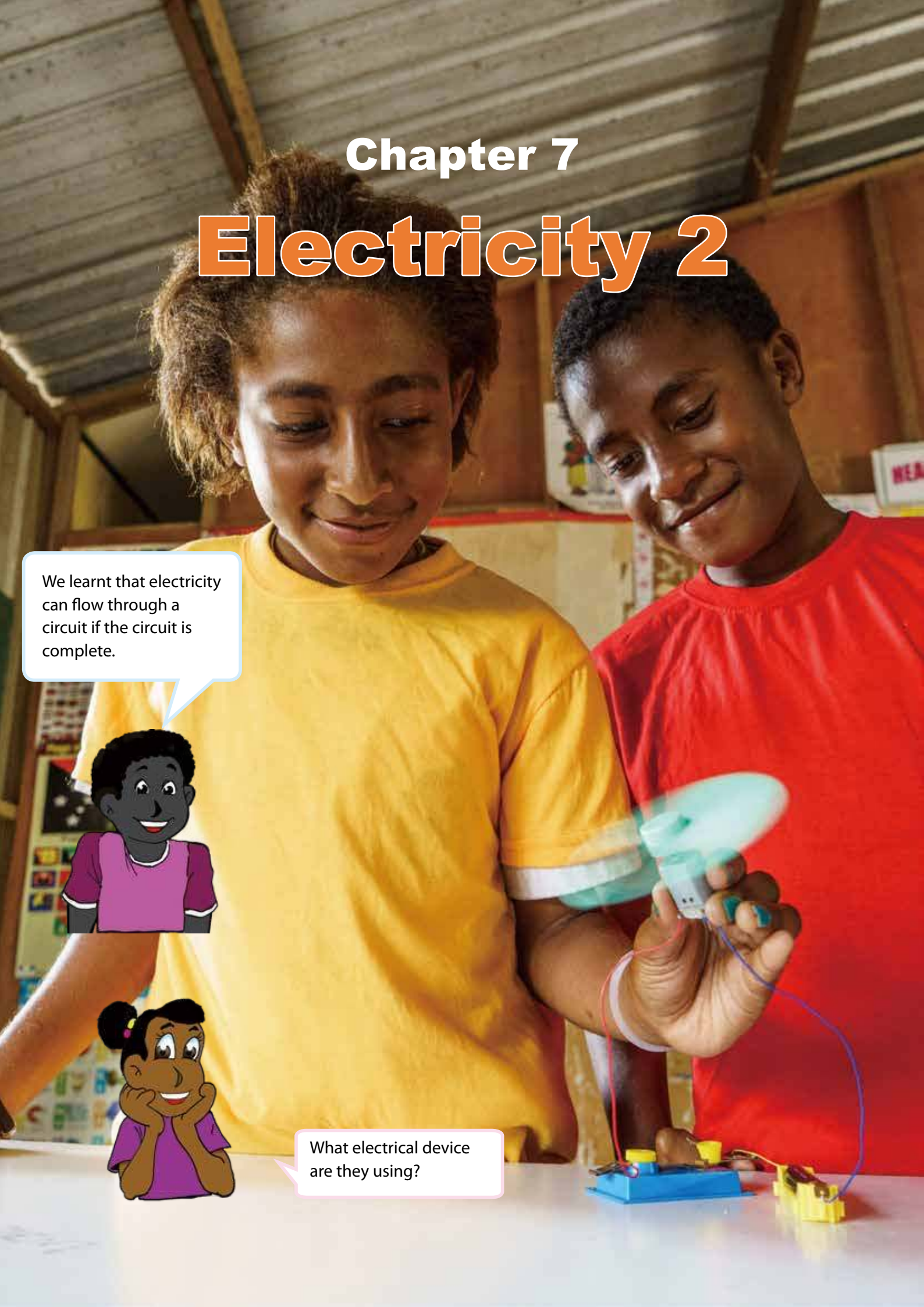
Chapter 7

Electricity 2



7.1 Electrical Circuit

Lesson 1 Direction of Electric Current

Electricity can make a light bulb glow when electric current flows through a complete circuit. A **motor** is an electrical device that produces power to rotate things using electricity. What happens when electric current flows through a motor?

How does electric current work in a circuit?

