

I V Characteristics

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

Name _____ Class _____ Date _____

1. Worked example

An I–V graph is a straight line through the origin. A second graph is a curve that becomes flatter at higher p.d. Identify each component. (2 marks)

Step 1 · Straight line through the origin

Current $\propto$ p.d., constant resistance: a fixed resistor (or a wire at constant temperature).

Step 2 · Curve that flattens

Resistance increases current increases: a filament lamp.

Answer: Fixed resistor; filament lamp

Check: Flatter means less extra current for each extra volt: more resistance.

2. Now try one with the steps

A filament lamp takes 0.18 A at 2.0 V and 0.30 A at 6.0 V. Calculate its resistance at each p.d. and describe the trend. (4 marks)

Step 1 · At 2.0 V

Step 2 · At 6.0 V

Step 3 · Trend

Answer:

3. Practice

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

1. Describe the I–V graph for a fixed resistor at constant temperature. [2]

2. State what happens to the resistance of a filament lamp current through it increases. [1]

3. State what happens to the resistance of a thermistor temperature increases. [1]

4. Give one use of a light-dependent resistor. [1]
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5. Describe the I–V characteristic of a diode. [2]
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6. Use the thermistor graph to state its resistance at 40 °C, in k Ω . [1]
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7. A filament lamp has a current of 0.30 A when the p.d. across it is 6.0 V. Calculate its resistance in ohms. [2]
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8. Explain why the resistance of a filament lamp increases potential difference increases. [3]
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9. Explain why the I–V graph for a fixed resistor is a straight line through the origin. [2]
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10. A potential difference is applied across a diode in the reverse direction. State the current through it and explain why. [2]
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11. A diode has a current of 0.050 A when the potential difference across it is 0.80 V. Calculate its resistance at this point, in ohms. [2]
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12. Explain why you should not find the resistance of a filament lamp from the gradient of its I–V graph. [2]
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13. Explain how a thermistor can be used in a circuit that switches on a heater when a room gets cold. [3]
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14. In bright light an LDR has a resistance of $2.0 \text{ k}\Omega$. It is connected directly across a 6.0 V supply. [3]
Calculate the current in milliamps.

4. Before you hand it in

"A thermistor's resistance increases gets hotter, like a lamp."

Thermistor: hotter $\rightarrow$ lower resistance. Filament lamp: hotter $\rightarrow$ higher resistance.

Finding a lamp's resistance from the gradient of its curve

Read V and I at the point you want and divide: $R = V \div I$.

"An LDR's resistance increases in the light."

LDR: more light $\rightarrow$ lower resistance. In the dark its resistance is very high.

Drawing the diode graph straight line in both directions

Draw zero current for all reverse p.d.s and a steep rise only after about 0.6 V forward.