Electricity

National curriculum objectives:

- associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
- use recognised symbols when representing a simple circuit in a diagram.

Science in the news

A battery half the size of a football pitch is going to be installed in a wind farm near Glasgow, Scotland. When the wind is blowing, the turbines will convert this into power which will be stored in the battery. This means that when the wind isn't blowing, there will still be a supply of electricity generated by green sources to power more than 300,000 homes nearby.

The battery is a Lithium - Ion battery, which is the common type of battery that is used in mobile phones and computers. These types of batteries are rechargeable but don't last forever. Still, with the size of this battery and the amount of electricity it can store, it has twice the capacity of any other battery in the UK and is a great step towards upping the amount of renewable energy in Scotland and the UK, lets hope there are more!

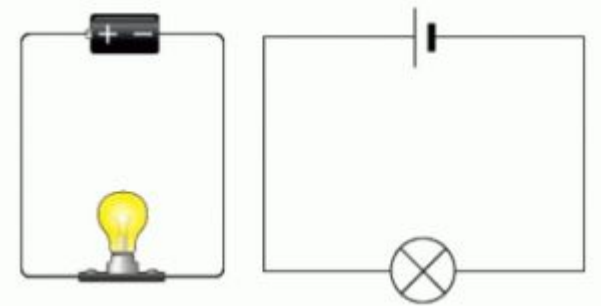
Here is a picture of Whitelee wind farm near Glasgow

Whitelee wind farm (pictured), near Glasgow(PA)
Photo credit: Phoebe Weston, Science Correspondent, The Independent.

A simple circuit

An electrical circuit always needs a **power source**, such as a battery. It also needs wires that connect to both the positive and negative end of the battery and then connect to another component e.g. a light bulb.

This is a drawing of a simple circuit with just a battery and a light bulb.

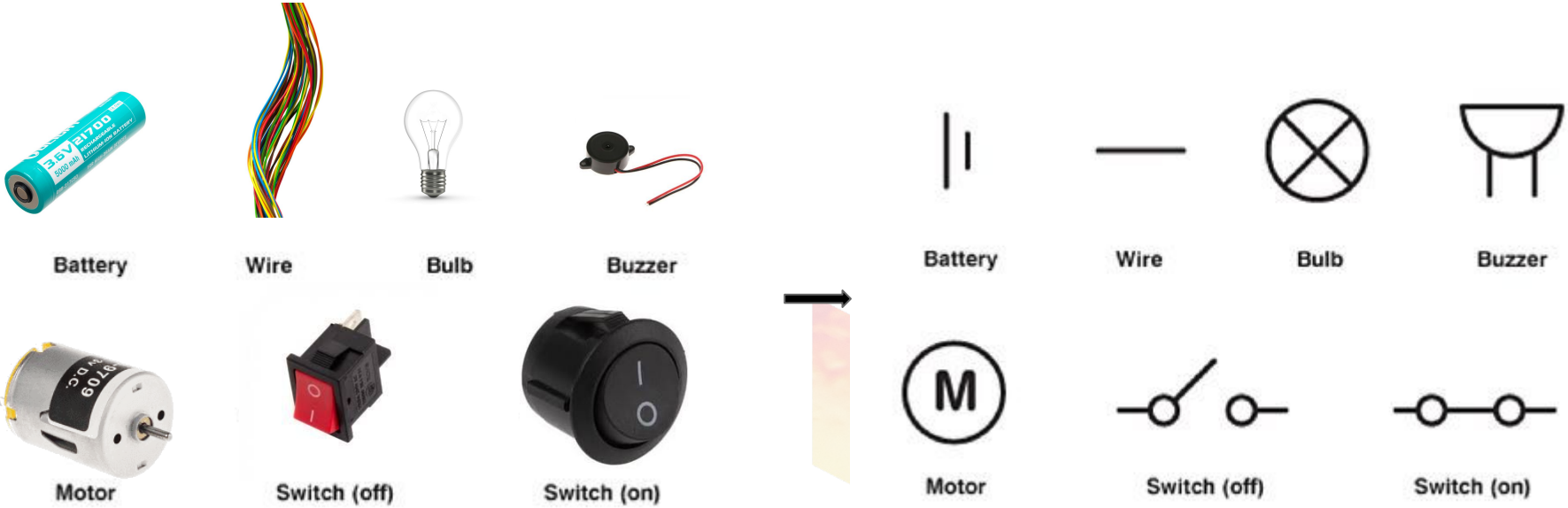


This is a scientific diagram of a simple circuit with symbols showing the battery and the light bulb.

