Your notes

GCSE Physics: revision notes

Mains electricity and the National Grid

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Direct and alternating current

- Cells and batteries supply direct current (dc): the current flows in one direction only.
- Mains electricity is an alternating current (ac) supply: the current repeatedly changes direction.
- In the UK, the mains supply has a frequency of 50 Hz and a potential difference of about 230 V.

Three-core cable

- Most appliances are connected to the mains with a three-core cable, with colour-coded insulation.
- **Live wire** (brown): carries the alternating potential difference from the supply.
- **Neutral wire** (blue): completes the circuit and is at or close to earth potential (0 V).
- **Earth wire** (green and yellow stripes): a safety wire that stops the appliance becoming live. It only carries a current if there is a fault.

Safety

- The potential difference between the **live wire** and earth is about 230 V.
- The **live wire** can be dangerous even when a switch in the mains circuit is open, because it is still at 230 V.
- Touching the **live wire** makes a connection between it and earth through your body, so a large current flows through you: an electric shock.
- A fuse or circuit breaker in the **live wire** cuts off the current if it gets too large.

The National Grid

- The **National Grid** is a system of cables and transformers that links power stations to homes and businesses.
- **Step-up transformers** increase the potential difference from the power station to the transmission cables.
- A higher potential difference means a lower current for the same power, so less energy is lost heating the cables. This makes the grid efficient.
- **Step-down transformers** decrease the potential difference to a much lower, safer value for use in homes.

Key terms

Direct current (dc)	Current that flows in one direction only.
Alternating current (ac)	Current that repeatedly changes direction.
Live wire	The brown wire that carries the alternating pd from the mains supply.
Neutral wire	The blue wire that completes the circuit, at about 0 V.
Earth wire	The green and yellow safety wire that stops an appliance becoming live.
National Grid	The network of cables and transformers that distributes electricity.
Step-up transformer	A transformer that increases the potential difference.
Step-down transformer	A transformer that decreases the potential difference.

Quick questions

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

1. What is the frequency of the UK mains supply?
2. What is the pd of the UK mains supply?
3. What colour is the live wire?
4. What colour is the neutral wire?
5. What is the job of the earth wire?
6. What type of current do batteries supply?
7. Why is the live wire dangerous even when a switch is off?
8. Why is electricity transmitted at a very high pd?

Answers

1. 50 Hz
2. About 230 V
3. Brown
4. Blue
5. A safety wire that stops an appliance becoming live

Your notes

6. Direct current
7. It is still at 230 V
8. The current is lower, so less energy is wasted heating the cables

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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