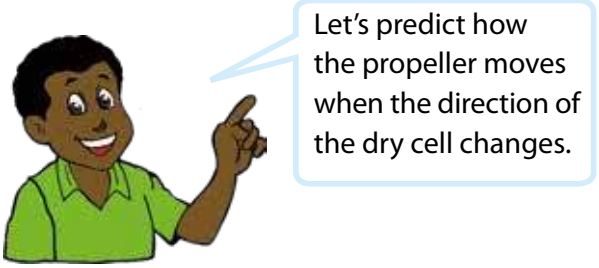
Activity : Rotating a propeller with a motor

What We Need:

- motor, propeller, dry cell, switch, cell holder, pieces of electrical wire and pieces of paper

What to Do:

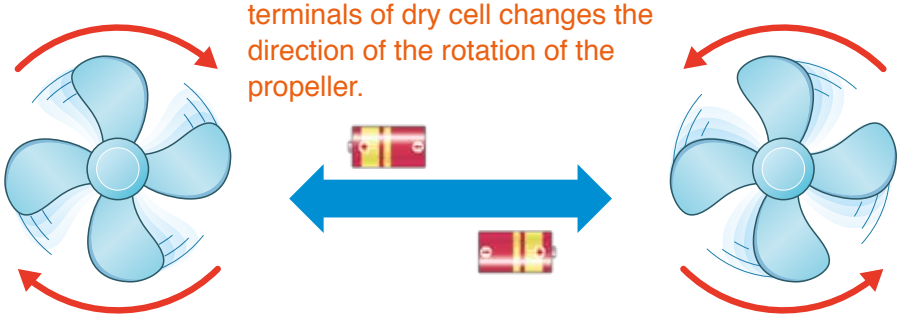
1. Cut a paper into thin strips and stick them onto the propeller. Attach the propeller to the motor.
2. Make the electric circuit as shown in the picture below.
3. Switch on and observe how the propeller moves.
4. Repeat Step 3 by changing the direction of the dry cell.
5. Share your results with your classmates.



Do not touch the propeller when it's spinning.

Result

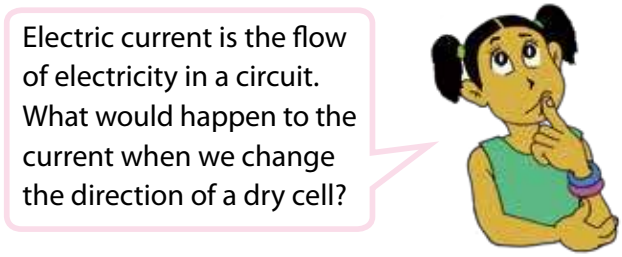
We found out that when we reversed the direction of the dry cell, the propeller rotated in the opposite direction.



Discussion

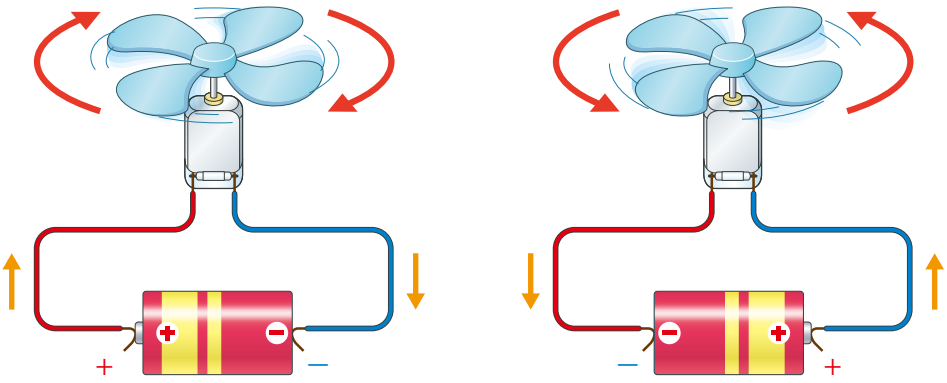
Based on your results, think about the following questions.

1. Why did the propeller rotate in the opposite direction when the direction of the dry cell was reversed?
2. What did you find out about the characteristics of electric current?



Summary

The flow of electricity is called **electric current**. Electric current has a definite direction. In the circuit with the dry cell, the electric current flows from the positive terminal to the negative terminal. When positive and negative terminals of the dry cell are reversed in the circuit, the electric current flows in the opposite direction.



