

BBC Bitesize – Physics

Episode 4 – Domestic uses and safety

ELLIE: Hello and welcome to the BBC Bitesize Physics Podcast.

JAMES: The series designed to help you tackle your GCSE in Physics and combined science. I'm James Stewart, I'm a climate science expert and TV presenter.

ELLIE: And I'm Ellie Hurer, a bioscience PhD researcher. Before you listen, just a reminder that you can listen to the whole series or find an episode that you want to focus on.

JAMES: Yeah, absolutely. Let's get started on today's episode, where we're going to be talking about the domestic uses of electricity and the three pin plug.

I don't know where you are right now, but there are probably, I don't know, two wall sockets in your room?

ELLIE: Yeah, there's loads in the room we're in. There's one socket that's plugged into the microphone that I'm using right now. My phone is charging on a wall socket, and there's a kettle on the other side of the room I plugged in earlier to make my tea.

JAMES: Exactly, because electricity is all around us. If you boiled a kettle this morning, or you used the computer at school, or your phone to listen to this podcast conveniently, you use electricity because it's a vital part of our everyday lives.

ELLIE: But what has this got to do with the physics exam?

JAMES: Alright, let's talk through some key facts about domestic electricity to prepare for your GCSEs.

ELLIE: Right, so most of the things we use at home are connected to the mains electricity, which is what wall sockets are connected to.

JAMES: Mains electricity is supplied using alternating current, which we usually call the AC supply. For a quick recap, an AC supply is an electric current that regularly changes its direction.

ELLIE: Whereas a direct current, or DC, only flows in one direction. But be sure to go back and listen to episode one of this series, it's brilliant, where we dig deeper into those different types of electric current.

JAMES: Here in the UK most homes and domestic buildings have an electric supply with a frequency of about 50 Hertz, that's H Zed, and a voltage of 230 volts that's measured in V if you see it. The frequency of 50 Hertz means that the current changes direction and back again 50 times per second.

A wall socket is what you put your plugs and chargers into. As you know, in the UK, most plugs have three pins, one at the top, two at the bottom. That's because most electrical appliances are connected to the mains using three core cables.

ELLIE: So if you're on your phone or on your laptop, now would be a great time to head to BBC Bitesize to see a diagram of a three pin plug.

JAMES: So a plug has three main copper wires, and you can identify them by the colour of the plastic insulation they are covered in.

ELLIE: The brown wire is the live wire. It's the wire that electric current travels through. The live wire carries the alternating potential difference from the electric supply.

JAMES: Yeah, and that live wire is at 230 volts, so it can be really dangerous.

ELLIE: The wire with green and yellow stripes is called the earth wire.

JAMES: Which you can remember by thinking about how so much of nature on earth is green.

ELLIE: Also, the earth wire is a safety wire to stop the appliance becoming live. The earth wire is at zero volts as it only carries a current if there is a fault.

JAMES: And finally, the blue wire is called a neutral wire.

ELLIE: Which you can remember by thinking about how a lot of blue things like the ocean and the sea are calming colours.

JAMES: That's right. The neutral wire connects the cable in the wall and completes the circuit. The neutral wire is at or pretty close to earth potential at zero volts.

ELLIE: So, just to help you remember, earth is green and yellow, like so much of nature. Blue is neutral, like the sea and sky, and the live wire is brown.

JAMES: All the wires in a plug play a key role, but the earth wire is extra important because it keeps us safe. The earth wire provides a path for current to flow from the case of the device to the ground if there is a fault.

James: Let's say we were looking at the plug for an electric hob. If the live wire were to become loose, it would be really dangerous if it were to touch the casing of the hob, as anyone touching the appliance would be electrocuted.

ELLIE: So what the earth wire does is direct the electric current to the ground instead of to the person touching the appliance.

JAMES: Exactly, so always be careful when it comes to electrical appliances and if you ever see or feel a spark, stop using that appliance and tell a responsible person, not me or Ellie, that there's a fault because no one wants to get an electric shock.

ELLIE: Alright guys, it's time to recap the key things that we've learnt. So in the UK, the domestic electricity supply has a frequency of 50Hz and is about 230 volts. A three pin plug includes a live wire, an earth wire and a neutral wire.

JAMES: And finally that earth wire is essential to making an appliance safe as it earths the electric current that flows through an appliance if there's a fault.

Thank you for listening to Bitesize Physics. If you found this helpful please go back and listen again and make some notes along the way and come back here whenever you want to revise. There's loads more resources available as well on the BBC Bitesize website, so be sure to check those out too.

ELLIE: And in the next episode of Bitesize Physics, we're going to dig into energy transfers in everyday appliances, so be sure to have a listen.

BOTH: Bye!