Questions 9.4
What have you learnt?

WORKSPACE
What have you learnt? 9.4
SCI09SUWR00260

Understand

1 Compare and contrast the speed and distance a signal can travel in optical fibre and copper wire.

2 Explain why a digital signal is able to deliver a better-quality signal than an analogue signal.

3 Explain how a cellular network is set up.

4 Brainstorm a list of reasons why countries might take a long time to adopt digital technologies.

Apply

5 Examine each of the Australian states in Figure 9.26 (page 223). Can you identify any obvious causes for the variation in coverage?

Evaluate

6 A variety of communication technologies have been described. Which one do you think is the greatest achievement? Give your reasons.

Synthesise

7 Go to your mind map and add in your new understandings of modern communication technologies.

Energy transfer in an electric circuit

An electric circuit is a pathway along which electrical current flows. Just like a rock rolling down a hill, energy flows from places with high potential energy to places with low potential energy. It is possible to arrange an electric circuit so that one end has higher energy potential than the other. This energy potential difference is often called a voltage. A greater potential difference provides greater energy to the circuit.

ACTIVITY SHEET
Investigating electric circuits
SCI09SIAS00261

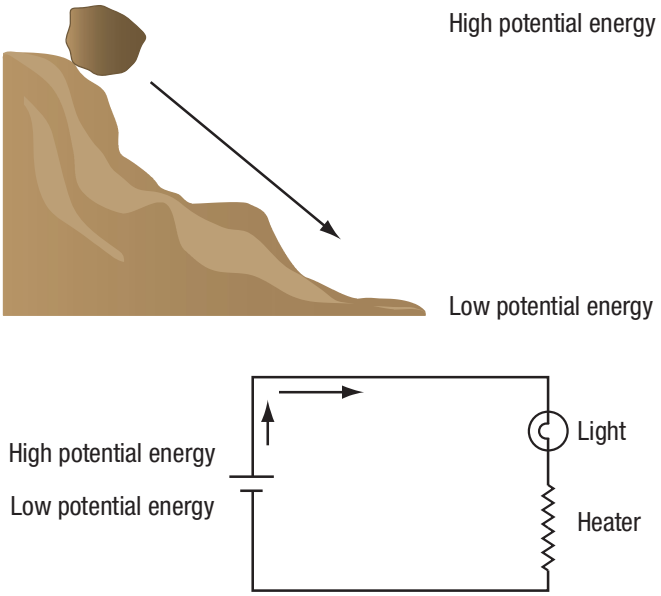

Figure 9.30 There is greater energy potential at the top of the hill than at the bottom of the hill, and so the rock rolls down the hill. Similarly, energy in a circuit flows from where there is greater energy potential to where there is less.

Extra energy can be added to a circuit with a battery. A battery stores chemical potential energy, which can be transformed into electrical energy. One side of the battery has high potential energy; the other side has low potential energy or zero voltage. The amount of potential energy decreases around the circuit, until it is regarded as zero at the low potential side of the battery.

Current transfers energy around the circuit. As the current travels around the circuit, the energy is shared with the metal circuit elements, which offer resistance to the current. Resistance will cause the material to increase temperature. If the material is chosen carefully, the temperature will rise to several hundred degrees and glow white-hot. A material such as tungsten is used inside light globes, while a special non-flammable gas fills the glass envelope. Mobile phones use complex electronic circuits to carry the electrical energy needed to make them operate.

glossary terms

current
flow of electrical charge through a medium

electric circuit
a pathway along which electric current flows

resistance
a measure of how hard it is for an electric current to flow through a material

voltage
potential difference between two points in an electric circuit

ISBN 9780170189262

Figure 9.31 Mobile phones are made up of complex electronic circuits, which include computer chips.

Every element within a circuit has a symbol (Figure 9.32). Thus, circuit diagrams can illustrate how a circuit can be constructed.

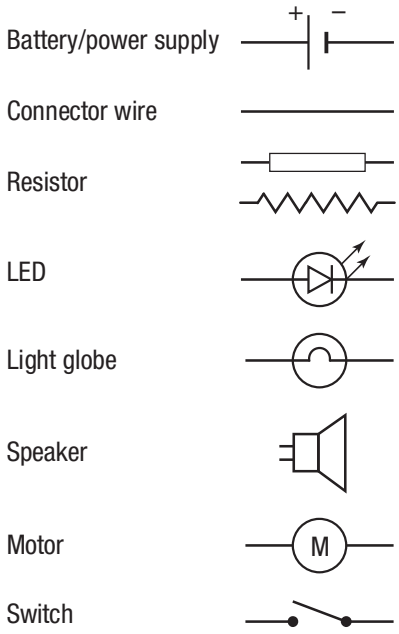

Figure 9.32 Symbols used when drawing electric circuits

Figure 9.33 shows a circuit diagram for the switches on a hairdryer. You can see that there are two speeds.

