

Required Practical I V Characteristics

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Describe how to set up a circuit to find the I–V characteristic of a filament lamp. (4 marks)

Step 1 · Series parts

Connect the lamp in series with a power supply, a variable resistor and an ammeter.

Step 2 · Voltmeter

Connect a voltmeter in parallel across the lamp.

Step 3 · Readings

Adjust the variable resistor to change the p.d.; record V and I for at least six values.

Step 4 · Negative values

Reverse the connections to the supply (or the lamp) and repeat to get negative readings.

Answer: Lamp, variable resistor and ammeter in series; voltmeter across the lamp; vary and reverse

Check: A variable-voltage supply can be used instead of a variable resistor.

2. Now try one with the steps

Use the example lamp data to calculate the resistance at 1.0 V and at 6.0 V. (3 marks)

Step 1 · At 1.0 V

Step 2 · At 6.0 V

Step 3 · Conclusion

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Name the component used to change the potential difference across the component being tested. [1]

2. Describe how the ammeter and voltmeter are connected. [2]

3. Explain why the connections to the component are reversed during the experiment. [1]
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4. Give one safety precaution when testing a filament lamp. [1]
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5. A student's results show zero current for all negative potential differences. Name the component. [1]
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6. Suggest how the student could make the results more repeatable. [1]
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7. At 4.0 V the lamp current is 0.26 A. Calculate its resistance in ohms to 2 significant figures. [2]
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8. Explain why a resistor is connected in series with a diode in this practical. [1]
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9. A fixed resistor gives 0.40 A at 2.0 V. Calculate its resistance in ohms. [2]
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10. Use the example lamp data to describe how its resistance changes p.d. increases. Use values in your answer. [2]
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11. Explain why the circuit for the fixed resistor should be switched off between readings. [1]
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12. Explain why the I–V graph for the filament lamp is not a straight line. [2]
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13. A diode has a forward current of 20 mA when the p.d. across it is 0.70 V. Calculate its resistance in ohms. [2]
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14. Explain why the I–V graph of a filament lamp has the same shape for negative p.d.s positive ones. [2]

4. Before you hand it in

Using the gradient of the curved lamp graph resistance

Read a pair of values and divide: $R = V \div I$.

Testing a diode without a protective resistor

Always include a series resistor to limit the current through a diode.

Plotting V on the y-axis and I on the x-axis

Plot current (y-axis) against potential difference (x-axis), the standard I–V characteristic.

Only taking positive readings

Reverse the connections and repeat to get negative values.