Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Education
Advanced Subsidiary Examination
June 2014

Physics
(Specifications A and B)

PHA3/B3/XPM2

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

Section A Task 2

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 2 is 18.

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

Section A Task 2

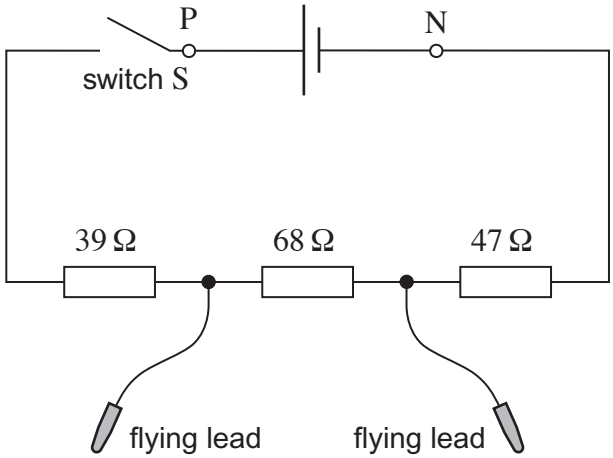
Follow the instructions given below.

Give the information required in the spaces provided.

No description of the experiment is required.

1 In this experiment you are required to investigate how the potential difference (pd) across a power supply varies when the resistance of the external circuit is changed. You are provided with the circuit shown in **Figure 8**.

Figure 8



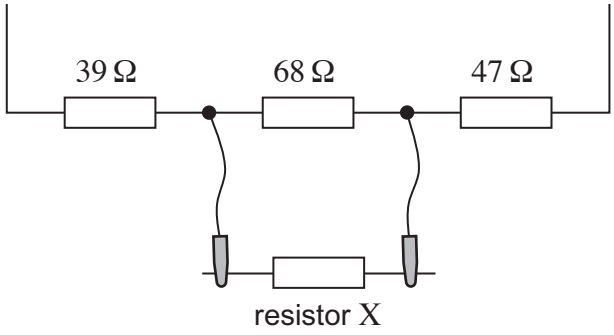
1 (a) Use the leads supplied to connect the voltmeter between socket P and socket N.

1 (a) (i) Ensuring that switch S is in the open (off) position, read and record the voltmeter reading ε, which is the electromotive force (emf) of the power supply.

ε = ...

1 (a) (ii) You are provided with a resistor X, the resistance of which has been concealed. Use the flying leads to connect resistor X in parallel with the 68 Ω resistor, as shown in **Figure 9**.

Figure 9



Close (turn on) switch S then read and record V_x, the new voltmeter reading.

V_x = ...

1 (a) (iii) Evaluate $\frac{\varepsilon}{V_x}$.

[1 mark]

$\frac{\varepsilon}{V_x}$ = ...

1 (a) (iv) Discuss how the voltmeter readings would have been affected if there had been significant contact resistance where the voltmeter leads are connected at terminals P and N.

[2 marks]

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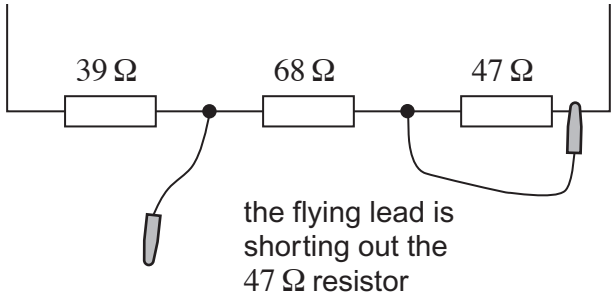
1 (b) Keeping switch S closed, remove resistor X so that R, the resistance of the circuit between socket P and socket N, is the series combination of the $39\,\Omega$, $68\,\Omega$ and $47\,\Omega$ resistors.

You may assume that each flying lead has zero resistance so these can be used individually, or in combination, to change R in a predictable way.
In the example shown in **Figure 10**, one flying lead has been connected in parallel with the $47\,\Omega$ resistor and R is now the series combination of the $39\,\Omega$ and $68\,\Omega$ resistors.

Figure 10



Using neither of the leads, or either lead separately or both leads in combination, obtain values of V that correspond to **all possible** values of R.
When you have completed your measurements, open (turn off) switch S.