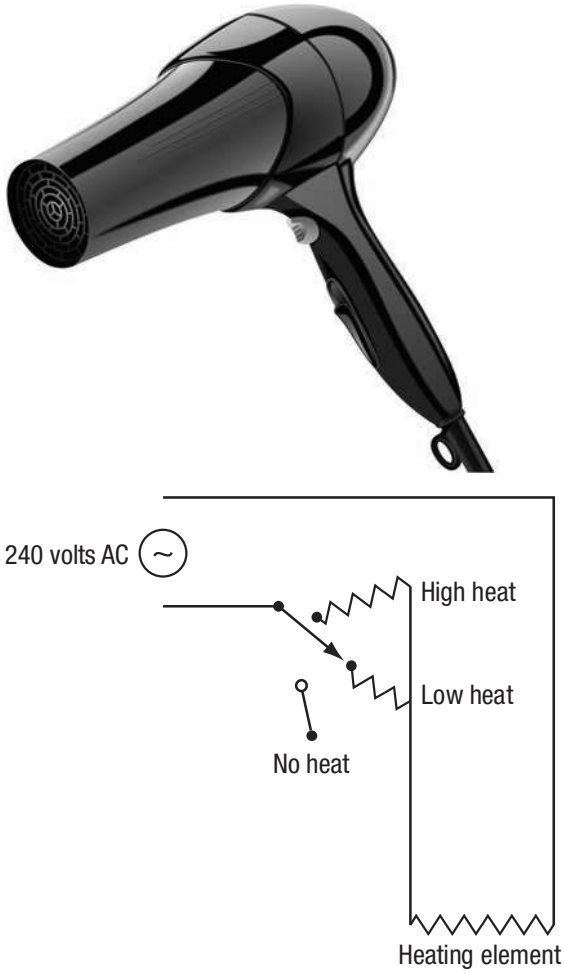

Figure 9.33 A hairdryer and the heater circuit. A different circuit controls the speed of the air blower fan.

Sometimes the electrical energy in a circuit is converted into other forms of energy. A hairdryer loses some energy as sound. This energy is 'lost' during the conversion.

Table 9.2 Energy lost in a circuit

Circuit element	Energy given off
Light globe	Light
Resistor	Heat
LED	Light
Speaker	Sound
Motor	Movement
Magnet	Magnetism

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Parallel and series circuits

Circuit elements can be connected to make a circuit in two different ways. A series circuit has one path for the current to follow. Every circuit element connected in series experiences the same amount of current. If one element breaks the current flow, no current is available to any other circuit element. The voltage is shared over all the elements so that the total supplied is the total used.

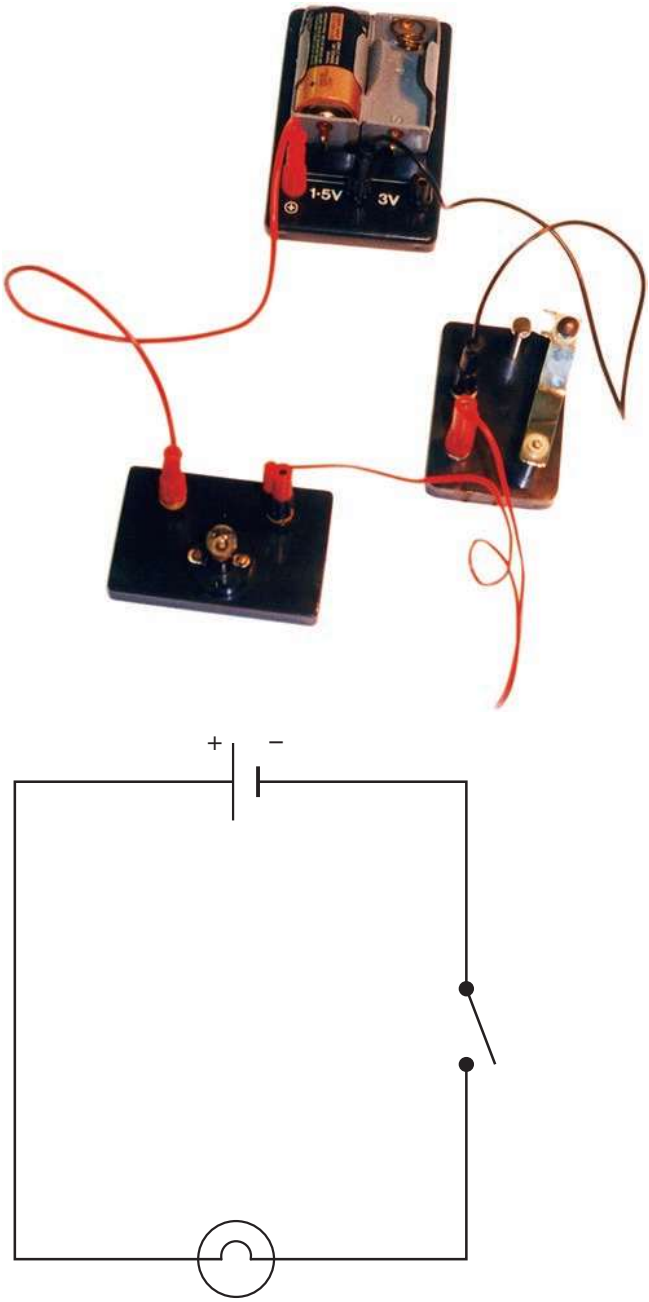

Figure 9.34 A simple series circuit and its diagram

A parallel circuit has at least two pathways available for the electric current. The circuit elements all have the same voltage available. If one circuit element breaks the flow of electric current, there is an alternative pathway, so the other circuit elements can keep operating.