Electric current flows from the positive to the negative terminal.

Lesson 2 Series and Parallel Circuit

Electric current flows from the positive to the negative terminal in dry cells. When we use two dry cells, how should we connect them to make a motor rotate?

How can we connect two dry cells to make a motor rotate?

Activity : Spinning a motor using two dry cells

What We Need:

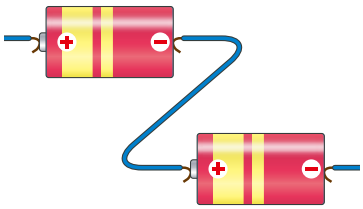
- 2 dry cells, switch, motor, propeller, electrical wire

Electric current flows from the positive to the negative terminal. If we connect two dry cells, what would happen to the direction of electric current?

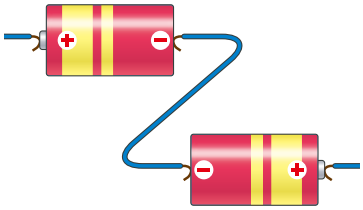
What to Do:

1. Study the diagrams below. Predict which connections of two dry cells will make a motor rotate. Record your prediction.

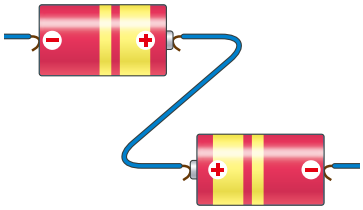
1) Connecting + and - terminals



2) Connecting - and - terminals

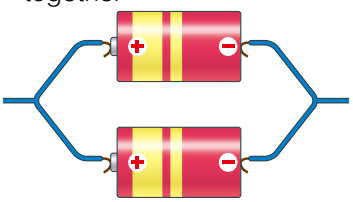


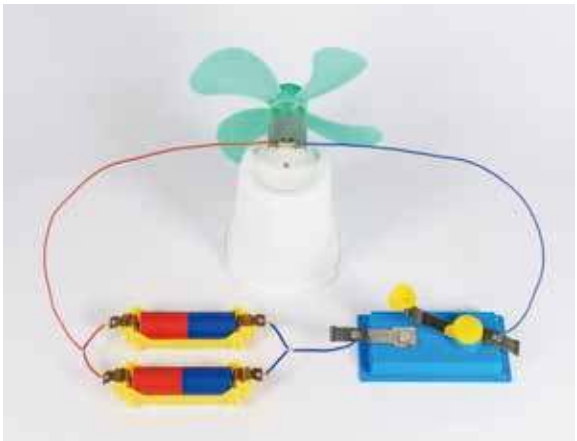
3) Connecting + and + terminals

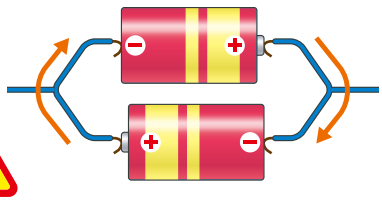


2. Connect two dry cells according to the diagrams and try to rotate the motor.
3. Record your results in your exercise book.
4. Share your results with your classmates.

4) Connecting same terminals together





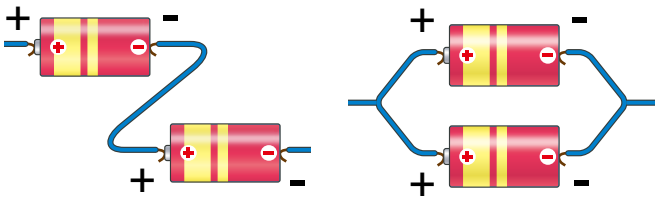


The connection in this picture is called a short circuit that would make cells and wire hot. In this case, disconnect the wire.

Result

We found out that the correct ways of connecting two dry cells to make the motor rotate are shown in the diagrams on the right.

Connection of two dry cells which can make motor rotate



Discussion

Based on your results think about the following question.

1. How does the electric current flow in a circuit?

Summary

The ways to connect two dry cells where electric current flows in a circuit are classified as series circuit and parallel circuit. Electric current always flows from positive to the negative terminal in both the series and parallel circuit.

