Your notes

GCSE Physics: revision notes

Resistance and I–V characteristics

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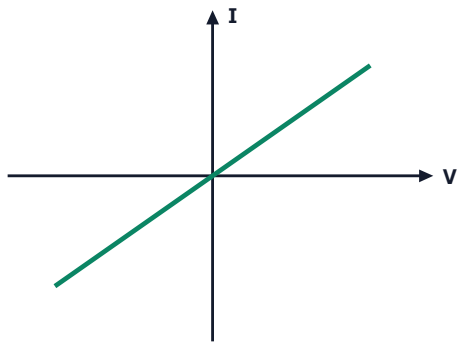
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Start here: how components respond to current

- Resistance is how hard it is for a current to flow through a component. It is measured in ohms (Ω), and $V = I \times R$ links it to current and potential difference.
- Some components keep the same resistance; others change with temperature, with light, or with which way the current flows.
- An I–V graph shows how the current changes as the potential difference changes. Its shape tells you what the component is.

Ohmic conductors

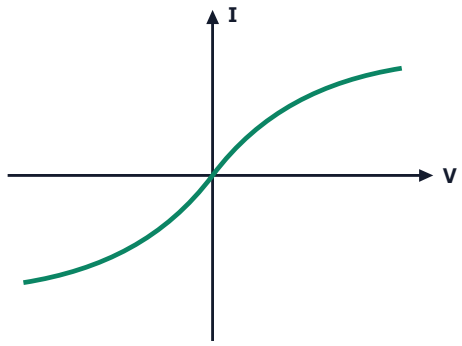
- For an **ohmic conductor**, such as a fixed resistor at constant temperature, the current is **directly proportional** to the potential difference.
- Its I–V graph is a straight line through the origin, so its resistance stays the same.



a resistor at a constant temperature

Components whose resistance changes

- **Filament lamp**: as the current increases, the filament gets hotter and its resistance increases, so the I–V graph curves.
- **Diode**: current flows in one direction only. It has a very high resistance in the reverse direction.
- **Thermistor**: its resistance decreases as the temperature increases. Used in thermostats.
- **Light-dependent resistor** (LDR): its resistance decreases as light intensity increases. Used to switch on lights when it gets dark.



a filament lamp

Required practical: I–V characteristics

- Set up a circuit with a power supply, the component, an ammeter in series, a voltmeter in parallel and a variable resistor.
- Change the variable resistor to change the current, and record the current and pd each time.
- Reverse the connections to the component to get negative values, then plot current against pd.

Required practical: length of wire

- Connect a length of resistance wire along a metre ruler, with an ammeter and voltmeter.
- Measure the current and pd for different lengths, and calculate $R = V \div I$.
- Resistance is **directly proportional** to length. Keep the current low so the wire doesn't heat up.

Exam tip

- For I–V graphs, describe then explain. A **filament lamp**'s resistance rises as it heats up because ions vibrate more and get in the way of electrons.
- Remember: an LDR's resistance falls as light increases; a **thermistor**'s falls as temperature rises.

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Common mistakes

- Saying a **filament lamp**'s resistance stays the same.
- Reversing how LDRs and **thermistors** behave.

Worked examples

A current of 0.5 A flows through a 12 Ω resistor. Find the potential difference across it.

Choose the equation that links potential difference, current and resistance. **V = I × R**

Put the numbers in. **V = 0.5 × 12**

Answer: 6 V

A 9 V battery makes a current of 0.3 A flow through a lamp. Find the lamp's resistance.

Start from V = I × R and rearrange for R: divide both sides by I. **R = V ÷ I**

Put the numbers in. **R = 9 ÷ 0.3**

Answer: 30 Ω

Key terms

Ohmic conductor	A conductor in which current is directly proportional to pd at constant temperature.
I–V characteristic	A graph of current against potential difference for a component.
Filament lamp	A lamp whose resistance increases as it gets hotter.
Diode	A component that lets current flow in one direction only.
Thermistor	A resistor whose resistance decreases as temperature increases.
Light-dependent resistor	A resistor whose resistance decreases as light intensity increases.
Directly proportional	When one quantity doubles, the other doubles; the graph is a straight line through the origin.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What is an ohmic conductor?
2. Why does the resistance of a filament lamp increase with current?
3. What does a diode do?
4. What happens to a thermistor's resistance when it gets warmer?

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5. What happens to an LDR's resistance in bright light?
6. What shape is the I–V graph for a fixed resistor?
7. What shape is the I–V graph for a diode?
8. How does the resistance of a wire change as it gets longer?

Answers

1. One where current is directly proportional to pd at constant temperature
2. The filament gets hotter
3. Lets current flow in one direction only
4. It decreases
5. It decreases
6. A straight line through the origin
7. Zero current in reverse, then rising steeply forwards
8. It increases

What to do next

Practise 10 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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