else or allow another candidate to copy from you, or if you cheat in any other way, you may be disqualified.

Candidate Declaration. I have read and understood the Notice to Candidate and can confirm that I have produced the attached work without assistance other than that which is acceptable under the scheme of assessment.

Candidate Signature		Date	

For Examiner's Use	
Examiner's Initials	
Section	Mark
Section A Part 1 Q1	
Section A Part 1 Q2	
Section A Part 2 Q1	
Section B Q1	
Section B Q2	
Section B Q3	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
June 2012

Physics (Specifications A and B) PHA3/B3/X

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

Section B Written Test

For this paper you must have	**Instructions**
• your completed Section A Part 2 question paper / answer booklet. • a ruler • a pencil • a calculator.	• 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 space 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.
Time allowed • 1 hour 15 minutes	**Information** • The marks for questions are shown in brackets. • The maximum mark for this paper is 24.

Details of additional assistance (if any). Did the candidate receive any help or information in the production of this work? If you answer yes, give the details below or on a separate page.

Yes ☐ No ☐

Practical Skills Verification Teacher Declaration: I confirm that the candidate has met the requirement of the practical skills verification (PSV) in accordance with the instructions and criteria in section 3.8 of the specification.	**Yes** ☐

Signature of teacher ..... Date .....

Section B

Answer **all** the questions in the spaces provided.

Time allowed is 1 hour 15 minutes.

You will need to refer to the work you did in Section A Part 2 when answering these questions.

1 **(i)** Determine the gradient, G, of your graph.

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.....

G = ...

(2 marks)

1 **(ii)** Calculate $\dfrac{G^2(H - h)}{H}$.

.....

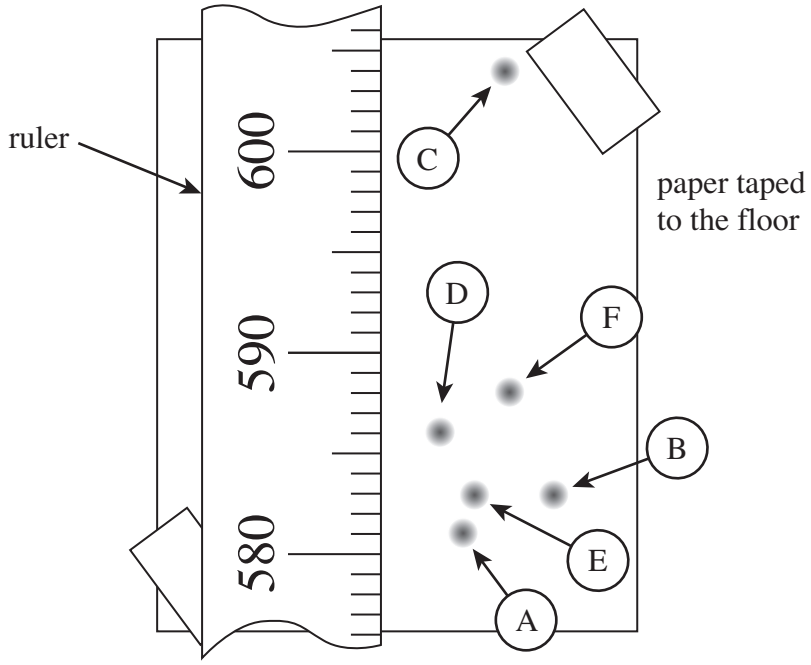
.....

$\dfrac{G^2(H - h)}{H}$ = ...

(2 marks)

2 **Figure 7** shows the impact marks (labelled A to F) produced on a piece of paper, taped to the floor, as a student attempts to make a measurement of x_1.

Figure 7



4

The six marks were produced by successive impacts of the same ball bearing which was released, on each occasion, from the **same point** on the track and at the **same height** above the bench. The ruler shown in **Figure 7** was then placed over the piece of paper and the zero graduation of the ruler was positioned level with a point marked on the floor, directly below the end of the track.

2 **(i)** Explain how, in your experiment, you located the point on the floor, directly below the end of the track.

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(1 mark)

2 **(ii)** Suggest why impact mark C is isolated from the other five impact marks.

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(1 mark)

2 **(iii)** Using the information in **Figure 7**, state and explain the measurement of x_1 that should be recorded by the student.

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(3 marks)

2 **(iv)** Calculate the uncertainty in the student's result for x_1. Show your working.