Series circuit

A **series circuit** is a circuit in which the electric current flows in one path. When we connect two dry cells in series, the positive terminal on one dry cell is connected to the negative terminal on the other dry cell.

Parallel circuit

A **parallel circuit** is a circuit in which the electric current flows in two or more paths. The current can split into several paths at the junction and then join again together at the other junction. When we connect two dry cells in parallel, positive terminals of both dry cells connect together as well as the negative terminals.

Lesson 3 Comparing Series and Parallel Circuits

The path of electric current in a series and parallel circuit is different. What would be the difference between the connections of two dry cells in series and parallel circuits?

How is the amount of electric current different between series and parallel connection of two dry cells?

Activity : Comparing brightness of bulbs

What We Need:

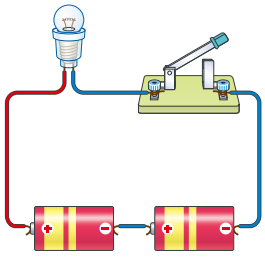
- 2 light bulbs, 4 dry cells, 4 cell holders, 2 switches, electric wire

What to Do:

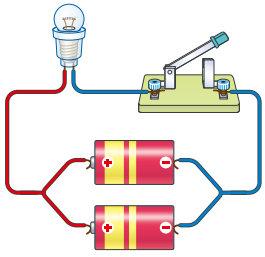
1. Draw a table like the one shown below in your exercise book.

Comparison of brightness of bulbs	Which one is brighter?
(1) and (2)	
(1) and (3)	
(2) and (3)	

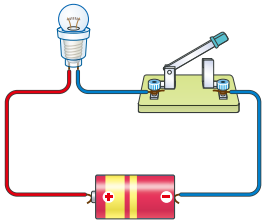
2. Make circuits (1) and (2) as shown in the diagrams below by connecting a bulb and dry cells and compare the brightness of the bulbs. Record your observations in the table.
3. Make circuit (3) and compare the brightness of the bulb between (1) and (3), (2) and (3).
4. Record your observations in the table.
5. Share your results with your classmates. Discuss the difference in the brightness of the bulbs in the different circuits.



(1) Two dry cells in series



(2) Two dry cells in parallel



(3) Single dry cell

Result

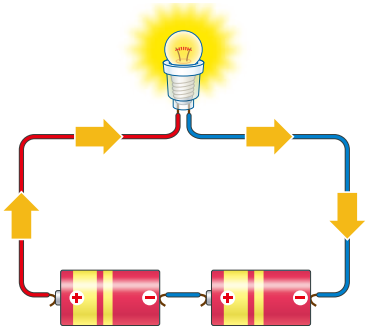
	Which one is brighter?
(1) and (2)	(1) is brighter
(1) and (3)	(1) is brighter
(2) and (3)	The brightness is same

We found out that the bulb in the circuit using two dry cells connected in series is brighter than that in parallel or in the connection using a single dry cell. The brightness of the bulb in the circuit using two dry cells in parallel and the one connected with a single dry cell is the same.

Summary

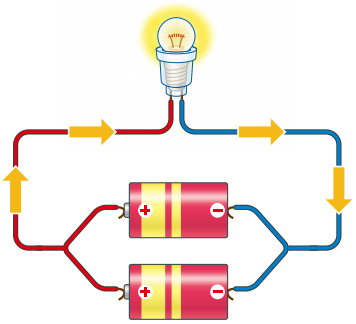
Series Connection

Compared to a single dry cell, a series connection of two dry cells increases the electric current in the circuit. Therefore the bulb glows brighter.



Parallel Connection

Compared to a single dry cell, a parallel connection of two dry cells does not change the amount of electric current in the circuit. Therefore the brightness of the bulb does not change.

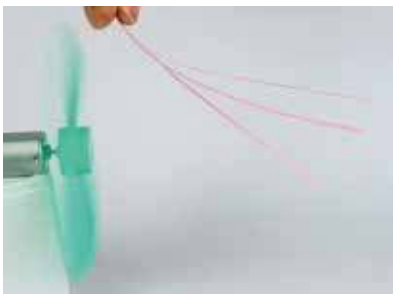


When you connect dry cells in parallel, it lasts longer than those connected in series.

Try it!

Think about the following question.

