



Textbook

9.4 electric circuits

- 1a** Appropriate circuit diagrams using the correct symbols.
 - b** B
 - c** Circuit A needs another connecting wire. Circuit C need one of the cells to be turned around.
- 2** Conductors: iron, copper, carbon as graphite.
Insulators: wood, carbon as diamond, paper.
- 3** The wires are covered in plastic because it is an insulator. This stops people getting shocks from bare wires.

9.5 Current: what is it and how can we measure it?

- 1** Current is the flow of charge rather than the amount – it is a measure of how many electrons are flowing per second.
- 2a** charge, second
 - b** high, charge
 - c** broken
- 3** One switch controls the whole of a series circuit – when it is open the circuit is broken.
- 4a** 0.5 A
 - b** Current is not used up in an electric circuit so the current will measure the same either side of the lamp.
- 5** Current is a measure of flow of charge, it is the same all the way around the circuit as it is not

9.6 Parallel circuits

- 1 In a series circuit there is only one loop. In a parallel circuit there is more than one loop.
- 2 The lamps in a house are connected in parallel, so that they can all be controlled by their own switches. In a series circuit one switch would turn all the lamps off or on at once.
- 3a X and Z
 - b Yes, they will all be the same brightness.
 - c A switch to turn all the lights on and off it should be placed before the first branch of the circuit to lamp X.
- 4a No, they are different because a different amount of current is flowing through each branch.
 - b $0.2\text{ A} + 0.3\text{ A} = 0.5\text{ A}$

9.7 Models for electric circuits

- 1 In the rope model, a flat battery is represented by person X not moving the rope around the circle.
In the factory or people model, a flat battery is represented by a shut factory or by a person holding an empty pot.
In the water circuit model, a flat battery is represented by a broken or stopped pump or a circuit with no water.
- 2a To represent a parallel circuit using a rope model use two ropes both controlled at the same time by X, but one going past Y and the other past a third person Z.
 - b The currents in the branches of a parallel circuit because the charge that flows out of the battery is divided between the branches.
- 3 An ammeter would be represented by a person counting the number of people walking past with sweets in a certain time.

- 4 The water represents the flow of charge, electrons, around the circuit.
- 5 Any suitable answers, e.g.: To put a switch in the truck model, she could use traffic lights or a swing bridge that moves to break the circuit.
To put a switch in the rope model, the knot could be untied or a person could stand and stop the rope moving.

Workbook

9.4 Electric circuits – what can you remember

- 1 Images in the left column are in order: cell, open switch, ammeter, lamp, battery, voltmeter, motor.
Images in the right column are in order: ammeter, lamp, cell, voltmeter, motor, open switch, battery.

2	Conductors	Insulators
	metal spoon, piece of graphite, aluminium foil, iron nail	wooden spoon, plastic spoon, paper cup, plastic bag

- 3a Metal conducts electricity and wires need to be able to conduct electricity.
- b Plastic is an insulator so it covers wires to protect you from the current.
- c The pins need to conduct electricity and metal is a conductor.
- d The outside of a plug is made of plastic to protect you from the current.

9.5 Current: what is it and how can we measure it?

1

The current in a wire is in ampere, or amps.
Inside a metal wire the charge flowing per second.
There are 1000 milliamps provides the push to make electrons in a wire move.
You measure current in one amp.
The battery there are lots of electrons that move.

2a B and C

b A – close the switch, D – reverse one of the cells, E – add a cell.

3a F

b F

c T

d F

4a 2 A

b 2 A

c The current flowing through the battery is 2 A.

9.6 Parallel circuits

1 Series circuit with a switch and bulb.

Parallel circuit with a switch before the circuit branches.

Parallel circuit with a switch before the circuit branches and in each branch.

2a C

b It is the only circuit where the lamps are not on separate branches of the circuit.

- 3a** Correct answers in order: 0.2, 0.1, 1.1
b The current is different in the branches because they have different resistance.

9.7 Modelling electric circuits

- 1a** Correct answers in order: water, cyclist, chain, back wheel, rate of water flow.
b Add a tap or valve.
c No cyclist to turn the pedals.
- 2** Any suitable answer: circuit 1 needs two different components, circuit two has cells incorrectly connected.

Extension:

- a** Half the students go down the first branch and half down the second one. The lamp on the first branch gets all of the sweets for that branch, but on the second branch they are divided equally between the two.
- b** The person represent the battery hold two ropes, pulling them both round the circuit. Branch one has one person holding onto one of the ropes, branch two has two people holding onto the other rope.