Question 1 continues on the next page

Record below all your values of R and V in a single table.
Note that the independent variable should be recorded in the **left-hand** column of your table.

[4 marks]

1 (c) Plot, on **Figure 11**, a graph with $\frac{\varepsilon}{V}$ on the vertical axis and $\frac{1}{R}$ on the horizontal axis.

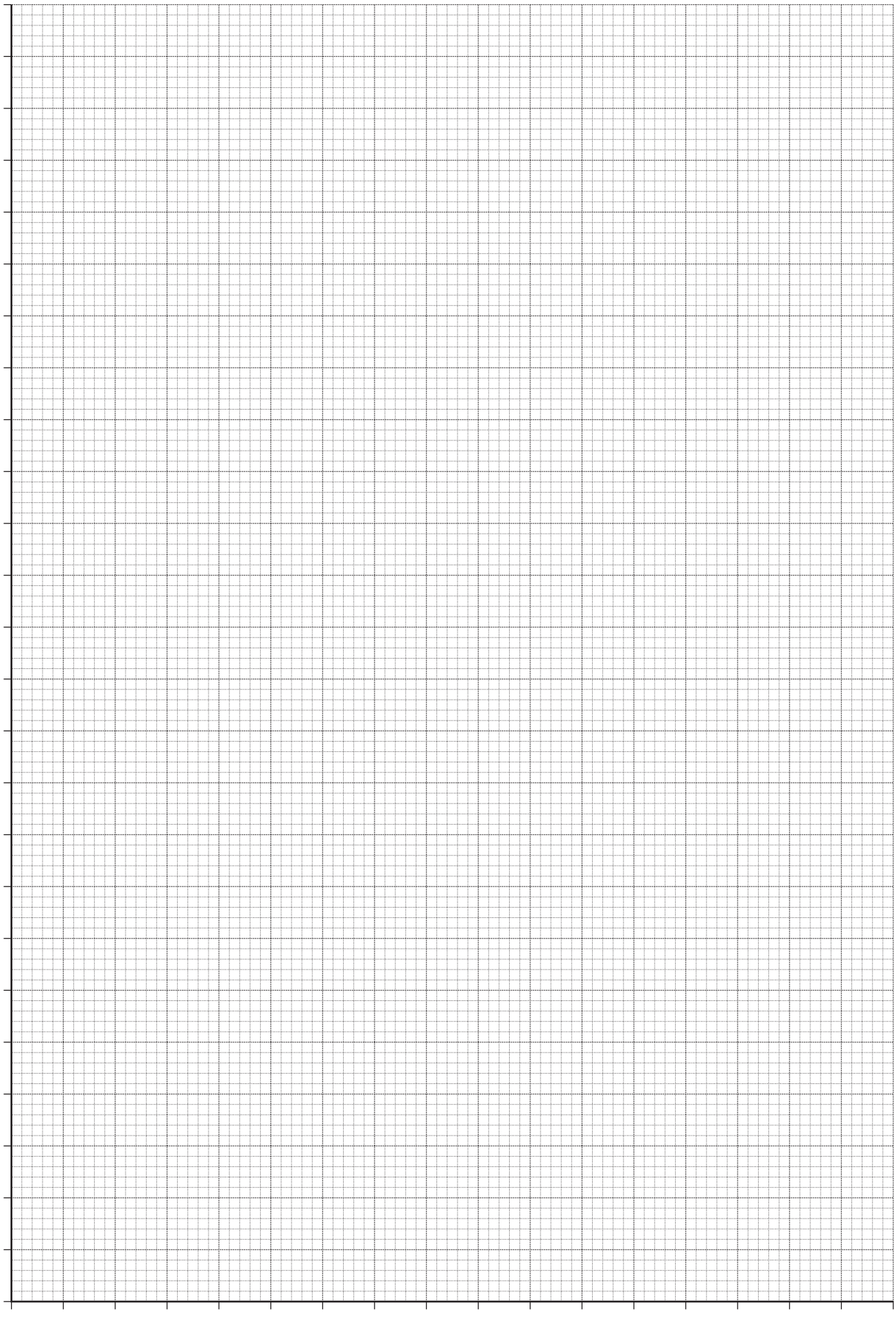
Tabulate below the readings you will plot on your graph.

[11 marks]

END OF QUESTIONS

18

Figure 11



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