How would the motor rotation be different when two dry cells are connected in series and parallel?



Series connection

Parallel connection

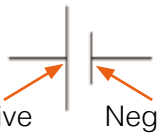
Lesson 4 Circuit Components and their Symbols

To draw an electric circuit, you have to draw the **electric circuit components** such as dry cell, bulb, switch and motor. Electric circuit components are basically made of various parts and are very difficult to draw.

How can an electric circuit be represented?

1. Symbols of circuit components

Using symbols of components helps us to simply draw within a shorter time. Each component that is used in an electrical circuit can be drawn as a symbol as shown in the table.

Component	Symbol	Examples
Bulb		
Dry cell (Battery)		
Open Switch		
Close Switch		
Wire		

(1) Bulb

A bulb is represented as a circle with an 'X' in the middle and two lines connecting on either side.

(2) Dry cell

The long line on the symbol of dry cell represents the positive terminal and the short line represents the negative terminal.

(3) Switch

An open switch is generally represented by providing a break in a straight line by lifting a part of the line upward.

(4) Wire

A straight line is used to represent a connecting wire between any two components of the circuit, even if wires in actual circuit are bending.

2. How to draw a circuit diagram

A diagram representing an electrical circuit drawn with symbols is called a **circuit diagram**. The following are some tips to draw a circuit diagram.

(1) All components in an actual circuit such as a dry cell, a switch and a light bulb are shown in a circuit diagram.

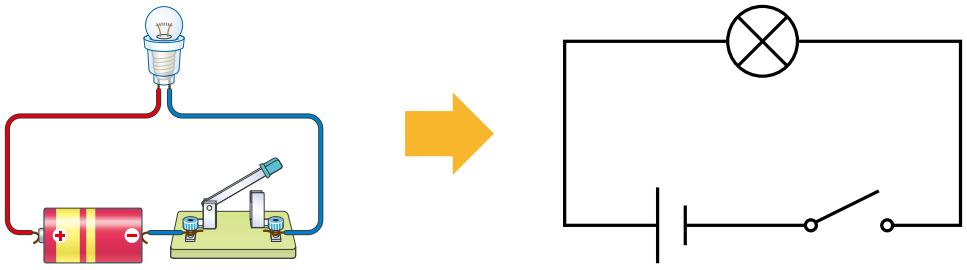
(2) Check the direction of the dry cells. It should be the same as the actual circuit.

(3) Corners in a circuit diagram are drawn as right angles.

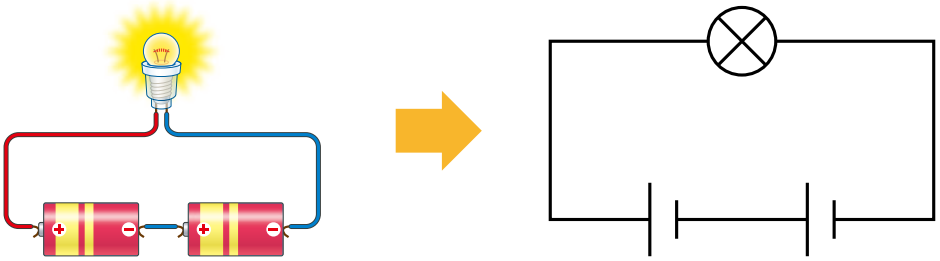
(4) Number of junctions in a circuit diagram should be the same as the one in the actual circuit.

Actual Circuit | Circuit Diagram

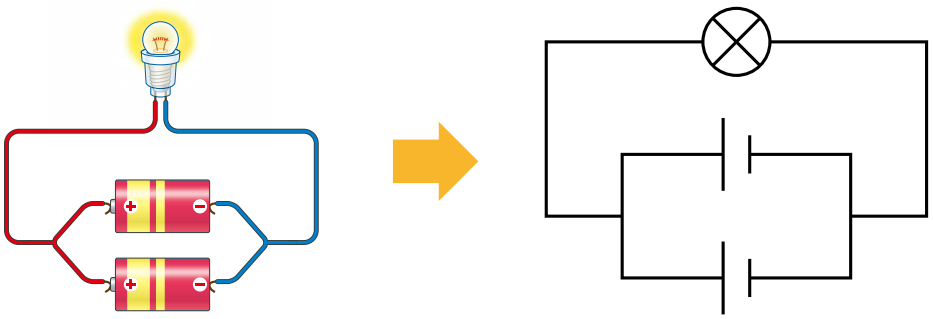
(a) Single dry cell circuit



(b) Series circuit



(c) Parallel circuit



Lesson 5 Daily Use of Electric Circuit

We learnt about electric circuit but where can we find electric circuit in our daily lives?

