Lesson 1 Wiring a Plug

Recap of last lesson

There are two types of electricity supply, alternating current (a.c.) and direct current (d.c.). In a.c. supplies, the charges are constantly changing direction. Alternating currents are produced by alternating voltages in which the positive and negative ends of the potential difference keep switching.

The UK domestic mains supply (the electricity in your home) is an a.c. supply at around 230V. the frequency of the a.c. mains supply (how often the current changes direction) is 50 cycles per second or 50Hz (hertz).

By contrast, cells and batteries supply direct current (d.c.). Direct current is a current in which the charges only move in one direction. It is created by a direct voltage – where, unlike for an alternating voltage, the positive and negative ends of the source are fixed.

Three-pin plugs

Most electrical appliances are connected to the mains supply by three-core cables. This means that they have three wires inside them, each with a core of copper and a coloured plastic coating. The colour of the insulation on each cable shows its purpose – the colours are always the same for every appliance. This is so that it is easy to tell the different wires apart.



The brown live wire is what provides the electricity from the mains supply. Current flows through the live wire. It is at 230V.

The blue neutral wire completes the circuit and carries away the current. It is around 0V.

The green and yellow earth wire is also at 0V. It is for protecting the wiring and for safety. It stops the appliance casing from becoming live. It doesn’t usually carry a current – only when there is a fault.

The potential difference between the live and the neutral wire is 230V. The potential difference between the live and the earth is also 230V, and there is no potential difference between the neutral and the earth wires, as they are both at 0V.

The live wire

Your body (just like the earth) is at 0V. This means that if you touch the live wire, a large potential difference is produced across your body and a current flows through you. This causes a large electric shock which could injure or even kill you.

Any connection between the live wire and earth wire can be dangerous. If the link creates a low resistance path to the earth, a huge current will flow, which would result in a fire.

Components that are used to break circuits (like switches and fuses) should always be connected to the live wire. This is so if there is a problem, the supply of electricity to the appliance can be cut off. If a switch was in, for example, the earth wire, electricity would still flow through to the appliance via the live wire and away via the neutral wire, so the appliance wouldn’t be turned off by a break in the earth wire. And if a fuse was connected in the neutral wire, in the event of a fault, electricity would flow in through the live wire and away via the earth wire. Both of these cases could lead to a shock or a fire.

Videos

This video repeats the information above, with visuals. <https://www.youtube.com/watch?v=fbu3o9wavHk>

Questions *answer these in full sentences in your exercise book*

1. What does a.c. stand for?
2. Describe a.c. and give an example of a source which uses an a.c..
3. Draw a diagram to represent a.c..
4. What does d.c. stand for?
5. Describe d.c. and give an example of a source which uses a d.c..
6. Draw a diagram to represent d.c..
7. Why is the inside of each of the three wires in a plug made of copper?
8. Why is the copper wire covered in a coloured plastic?
9. What is the plug case made of plastic?
10. What is the purpose of the cable grip?
11. Complete the labels of the three pin plug below. Remember to colour-in or label the colour of the three wires.

