Switches: breaking the circuit

Switches are used to break the circuit and control the flow of electricity.

A **CURRENT** flows when all of the parts of a circuit make at least one loop from the **NEGATIVE TERMINAL** to the positive terminal of the battery.

The current flows because every part of the circuit is connected. If one part of the circuit is not connected to the next, no current flows and the circuit does not work.

The switch

A **SWITCH** reliably breaks and remakes a circuit.

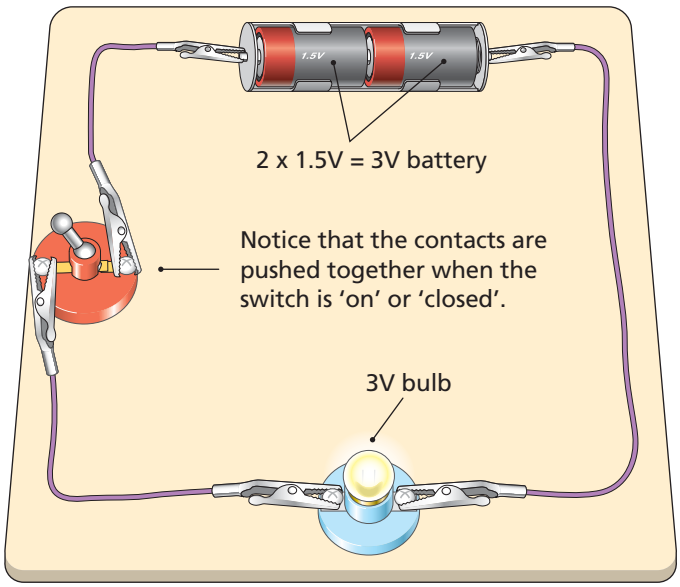
You can see how a switch works in Pictures 1 and 2. When the switch is turned on (closed), the contacts are pushed together and the bulb lights up; when the switch is off, the contacts spring apart and the bulb goes out.

Notice that, although the contacts move inside the switch and the light goes on and off, the symbols for a switch and a light bulb never change (Picture 3). The symbols show just the parts of the circuit and not what happens in the circuit.

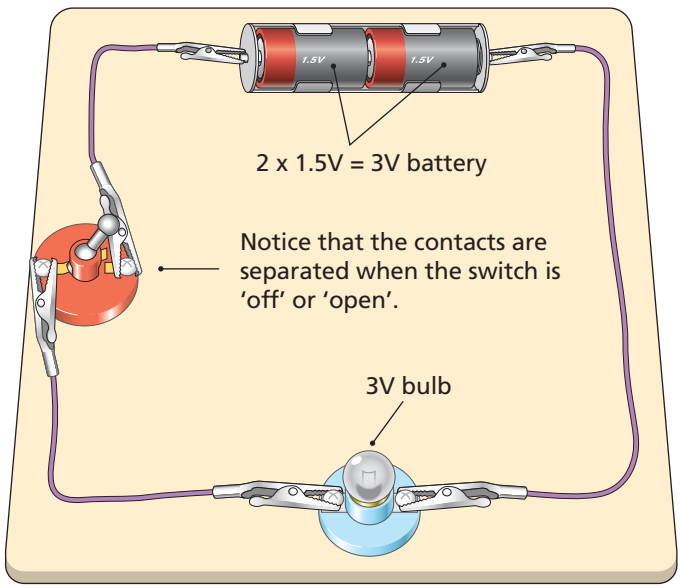
Using combinations of switches

Switches can be used like the points in a train-shunting yard. By clever use of switches, some parts can be disconnected from the circuit, or switched back on again.

▼ (Picture 1) The switch is at the 'on' position. Notice that the contacts are closed. Notice also that the symbol for the switch on the circuit diagram in Picture 3 does not change. This is because the circuit just shows you how the components are linked up, not what they do.



