



The National Orthodox School/ Shmessani

Text Book

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 used up around the circuit.

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.

9.8 How components affect the circuit

1a C

b B

2a circuit X

b circuit X

c two cells in X = one cell in Y

3 Narrower pipes

4a The rope model explain this by having two ropes coming from the battery to represent the current flowing down the two branches of the circuit. One rope goes down each branch.

b The current can only pass down one of the loops, it divides when it reaches the split which is like splitting at a junction.

9.9 Voltage

1 6 cells

2 Ammeters have no effect on the current, but a voltmeter connected in series would use some of the voltage and change the measurement.

3 The voltage that the battery supplies is used up by the components in a circuit. It is divided between the components so the voltage across all of the components will be the same as the voltage of the battery.

4a $6\text{ V} - 2\text{ V} = 4\text{ V}$

b The current will be the same because the lamp and buzzer are in a series circuit.

9.11 Energy and power

1 2000 W

2 Power = energy/time = 1200 J / 60 s = 20 W

3 LEDs use less power because they are more efficient than a CFL, but they are more expensive to produce.

4a Energy = power \times time = 0.015k W \times 10 h
= 0.15 kWh

b Incandescent bulb = 10 \times 0.6 = 6 rupees

CFL = 10 \times 0.15 = 1.5 rupees

LED = 10 \times 0.1 = 1 rupee

c You would save 5 rupees a month.

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.

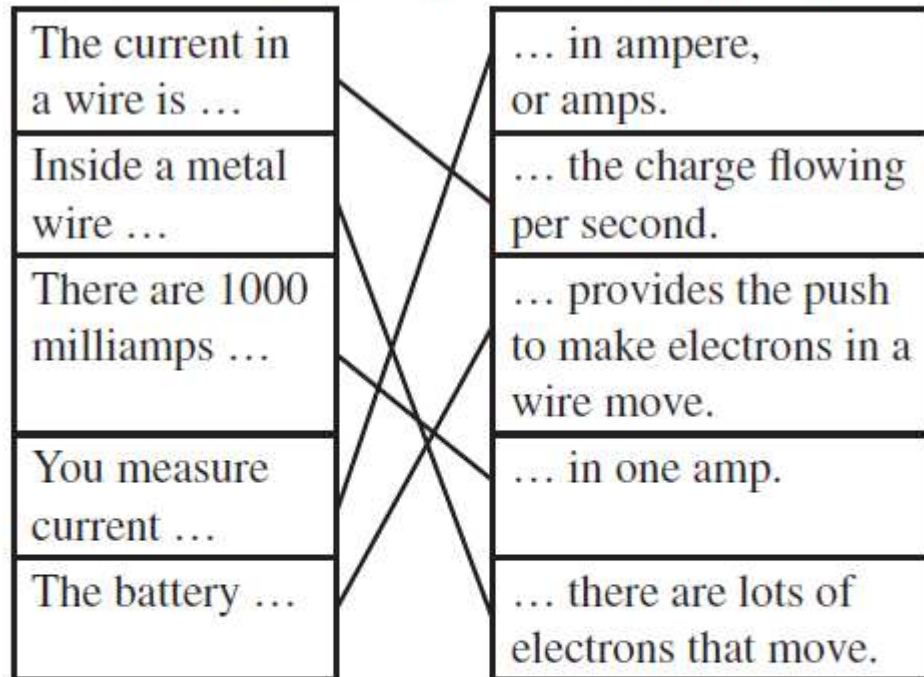
2

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



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.

9.8 How components affect current

- 1** Correct answers in order: dimmer, the same brightness, brighter, bigger, smaller, adds up.
2 A1, C1, D2 and D3.

9.9 Voltage

- 1 Missing words in order: voltage, energy, charges, charges, current, energy, current, volts, voltmeter.
- 2a 6 V
b 0 V
c 3 V
- 3a F
b T
c F
d T
e T

9.11 Energy and power

- 1a F – Lamp A is less powerful than lamp B.
b F – The first motor is more powerful.
c T
d F – They are the same power.
e F – There are 1000 watts in a kilowatt, there is only 1 watt in a watt.
- 2 Correct answers in order: 1000 W/1 kW, 500 W, 1 W, 800 W.
- 3a 10 kJ
b 6000 kJ
c 2 seconds
- 4a 0.8 kW
b 0.5 hours, 0.4 kWh
c 4 rupees