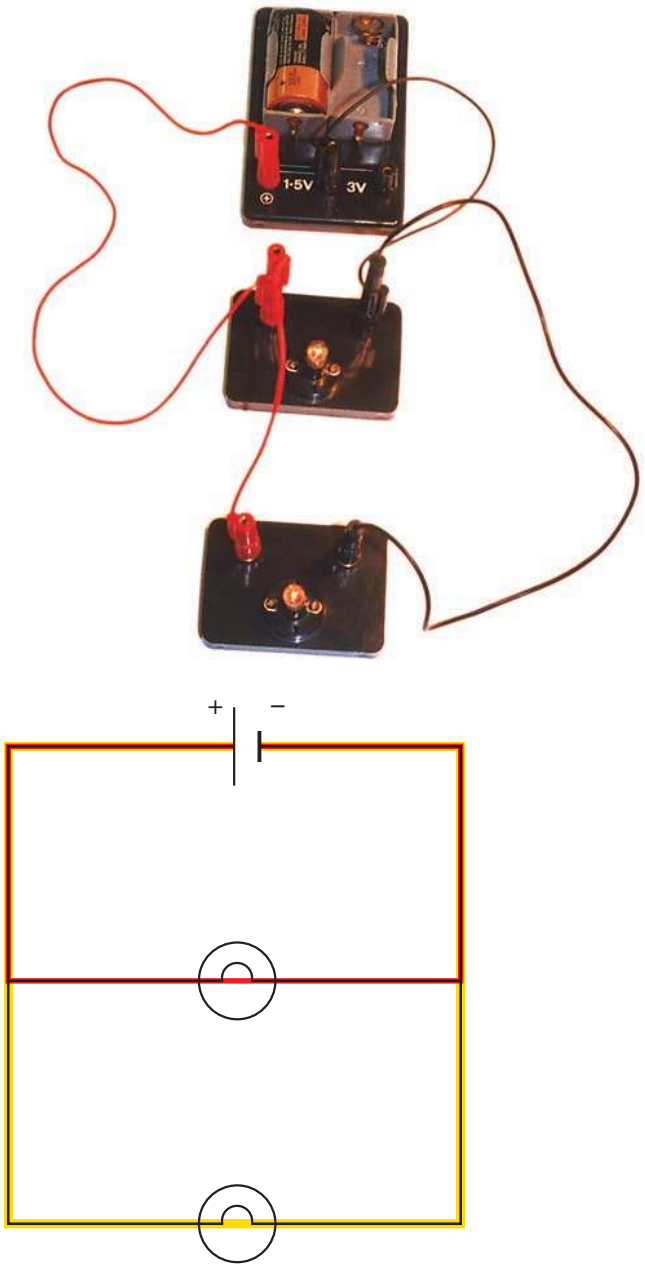

Figure 9.35 A parallel circuit and its diagram

INTERACTIVE

Wiring: the parallel circuit

SCI09SUIN00264

glossary terms

parallel circuit
an electric circuit in which the current can travel through different pathways

series circuit
an electric circuit in which the same current flows through all components

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A short circuit, or 'short', is when the current escapes the circuit pathway via an unintended path. All the available energy can be released across a small distance, causing heating and sometimes sparks if the current is very high. Plastic is a poor conductor of electricity so it is used as insulation to cover wires. This prevents wires touching each other or other parts of the circuit. The high potential energy of active wires must be kept isolated from low potential energy wires or a short circuit will occur. Sometimes a person can complete a circuit by touching the active or live parts of the circuit and connecting to an earth of zero potential.

ACTIVITY SHEET
Safety switches
SCI09SIAS00265

Questions 9.5
What have you learnt?

WORKSPACE
What have you learnt? 9.5
SCI09SUWR00266

Understand

1 How is electrical energy in an electronic circuit similar to a rock rolling down a hill?

2 Write two possible questions for each of the following answers.
- **a** Voltage
- **b** Current
- **c** Resistance

3 How is extra energy added into an electronic circuit?

4 How can energy be lost from an electronic circuit?

Apply

5 Draw a diagram to show the energy flow that occurs when you recharge your mobile phone by plugging it into a power point.

6 Compare and contrast parallel and series circuits.

Synthesise

7 List several ways a mobile phone battery can be recharged. Create a PMI (plus, minus, interesting) chart for each method. Which would you choose, and why?

8 Create a single-sentence safety message to warn people about short circuits.

9 Draw an electronic circuit for a battery-operated torch, using the correct symbols.

10 Go back to your mind map and add in your new understandings of electronic circuits.

Evaluate

11 What do you think about the following statement?

'People should have a choice as to whether or not to have a safety switch.'

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