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(2 marks)

7

Turn over for the next question

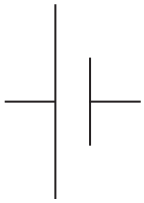
3 The electrically conductive surfaces of the paper you used in Section A Part 1 have a coating of paint containing a form of carbon (graphite) similar to that used in pencils.

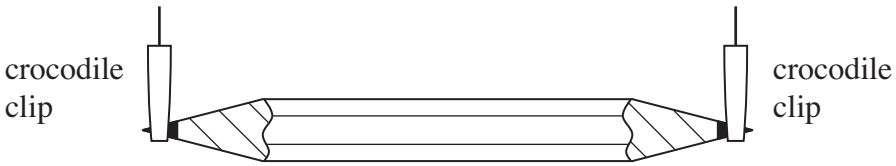
Using a pencil as part of a circuit containing a single 1.5 V cell, a student designs an experiment to find out more about the electrical properties of graphite.

3 (a) Complete **Figure 8** to show the external circuit that the student should use to investigate the current – potential difference (pd) characteristic of the graphite used in the pencil.

Figure 8

single 1.5 V cell

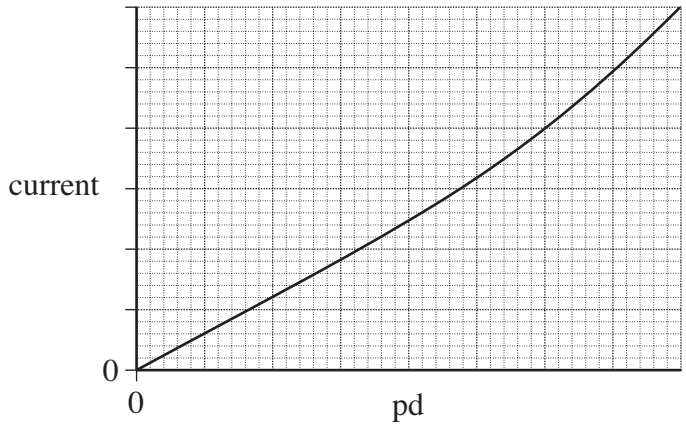




(2 marks)

The experimental results are displayed in **Figure 9**.

Figure 9



3 (b) With reference to **Figure 9**, explain how the resistance of the graphite is affected by temperature.

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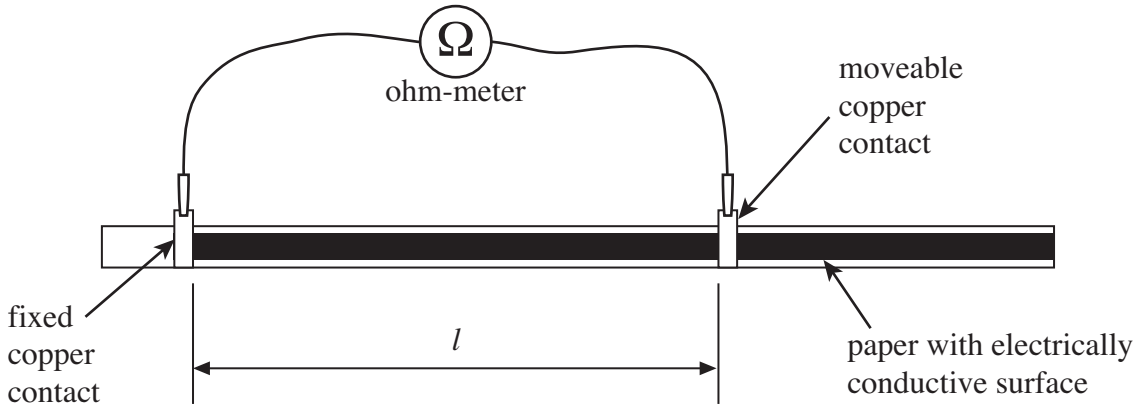
(3 marks)

