I-V characteristics

Physics required practical | AQA Combined Science 8464 and AQA GCSE Physics 8463 | 14 questions, 36 marks

GCSE science required practicals

This practical online

Name: _____ **Date:** _____ **Score:** _____ **/ 36**

Aim: To find how the current through a fixed resistor, a filament lamp and a diode changes with the potential difference across it, and to draw their current-potential difference graphs.

Equipment: Variable d.c. power supply (or a battery with a variable resistor); Fixed resistor (for example 20 Ω); Filament lamp (for example 6 V, 0.3 A) in a holder; Diode with a protective resistor of about 100 Ω; Ammeter (or milliammeter for the diode); Voltmeter; Switch; Connecting leads.

Results

Hana tested a 6 V filament lamp. After the readings with positive values she reversed the connections to the lamp to get readings with negative values.

Potential difference in V	Current in A
-6.0	-0.30
-4.0	-0.24
-2.0	-0.16
0.0	0.00
1.0	0.10
2.0	0.16
4.0	0.25
6.0	0.30

Questions

1 In Hana's experiment, what was:

a. the independent variable

b. the dependent variable?

(2 marks)

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2 Describe how Hana could:

a. change the potential difference across the lamp

b. get the readings with negative values.

(2 marks)

3 Hana also tested a fixed resistor. She switched off between readings so that one variable stayed the same. Name this variable and explain why it matters.

(2 marks)

4 Give one hazard when testing the filament lamp and say how Hana can reduce the risk.

(2 marks)

5 Describe how the current through the lamp changes as the potential difference increases from 0 V to 6.0 V.

(2 marks)

6 Calculate the resistance of the lamp when the potential difference is 2.0 V.

(2 marks)

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7 Calculate the resistance of the lamp when the potential difference is 6.0 V, and use your answer and the previous question to say what happens to the resistance of the lamp as the potential difference increases. Show your working.

(3 marks)

8 **Higher tier**

Explain why the resistance of the filament lamp increases as the current through it increases.

(3 marks)

9 Hana's results for the fixed resistor were:

-3.0 V, -0.15 A; 1.0 V, 0.05 A; 2.0 V, 0.10 A; 3.0 V, 0.15 A.

Describe the relationship between current and potential difference for the resistor, using her results.

(2 marks)

10 Hana's results for the diode were:

-2.0 V, 0 mA; -1.0 V, 0 mA; 0.2 V, 0 mA; 0.4 V, 1 mA; 0.6 V, 12 mA; 0.7 V, 24 mA; 0.8 V, 60 mA.

Describe what these results show about the diode.

(3 marks)

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11 Calculate the resistance of the diode when the potential difference across it is 0.7 V and the current is 24 mA.

Give your answer to 2 significant figures. Show your working.

(3 marks)

12 **Higher tier**

Ifeoma tested a different fixed resistor. Her graph of current (y-axis) against potential difference (x-axis) was a straight line through the origin. It passed through the point 5.0 V, 0.040 A.

Calculate the gradient of her graph and use it to find the resistance of the resistor.

(2 marks)

13 Hana's lamp curve changes shape most quickly between 0 V and 2.0 V, but she has only one reading in between. Suggest an improvement to her method and explain how it helps.

(2 marks)

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14 Plan an investigation to find the current-potential difference graph of a diode, including negative values. Include how you would protect the diode from damage.

(6 marks)

End of questions | Total 36 marks | The answers sheet has the full method as revision notes.

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