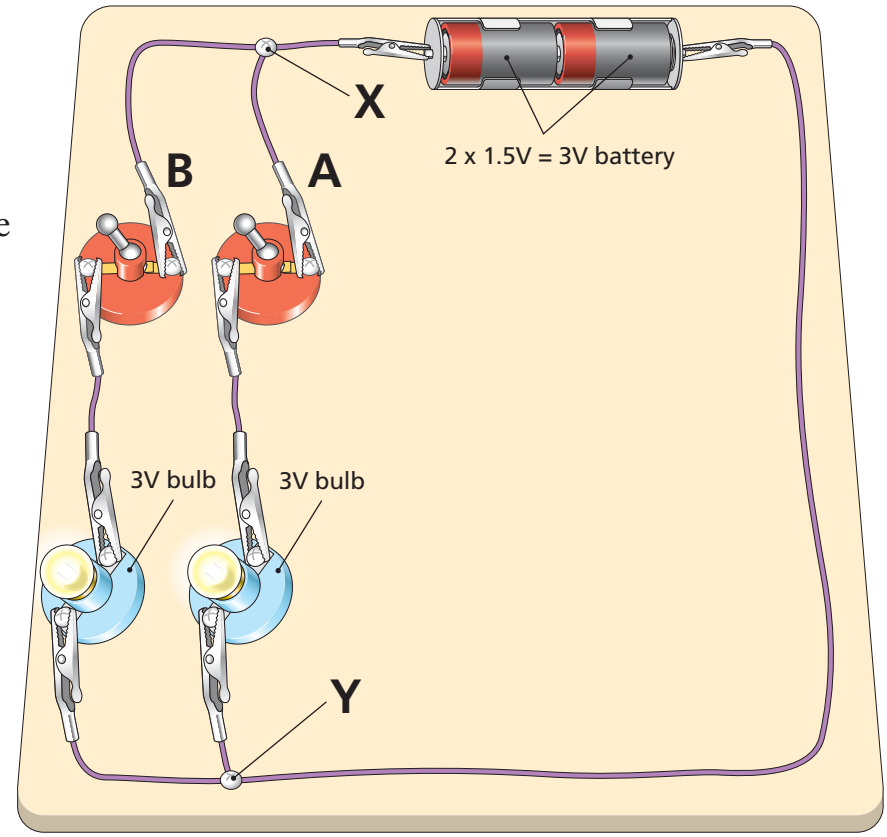
▼ (Picture 2) The circuit when the switch is off.

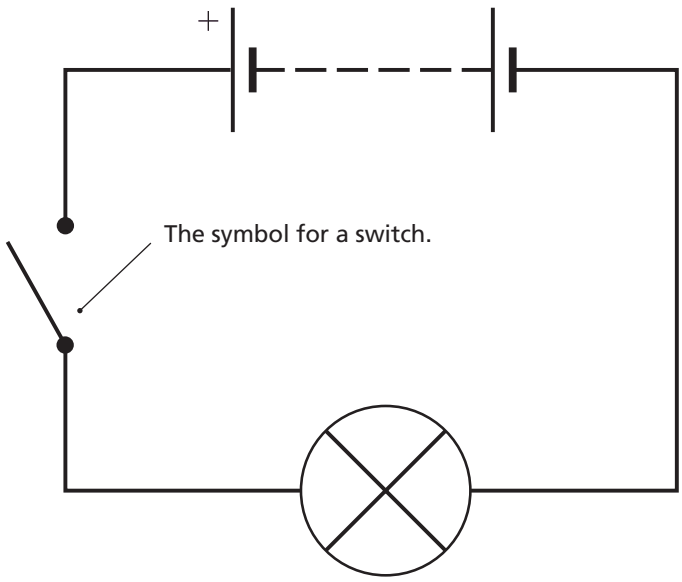


Weblink: www.science-at-school.com

Picture 4 shows a circuit with two batteries, two switches and two bulbs. Follow it around carefully, starting from the positive (+) terminal of the battery, to see what happens.
Follow the circuit to the left across the top of the circuit. Notice that the wire arrives at a junction – a place where wires are joined together. This is marked **X**.
From this junction there are now two routes for the electricity to follow. Route **A** goes straight down, then through a switch and a bulb. Route **B** also goes down, to another switch and then to another bulb.
Both routes meet again at a junction at the bottom of the diagram marked **Y**. A single wire leads directly from Y to the negative terminal of the battery. This completes the circuit.

▼ **(Picture 4) Four possible combinations can be achieved with the two switches and two light bulbs in this circuit.**





▲ **(Picture 3) The circuit diagram for the circuit shown in Pictures 1 and 2.**

This is a clever circuit, because we can now have the left-hand bulb switched on while the right-hand bulb is switched off, or the left-hand bulb off and the right-hand bulb on, or both on together, or both off together.

This is the principle on which the lights in your home and school work (see also pages 20 to 21).

Summary

- **Switches control the flow of electricity.**
- **Combinations of switches can give complex control.**