How does electricity work?

KS2 KS3 Ages 7-14 ⏰ 4 min read

Everything around you — your phone, the lights, the telly, your microwave — runs on electricity. But what *is* it, actually?

At the heart of it, electricity is the movement of tiny particles called **electrons**. Electrons are part of every atom, and they have a negative electrical charge. In some materials — especially metals — electrons aren't stuck tightly to their atoms. They can wander around freely. When something pushes those electrons in the same direction, you get an electric current.

Picture a pipe full of marbles, packed end to end. Push one marble in at one end, and a marble immediately pops out the other end. You didn't need to wait for the first marble to travel the whole length — the push travels almost instantly. Electricity works the same way: you push electrons in at one end of a wire, and the effect appears at the other end almost immediately, at the speed of light.

Voltage, current, and resistance

Voltage is the pressure pushing the electrons along — like water pressure in a pipe. The higher the voltage, the harder the push. Your phone charger uses around 5 volts. Your household sockets are 230 volts. High-voltage power lines can be hundreds of thousands of volts — enough to cause an arc of electricity through the air without even touching anything, which is why they're so dangerous.

Current is how many electrons are flowing past a point per second. Think of it as the flow rate of water through the pipe.

Resistance is how much a material fights against the electron flow. Copper wire has very low resistance (great for wires). Rubber has extremely high resistance (great for insulating those wires so you don't get a shock).

How does it get to your house?

A power station (whether it burns gas, uses nuclear reactions, or spins turbines with wind) generates electricity at high voltage. It travels through pylons and cables across

the country, then passes through transformers that step the voltage down to the 230 volts that comes out of your sockets. The whole network is called the National Grid.

What makes a circuit?

Electricity needs a complete loop — a circuit — to flow. Electrons leave the power source, travel around the circuit doing useful work (lighting a bulb, powering a motor), and return to where they started. Break the circuit — flip a switch, pull out a plug — and the flow stops instantly.