Where are electric circuits used in our daily lives?

Activity : Let's investigate an electric circuit of a flashlight

What We Need:

- flashlight with dry cells

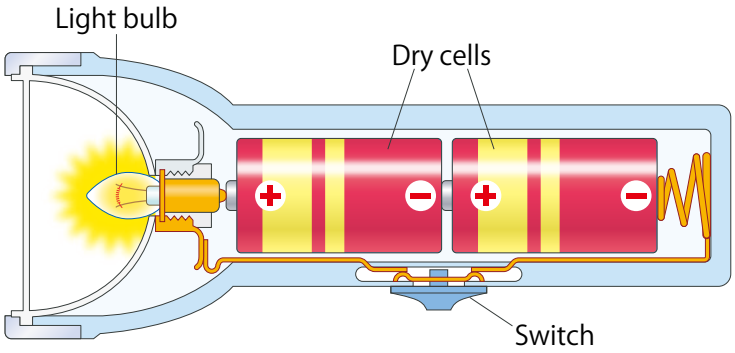
What to Do:

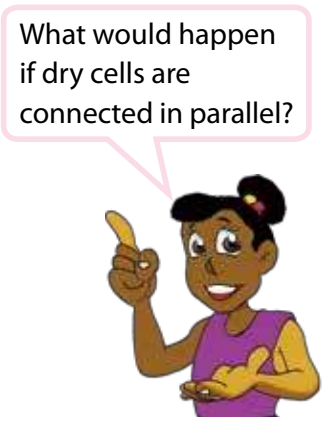
1. Predict the components of a flashlight and how they are connected to each other.
2. Take apart the components of the flashlight.
3. Observe and investigate how each component connects with the other components to make the bulb light up. Pay attention to:
   (1) What components do you find in the flashlight?
   (2) How does electric current flow in a bulb?
   (3) Are the dry cells connected in series or parallel?
4. Draw a circuit diagram of the flashlight in your exercise book.
5. Share your ideas about the circuit in the flashlight with your classmates.

Summary

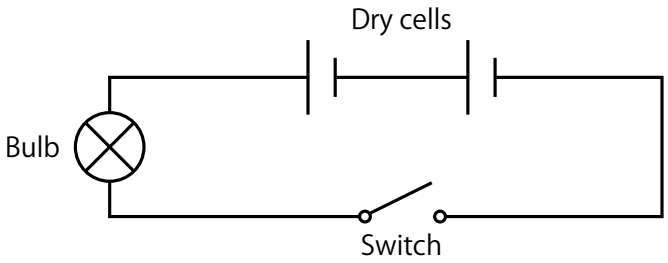
A flashlight has a simple electric circuit connecting the main components such as light bulb, switch and dry cells. We can turn the light on and off by using a switch to control the flow of electric current in the circuit. Connecting several dry cells in series can provide brighter light because more electric current flow through the bulb.

