

Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 3_ElectricCircuits

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

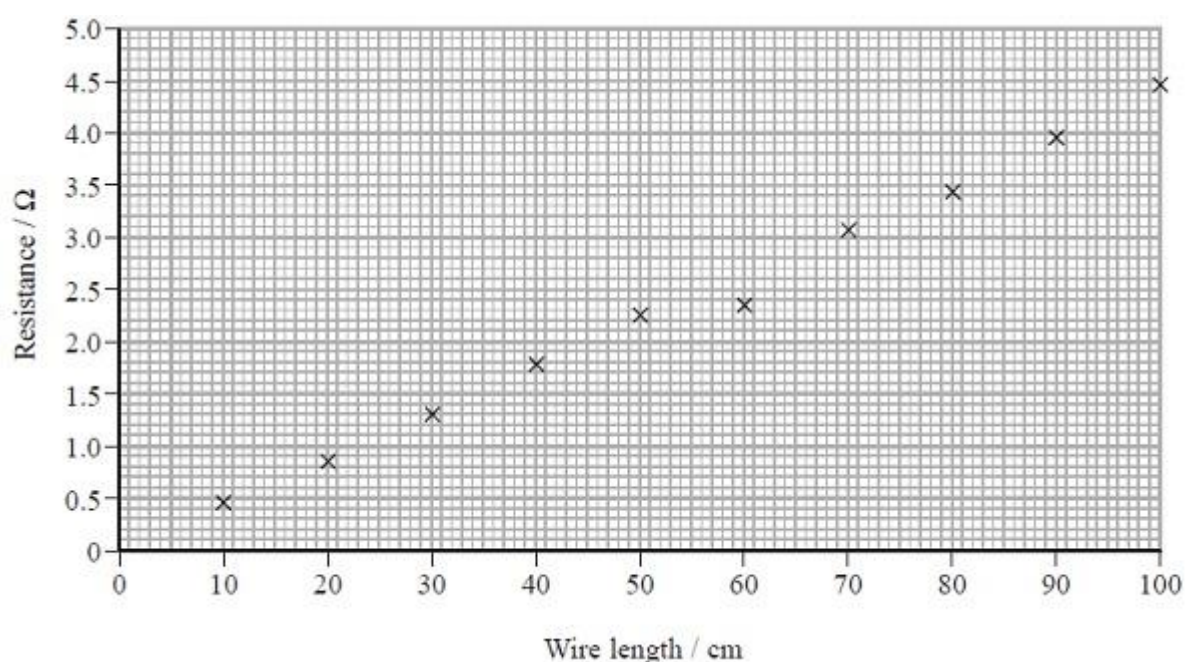
Q1.

A student carried out a series of measurements to determine how the resistance of a wire varies with its length.

The student obtained the following results.

Wire length / cm	Current / A	Potential difference / V	Resistance / Ω
100	0.15	0.67	4.47
90	0.16	0.63	3.94
80	0.17	0.58	3.41
70	0.17	0.52	3.06
60	0.18	0.42	2.33
50	0.18	0.40	2.22
40	0.19	0.34	1.79
30	0.20	0.26	1.30
20	0.22	0.18	0.82
10	0.22	0.10	0.45

The student plotted the results on a graph.



(a) Calculate the resistivity of the wire used.

cross-sectional area of wire = $1.06 \times 10^{-7} \text{ m}^2$

(4)

Resistivity = ...

(b) One precaution taken by the student was to keep the current small.

Explain why this precaution was necessary.

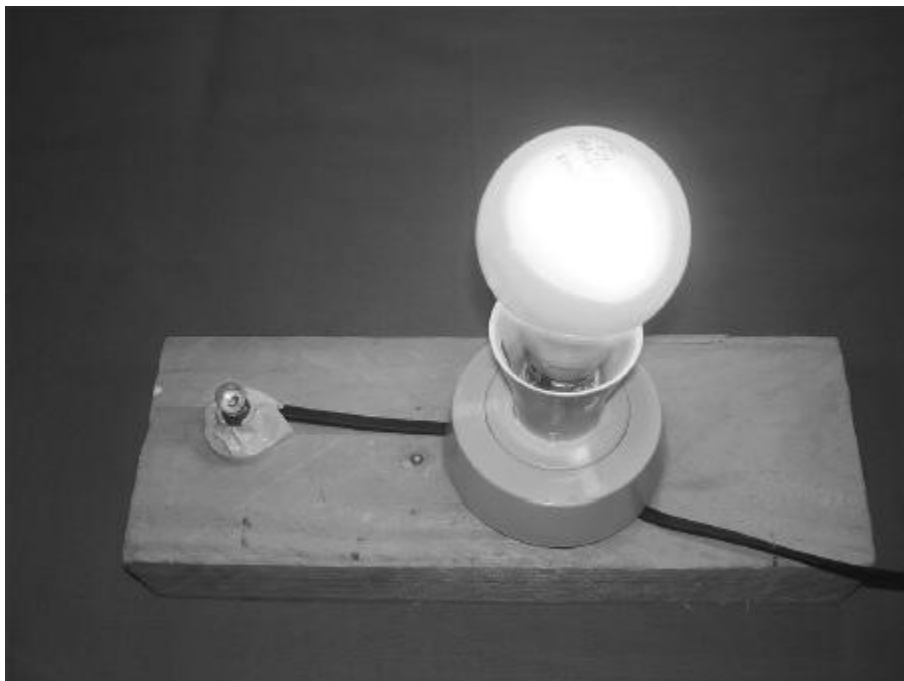
(2)

(c) Explain **one** other precaution which should be taken by the student to ensure the accuracy of the results in the table.

(2)

(Total for Question = 8 marks)

Q2.
The photograph shows a piece of apparatus in which a mains light bulb and a torch bulb are both connected to the mains.



Students were surprised to see both bulbs shining normally when the apparatus was switched on.

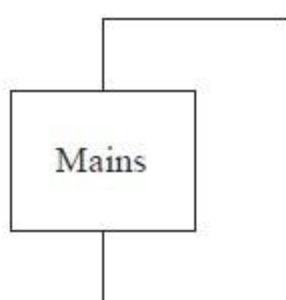
It is impossible to tell from looking at the apparatus whether the bulbs are connected in series or in parallel.

To test this, the apparatus was switched off and the mains bulb was removed. When it was switched on again the torch bulb did not light up. When this was repeated, removing the torch bulb, the mains bulb did not light up.

When the circuit was tried again with both bulbs, they still operated normally.

(a) Complete the circuit diagram to show how the bulbs are connected and explain why they must be connected in this way and not the alternative.

(3)



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(b) The mains bulb is marked 40 W, 230 V.

(i) Show that the current in the mains bulb is about 0.2 A when it is operating normally.

(2)

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(ii) Calculate the resistance of the mains bulb when it is operating normally.

(2)

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Resistance = ...

(iii) The torch bulb is marked 2.5 V, 0.20 A.

Calculate the resistance of the torch bulb when it is operating normally.

(2)

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Resistance = ...

(c) Explain, with reference to both current and potential difference, why it is possible to operate both bulbs at the same time from the same power supply.

(2)

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(d) Earlier in the question you were asked to calculate the resistances of the bulbs when operating normally.

Explain the effect on the resistances of the bulbs if they are operated at a much smaller current so that neither bulb lights up.

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(Total for Question = 15 marks)