

## Student Revision Notes (age 11 – 14): Electrical Safety in the home.

### Switches

The purpose of a **switch** is to break or connect an electric circuit, but they must be correctly connected in the home. A switch in the electrical circuit is always connected to the live wire so that the socket/appliance is not live when it is switched off.

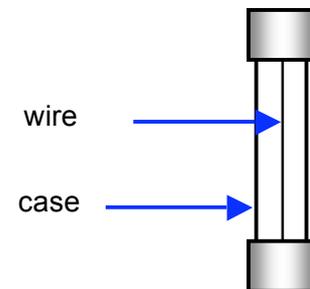


### Insulation

Materials that do not conduct electricity are called insulators. **Insulation** on wires, the plastic around the metal conducting wire in the centre, protects people by preventing them from touching the live wires and getting shocks

### Fuses

A **fuse** is usually a thin piece of wire that will melt and break the circuit if too large a current flows through it. The thicker the wire the more current is needed to melt it and the higher the 'rating' of the fuse. The purpose of a fuse is to protect the wiring and the equipment from overloading and potentially catching fire. The fuse does not protect people from shocks as it only takes a tiny current to kill people, whereas fuses won't blow until much higher currents. Fuses are always connected in the live wire in an electrical circuit, like switches, and circuits are always switched off before a fuse is changing.



### Earth

The **earth** wire is there to prevent the metal casing of electrical equipment becoming live if something goes wrong with the equipment, for example washing machines, freezers or computers. In the event of a problem the electricity is conducted to the ground, usually via the 'earth' wire in the house circuit being connected to a metal water pipe (the 'earthing point'). In a circuit diagram the 'earthing point' is represented by the symbol:



## Circuit breakers

In houses today most fuse boxes are being replaced by a set of switches called **circuit breakers**. These act like a fuse in that they cut off the electricity supply if there is a problem. However they are based on an electronic circuit and are safer than fuses because they act to cut off the current much more quickly and they are easier and safer to reset. There are two main types:

**Thermal** circuit breakers – which cut the current if they get too hot.

**Electromagnetic** circuit breakers – which use an electromagnet to pull the switch and cut the current if too much flows.

## RCCBs, RCDs & ELCBs

Circuit breakers are primarily still to protect the equipment and wiring. Other devices such as **Residual Current Circuit Breakers** (RCCBs), **Residual Current Devices** (RCDs) and **Earth Leakage Circuit Breakers** (ELCBs) are designed to protect people from electric shocks. They are very sensitive and switch off the current if the live wire isn't equal to the current in the neutral wire before a person can get an electric shock. They are often used with outdoor appliances such as electric lawn movers or strimmers.

## Double Insulation

If a machine or piece of electrical equipment does not have metal parts in its casing then people cannot get an electric shock from it even if things go wrong. This is called **double insulation**. Examples include hair dryers and televisions and these items do not need an earth wire in the flex.

## **Linked Resources**

[www.twothirtyvolts.org](http://www.twothirtyvolts.org):

Electrical Safety in the Home (11-14) Student Quiz