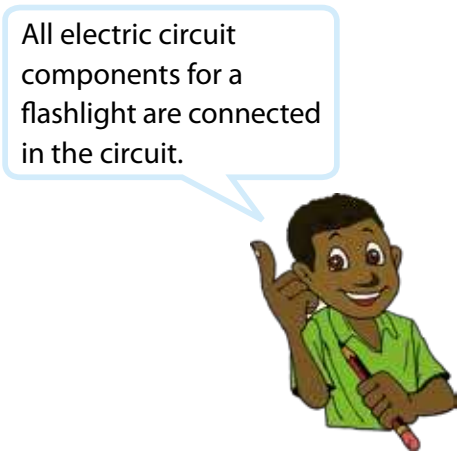
Cross section of a flashlight





Circuit diagram





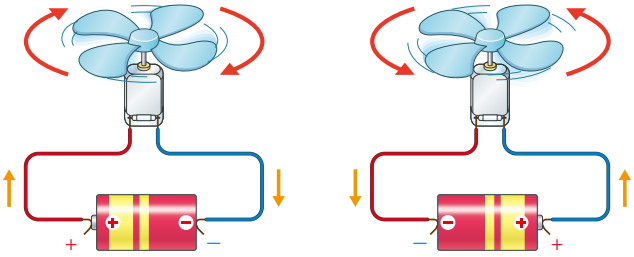
All electrical appliances used in our daily lives such as a flashlight, radio, cell phone, television, computer and refrigerator contain electric circuits. Room lights on the ceiling in a house are also parts of a large electric circuit. All components are connected in series or parallel in the circuit according to their own purpose.

Summary and Exercise

Summary 7.1 Electrical Circuit

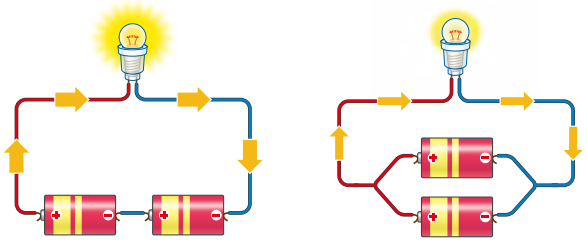
Electric Current

- In the circuit with the dry cell, the electric current flows from the positive terminal of the dry cell to the negative terminal.



Series and Parallel Circuits

- A series circuit is a circuit in which the electric current flows in one path.
- A parallel circuit is a circuit in which the electric current flows in two or more paths.

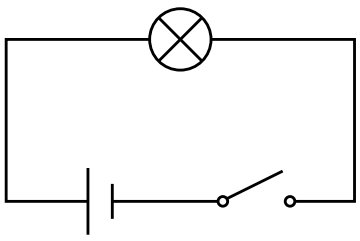


Comparing Series and Parallel Circuits

- Series connection of two dry cells increases the electric current in the circuit, causing the bulb to light up brightly.
- Parallel connection of two dry cells does not change the amount of electric current in the circuit and therefore the brightness of the bulbs does not change.

Circuit Components and their Symbols

- Each component that is used in the electrical circuit can be drawn as a symbol.
- Circuit diagram is a diagram representing an electrical circuit drawn using circuit symbols.



Daily Use of Electric Circuit

- All electrical appliances used in our daily lives contain electric circuit. Some examples are flashlight, radio and room lights on the ceiling in a house.

Summary and Exercise

Exercise 7.1 Electrical Circuit

Q1. Complete each sentence with the correct word.

(1) A _____ circuit is a circuit in which the electric current flows in one path.

(2) Each component that is used in the electrical circuit can be drawn as a _____.

(3) All electrical _____ used in our daily lives contain electric circuit.

(4) The electric current flows from the _____ terminal of the dry cell to the negative terminal.

Q2. Choose the letter with the correct answer.

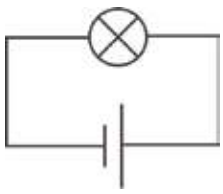
(1) If we connect two dry cells with a motor and a propeller to an electric circuit, which connection would make the motor rotate?

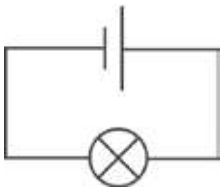
A. Connecting + and – terminals of dry cells

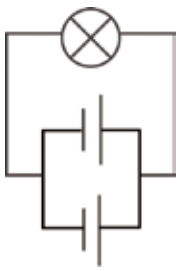
B. Connecting – and – terminals of dry cells

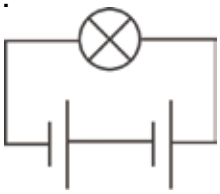
C. Connecting + and + terminals of dry cells

(2) In which circuit is the bulb brighter than others?

A. 

B. 

C. 

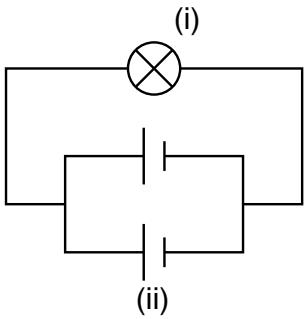
D. 

Q3. Study the circuit diagram on the right and answer the following questions.

(1) What type of circuit is shown in the diagram?

