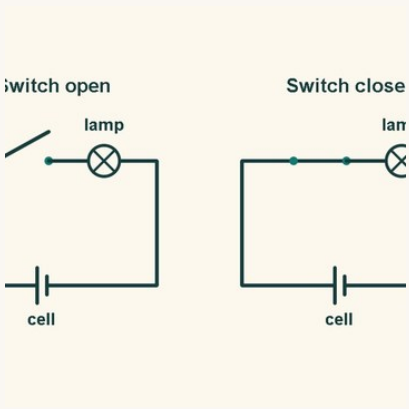
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Electric circuits







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Electric circuits

What is inside a torch?



THE IDEA

A torch needs a source, a lamp and a conducting path. The switch opens or completes the path.

A cell supplies energy. The metal parts inside the case help join the pieces into a circuit.

CHECK YOUR THINKING

Which part supplies energy?

A The switch.

B The cell.

B. The cell.

A RELATED EXAMPLE

Two ends of a cell

A cell has a positive terminal and a negative terminal. In the cylindrical cell shown, the raised cap is positive and the flat base is negative. A working circuit connects the two terminals through a device. Directly joining them can overheat the cell.

Electric circuits

Cells in a team



THE IDEA

Two cells can supply a lamp together. In series, the positive end of one cell touches the negative end of the next.

The two free ends connect to the rest of the circuit. The cell combination is a battery.

CHECK YOUR THINKING

Which connection makes their effects add?

A Positive of one cell to negative of the next.

B Both positive ends pressed together.

A. Positive of one cell to negative of the next.

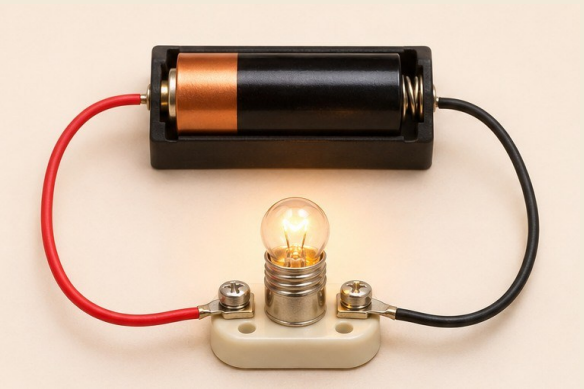
A RELATED EXAMPLE

Follow the filament

A filament lamp has two separate contacts. One lead from the filament reaches the metal case and the other the bottom tip. Current through the thin filament heats it until it glows. A break in the filament opens the path.

Electric circuits

One complete loop



THE IDEA

Trace the whole path. A cell, bulb and wires form a loop from one cell terminal, through the bulb, to the other terminal.

If a wire comes loose, the loop breaks and the bulb goes out. Touching only one bulb contact cannot complete the path.

CHECK YOUR THINKING

What does a break anywhere in this single loop do?

A It stops current throughout the loop.

B Only the wire after the break stops working.

A. It stops current throughout the loop.

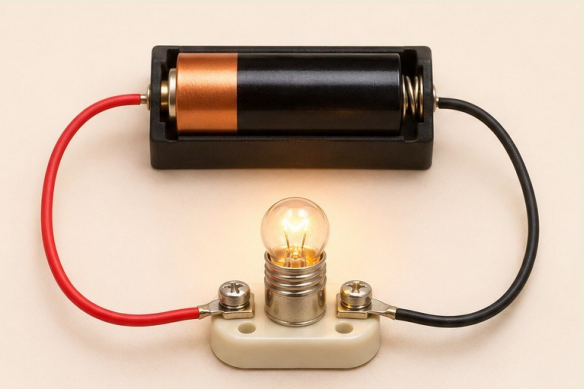
A RELATED EXAMPLE

A deliberate gap

The switch controls the path without removing the cell. An open switch separates its contacts. Closing it connects them. If lamps share one series path, opening it affects both. Separate branches can be controlled separately.

Electric circuits

Diagnose the dark bulb



THE IDEA

A working cell and bulb are connected, but one wire end hangs loose. Start at one terminal. Trace the path aloud and stop at the gap.

Choose the repair that completes the path through the bulb, without directly joining the cell terminals.

CHECK YOUR THINKING

What is the useful first repair?

A Reconnect the loose end to the missing bulb contact.

B Add a second cell while leaving the gap open.

A. Closing the gap allows a complete path through the bulb. Use the intended bulb contacts.

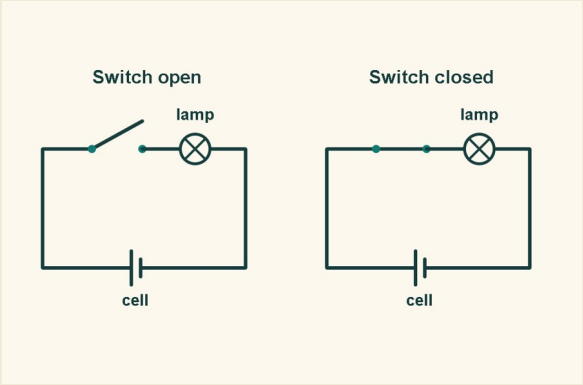
A RELATED EXAMPLE

An LED has a direction

An LED needs both the right direction and a safe current. In the teacher's low-voltage circuit, a suitable resistor limits current. The anode faces the positive side and the cathode the negative side. Reverse only the LED. If it now lights, the earlier direction blocked it. A dark LED alone cannot prove that the cell is flat.

Electric circuits

Draw the torch as a circuit



THE IDEA

In a circuit drawing, the long and short lines stand for a cell. The circle with a cross stands for the lamp. Follow the wire with your finger. Start at the long line and trace the loop back to the short line.

An open switch leaves a gap. Close it and there is a path all the way through the lamp.

CHECK YOUR THINKING

A pupil says the lamp can still shine because one wire reaches the cell. Where does the trace stop?

A At the lamp. Only one connection to the cell is needed.

B At the open switch. There is no complete loop.

B. At the open switch. There is no complete loop.

LOOK AGAIN

Trace each loop. Which switch lets the lamp glow?

Trace from one cell terminal through the lamp and back to the other terminal. An open switch breaks that path.

ONE LAST CHALLENGE

How can you check whether the tester itself works?

A bulb stays dark when a sample bridges the gap in a simple low-voltage tester.



THE REVEAL

Bridge the gap with a known conductor.

If the bulb still stays dark, the cell, bulb or connections may be faulty.

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