

## Student Revision Notes (age 11 – 14): House Electrical Circuits

Electricity produces three effects:

1. heat and light as in a light bulb, electric fire or cooker;
2. magnetism as in an electromagnet in a door bell or induction in a motor; &
3. chemical changes as in electrolysis and electroplating - does not normally occur in the home!

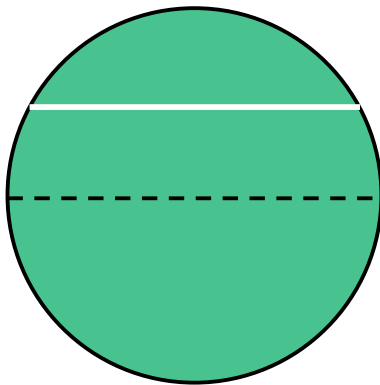
### Direct current (d.c.) and Alternating current (a.c.)

There are two 'types' of electricity depending on how they were produced.

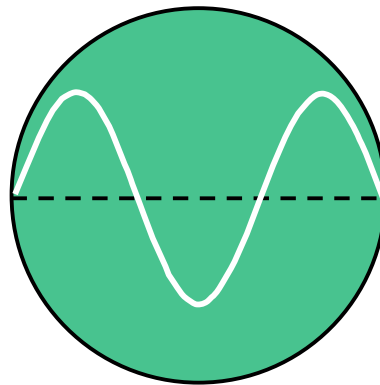
**Direct current** - or d.c. This means current that is always flowing in the same direction, and is taken to be from positive to negative. d.c. is made by a battery or a d.c. generator. Items powered by a battery in the home, for example a torch, will use d.c. .

**Alternating current** - or a.c. This means current that is constantly changing direction, first flowing one way and then the other. In Britain a complete cycle takes one fiftieth of a second - the frequency of the mains is 50 Hz. The electric current from a socket or in a lighting circuit in a house will be a.c. .

You can see how the voltage of d.c. and a.c. changes with time if you connect them to an oscilloscope.



Direct current (d.c.)



Alternating current (a.c.)

### House electric circuit

The diagram below shows an example of the electrical wiring of a house. In Britain the electricity supply to a home (the mains) has a voltage of 230 V a.c. but the different circuits within the home will use different amounts of current (Amps) depending upon their purpose.

Circuits for items such as cookers will have high currents (up to 30 Amp), lighting circuits lower currents (up to 5 Amps), and circuits such as immersion heaters will be in-between (up to 15 Amps). These are dangerous levels of current, as can be seen from the following