Electricity will only travel around a circuit that is complete. That means it has no gaps or breaks.

A simple circuit with a variety of components

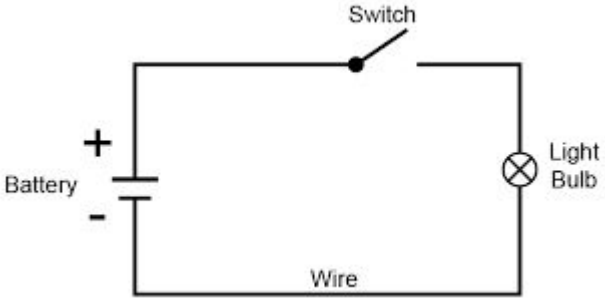
A circuit can also contain other electrical components, such as bulbs, buzzers or motors, which allow electricity to pass through. You can also use a switch in a circuit to create a gap in a circuit. This can be used to switch it on and off. We use simple icons to symbolize the different types of electrical components in a circuit :

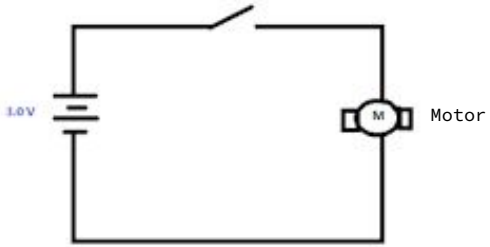


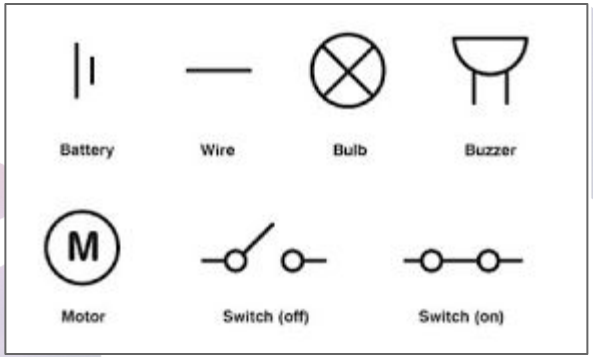
A simple circuit with a variety of components

Using these icons, you can create diagrams to easily show what different circuits look like.

Have a look at the examples below of different components in circuits.



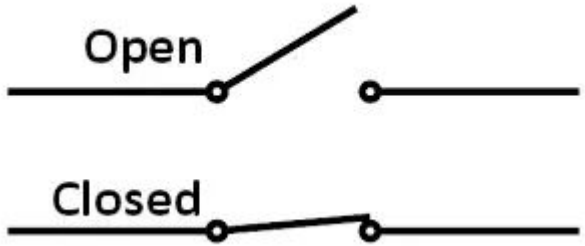




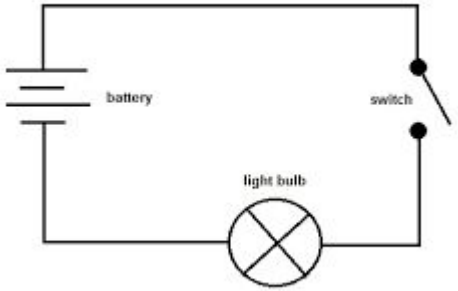
Switches in circuits

When a switch is open, there is a gap or break in the circuit which means the electricity cannot flow through it. When this happens, any components in the circuit (a bulb, a motor, a buzzer etc) will not work or will stop working.

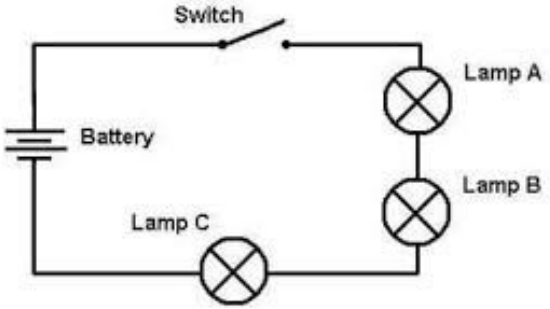
When a switch is closed, the circuit is complete which means the electricity can move through it. When this happens, any components in the circuit (a bulb, a motor, a buzzer etc) will work.



Does the number of batteries or bulbs in a circuit make a difference?