(2) What is the symbol labeled (i)?

(3) What is the symbol labeled (ii)?

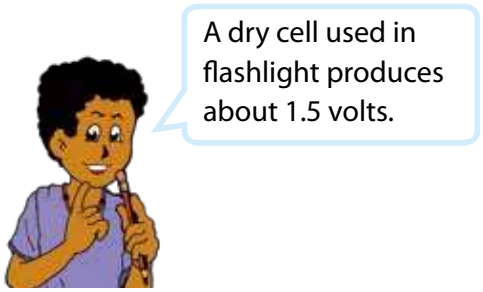


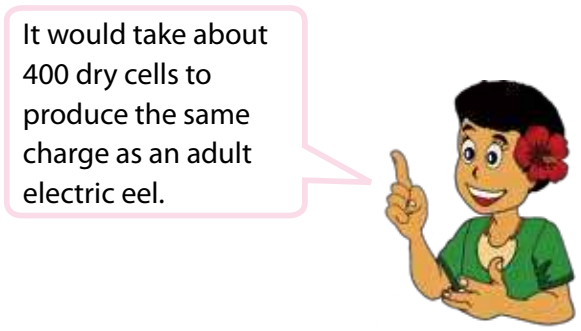
Q4. Ahmed set up three circuits. He connected one dry cell in a circuit, then two dry cells in series and two dry cells in parallel. His aim is to compare the brightness of the three connections. Which circuit has the brightest light?

Nature's Living Battery

You wouldn't want to bump into an electric eel while swimming. It can jolt other animals with over 600 volts of electricity! That's more than enough to stun or even kill its prey.

The electric eel uses thousands of specialised muscles to produce its charge. These muscles cause a powerful electric current to flow from the eel's body through the water and through whatever it wants to zap. Electric eels use their electrical power to hunt small fish, shrimps, frogs and water birds.





The head of the eel is the positive terminal and the long tail is the negative terminal.

Chapter Test

7. Electricity 2

Q1

Complete each sentence with the correct word.

(1) Electric current flows from the positive to the _____ terminal of the battery.

(2) Electric circuits can be classified as _____ and parallel circuits.

(3) A straight line is used to represent a connecting _____ in a circuit diagram.

(4) A flashlight generally has a simple _____ circuit.

Q2

Choose the letter with the correct answer.

(1) From which direction does the electric current flow?

A. Negative to positive terminal

B. Negative to negative terminal

C. Positive to negative terminal

D. Positive to positive terminal

(2) How would a motor's rotation be different when connected in series and parallel with two dry cells? The motor in

A. series will be faster than the one in parallel.

B. series will be slower than the one in parallel.

C. parallel will be faster than the one in series.

D. both connections will turn with the same speed.

(3) Which of the following symbol represents a bulb?

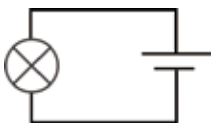
A. 

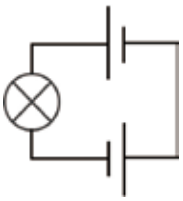
B. 

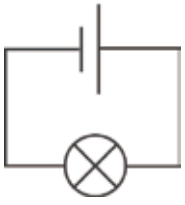
C. 

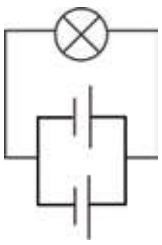
D.

(4) Which of the following connection has a much brighter light bulb?

A. 

B. 

C. 

D. 

Q3

(1) Stefan took apart a flashlight to investigate how the electric circuit components are connected in it. What are the four components he would find in the flashlight?

_____

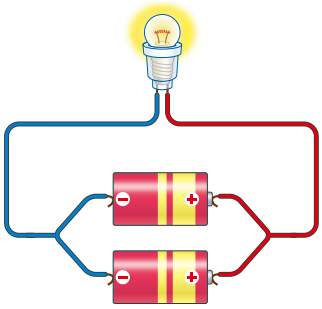
(2) Why are symbols and circuit diagrams used?

_____

_____

_____

(3) Study the picture on the right.
Draw the circuit diagram of the electrical circuit below.



Q4

(1) What is the difference between a series and a parallel circuit?

_____

_____

_____

(2) What happens when more dry cells are added in a series circuit?

_____

_____