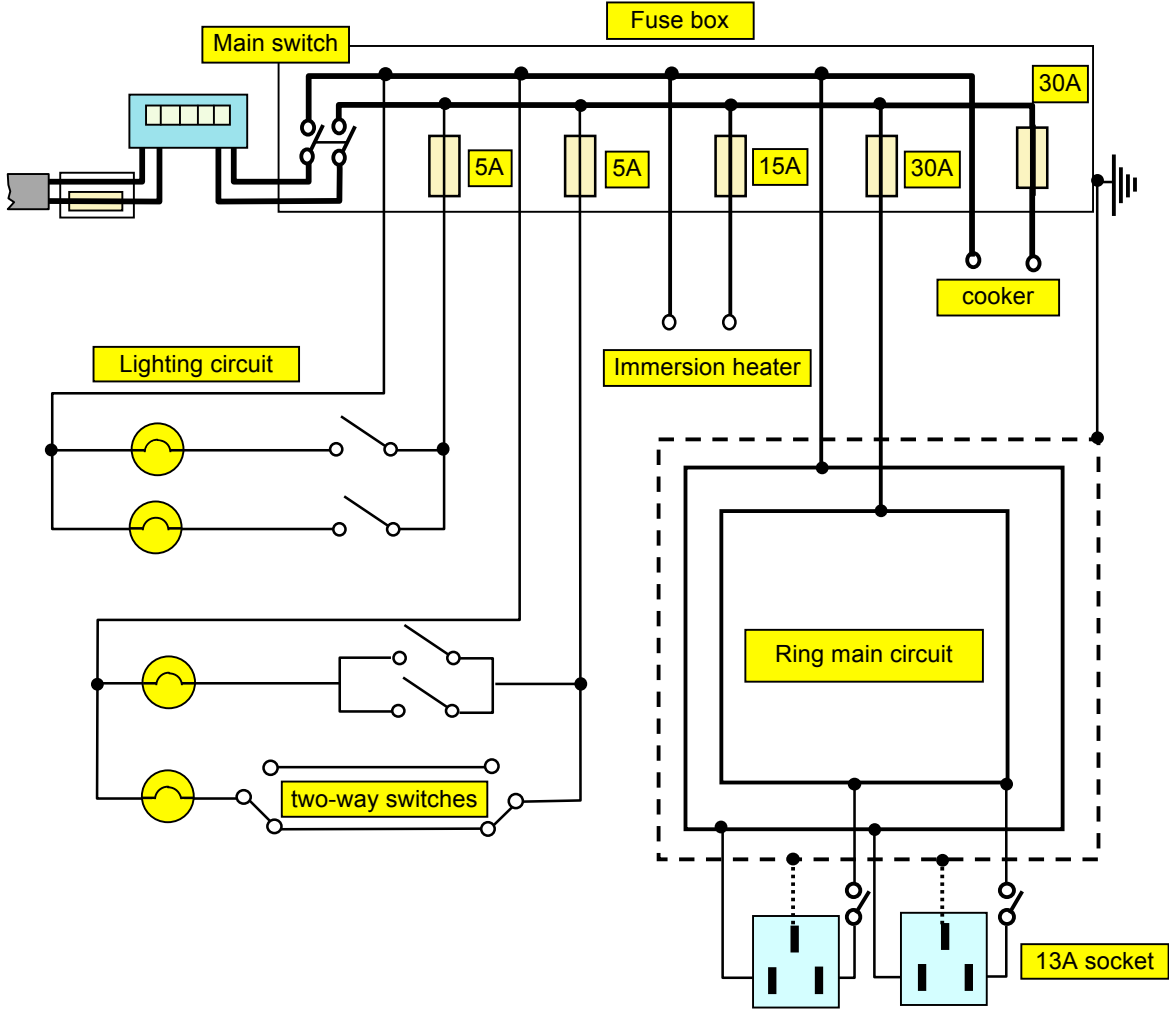
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examples of the average effects of continuous a.c. or d.c. electrical currents on healthy adults:

Electrical Current	Biological Effect
1 mA	Threshold for feeling
10-20 mA	Voluntary let-go of circuit impossible
25 mA	Onset of muscular contractions
50-200 mA	Ventricular fibrillation or cardiac arrest



The house circuit diagram also shows the fuse box contains different fuses for different circuits, the largest fuses being for those that take the most current.



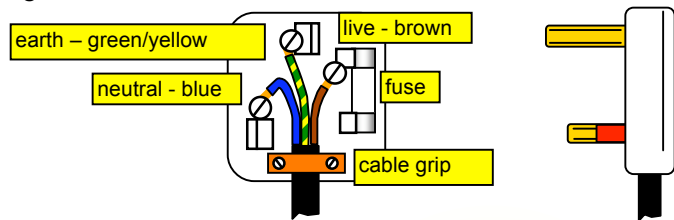
The 13 A sockets are wired to the **ring main**. This is a circular live wire and a circular neutral wire that loop round the house with the sockets connected between them.

The lights are wired in parallel with the switches on the live side of the lamps. A two-way switch is shown; you will probably have one of these for your hall and landing lights. Either of the switches A or B will control the light.

## The plug

There are three wires to a modern 13 A plug:

1. **live** - coloured brown
2. **neutral** - coloured blue
3. **earth** - coloured green/yellow stripes.



## Light bulbs

The filament in a traditional light bulb is a coil of tungsten wire. The inside of the bulb is filled with argon or nitrogen and not air. The wire glows white hot when a current flows through it. It does not catch fire because of the lack of oxygen.



## **Linked Resources**

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

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