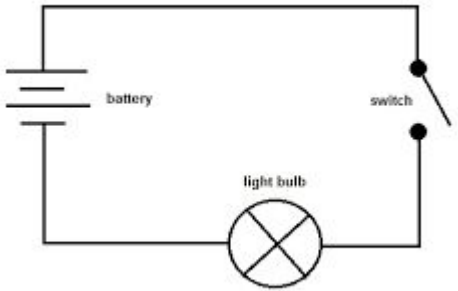
This circuit has 1 battery and 1 bulb



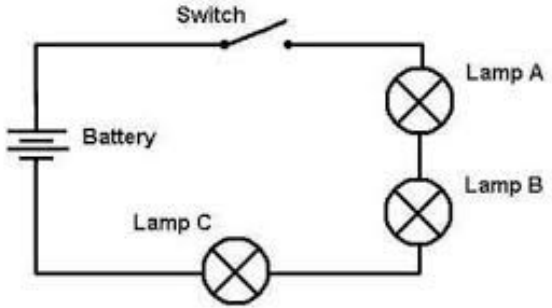
This circuit has 1 battery and 3 bulbs

Do you think there will be any differences in the brightness of the bulbs in each circuit? What do you think?

Does the number of batteries or bulbs in a circuit make a difference?



When the switch is on (or closed), the bulb in this circuit will be brighter than the other circuit (shown on the right).

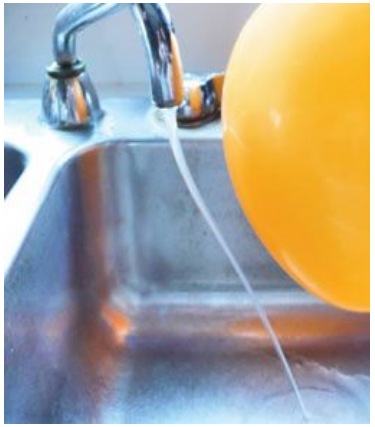


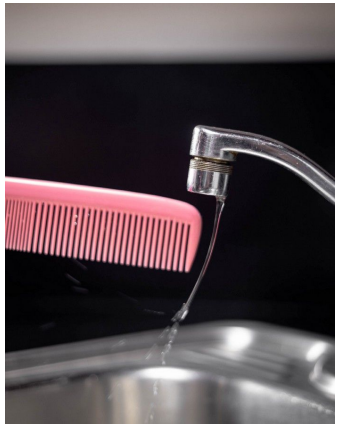
When the switch is on (or closed), the 3 bulbs in this circuit will be dimmer than the bulb in the other circuit (shown on the left). This is because they are sharing the power source between all 3 of them and the voltage is equally distributed.

Make water bend!

What do you need?

- Access to a tap with running water
- A plastic comb OR a balloon (or both!)





Instructions:

1. First, if you are using a balloon for this, blow up the balloon.
2. Next, turn on the tap so a narrow stream of water is coming out - you don't want the water to be flowing very strongly for this!
3. Then, if you are using a comb, comb your hair like normal, running it through your hair 10 times. If you are using a balloon: rub the balloon against your hair for a few seconds.
4. Finally, hold the object you have charged next to the running water and watch as it bends!

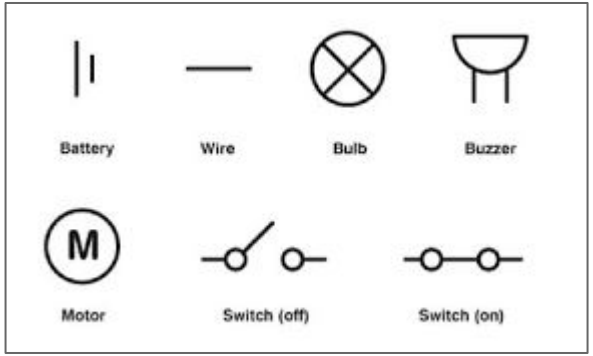
What am I learning?

This is a very easy and simple experiment but the idea is quite complicated. When you rub the balloon or the comb on your hair, negatively charged particles are transferred to it. This means the object now has a static charge that is negative. The water in the stream contains both positive and negative particles, and is neutral. Because positive and negative charges attract, the negative object attracts the positive particles in the water and the water bends!

Draw a circuit

What do you need?

- A piece of paper
- A pencil



Have a go at drawing the following circuits:

1. A circuit with a battery and a bulb
2. A circuit with a switch (off), a battery and a buzzer
3. A circuit with a switch (on), a battery and 2 bulbs
4. A circuit with a switch (off), a battery, a motor and a bulb