Your notes

GCSE Physics: revision notes

Series and parallel circuits

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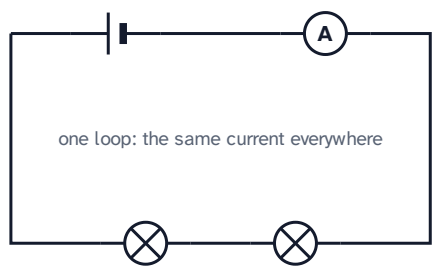
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Start here: two ways to connect components

- In a **series circuit**, components are joined one after another in a single loop. The same current flows through each, and they share the potential difference.
- In a **parallel circuit**, components are on separate **branches**. Each **branch** gets the full potential difference, and the currents in the branches add up to the total.
- Homes are wired in parallel, so each light can be switched on and off on its own.

Series circuits

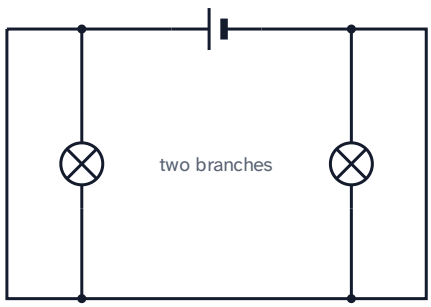
- Components are connected one after another in a single loop.
- The current is the same through each component.
- The total potential difference of the supply is shared between the components.
- The **total resistance** is the sum of the individual resistances: $R_{total} = R_1 + R_2$.



Parallel circuits

- Components are connected on separate **branches**.

- The potential difference across each **branch** is the same (equal to the supply pd).
- The total current is the sum of the currents through the separate **branches**.
- The **total resistance** of two resistors in parallel is less than the resistance of the smaller one.



total current = current in branch 1 + branch 2

Why resistance changes

- Adding resistors in series increases the **total resistance**, because the charge has to pass through each resistor in turn.
- Adding resistors in parallel decreases the **total resistance**, because there are more paths for the charge to flow through.

Solving series problems

- Find the **total resistance**, then the current: $I = V \div R_{total}$.
- Then find the pd across each resistor: $V = I R$.
- Check: the pds across the resistors add up to the supply pd.

Exam tip

- Series: the current is the same everywhere, and the potential difference is shared. Parallel: the potential difference is the same on each **branch**, and the current splits.
- Adding a resistor in parallel lowers the **total resistance**.

Common mistakes

- Adding parallel resistors as if they were in series.
- Saying current gets used up.

Your notes

Worked examples

A 4 Ω and a 6 Ω resistor are in series with a 5 V supply. Find the current.

In series, add the resistances. **R = 4 + 6 = 10 Ω**

Use I = V ÷ R. **I = 5 ÷ 10**

Answer: 0.5 A

Key terms

Series circuit	A circuit where components are connected in one loop.
Parallel circuit	A circuit where components are connected on separate branches.
Branch	A separate path in a parallel circuit.
Total resistance	The combined resistance of all the components in a circuit.
Junction	A point where a circuit splits or joins.

Quick questions

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

1. In a series circuit, how is the current through each component?
2. In a series circuit, how is the supply pd shared?
3. What is the total resistance of 4 Ω and 6 Ω in series?
4. In a parallel circuit, what is the pd across each branch?
5. How is total current found in a parallel circuit?
6. What happens to total resistance when a resistor is added in parallel?
7. Two resistors of 10 Ω and 20 Ω are in parallel. Which is true of their total resistance?
8. A 12 V supply is connected to 4 Ω and 2 Ω in series. What is the current?

Answers

1. The same
2. It is shared between the components
3. 10 Ω
4. The same as the supply pd
5. Add the currents in the branches
6. It decreases
7. It is less than 10 Ω
8. 2 A

What to do next

Practise 10 questions on this topic

Try 7 exam questions, with mark schemes

Your notes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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