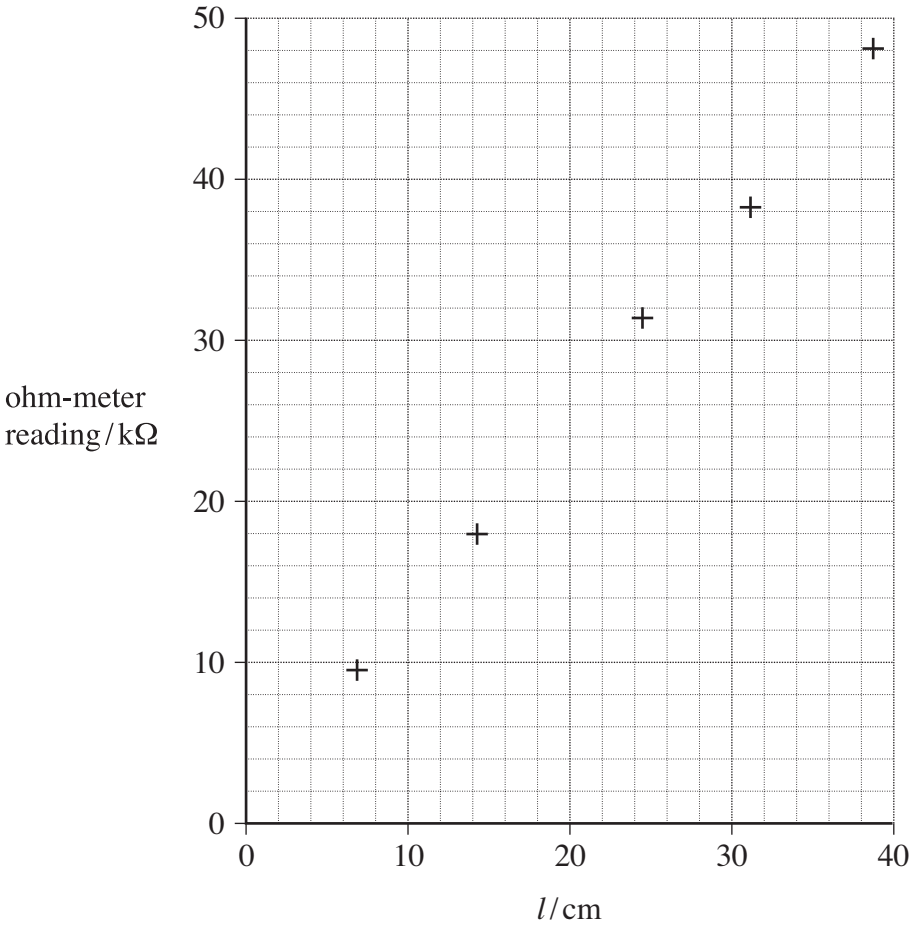
Using the equipment used in Section A Part 1, the student then carries out measurements on one strip of the paper with the electrically conductive surface. By using the moveable contact shown in **Figure 10**, the student investigates how *l*, the length of the strip, affects the ohm-meter reading.

Figure 10



The experimental results are displayed in **Figure 11**.

Figure 11



3 (c) Use **Figure 11** to determine the resistance per metre of the strip. Show your working.

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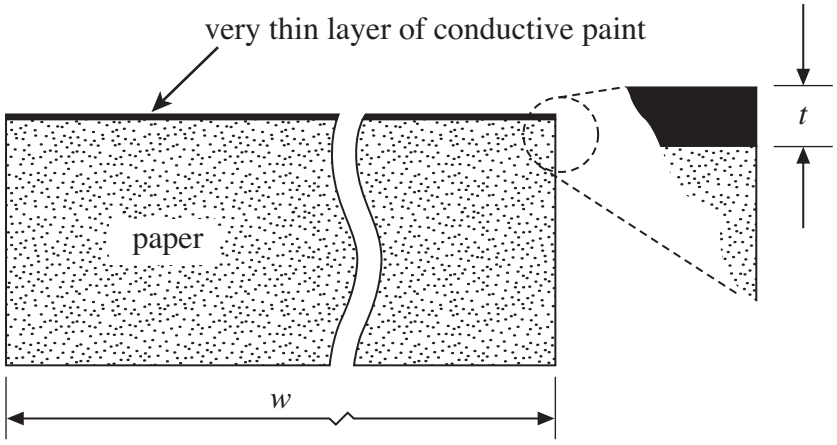
(3 marks)

Figure 12 shows a cross-sectional view of the strip; the conductive layer of graphite paint is of uniform thickness = t and the width of the paper strip = w.

Figure 12



3 (d) Show that $\frac{R}{l} = \frac{\rho}{wt}$, where $\frac{R}{l}$ = resistance per unit length of the strip and ρ = resistivity of graphite.

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(2 marks)

3 (e) Describe how w, the width of the conductive paper strip, can be measured and explain how your procedure reduces uncertainty in the result.

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(3 marks)

13

END OF QUESTIONS

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED