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Science

Quarter 3 – Module 4:
Electric Circuit

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Science

Quarter 3 – Module 4:
Electric Circuit

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you master electric circuit. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module will help you infer the conditions necessary to make a bulb light up.

The module is divided into three lessons, namely:

- **Lesson 1** – Parts of a Simple DC Electric Circuit
- **Lesson 2** – Open and Closed Circuit
- **Lesson 3** - Electric Safety Measures

After going through this module, you are expected to:

1. identify and describe the parts of a simple Direct Current (DC) electric circuit;
2. differentiate open and closed circuit; and
3. discuss safety features and measures on the use of electricity.

What I Know

Directions: Identify the word/words being described in each statement. Choose the correct answers from the box and write your answers in your Science notebook.

closed circuit	open circuit
power source	insulators
electric current	switch
conductors	circuit
fuse	short circuit

1. It is composed of interconnected electrical components, which allow electric current to flow in a complete path.
2. It is produced when free electrons flow in a complete and closed electric unit.
3. It gives protection in case of a short circuit and overloading.
4. They are materials that do not allow electricity to flow through them.
5. They are materials which allow electric current to flow through them.
6. It supplies the power, may be a generator, a battery, or a solar cell.
7. It happens when exposed wires touch each other.
8. It is a kind of circuit that results when the knob is switched on and the metals are connected with each other so electricity flows.
9. It is a kind of circuit that results when the knob is switched off, the metals are disconnected so electricity does not flow.
10. It is a device that can break or connect an electric circuit.

Lesson 1 Parts of a Simple DC Electric Circuit

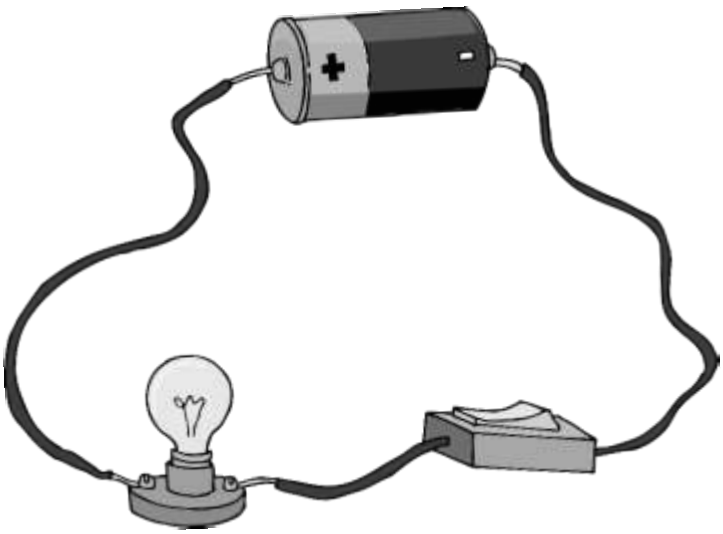
Look around your house and observe what electricity does for you. Electricity is important to everyone. Everybody benefits from it. Almost all homes use electricity. Using electricity lightens our load. It makes work easier, faster and better, especially for busy persons. Doesn't electricity power up your fan, television, radio, flat iron and refrigerator? Imagine how uncomfortable life would be if these appliances were taken away from you. How does electricity flow to your appliances?

What's In

List some objects in your home which use electricity. Write them in your Science notebook.

What's New

Study the illustration. What makes the bulb light up?



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

What is It

An **Electric Circuit** is composed of interconnected electrical components. These components form a complete path of an electric circuit. Simple electric circuit has three main parts: The sources are power supply, the conductor, and the load.

Electric current does not flow in an open or incomplete circuit. A current does not flow from the dry cell unless there is a path from one terminal to another.

Parts of an Electric Circuit

A complete electrical circuit has the following parts:

1. **Power Source** – the source of energy to move the electrons, maybe a dry cell, battery, generator, or a solar cell.
2. **Connector** – the wire or other conductors that link all parts of the circuit and create a path where current flows. Metals like silver, copper and aluminum wire are good conductors of electricity.
3. **Load** – a load is an output device that uses electricity such as a light bulb, appliances, computers and gadgets.
4. **Switch** – controls the flow of electricity; can connect or disconnect the path of electric current.

What's More

Activity 1: "Name Me!"

Directions: Label the parts of a simple DC electric circuit shown in Figure 1 below. Write your answers in your Science notebook.

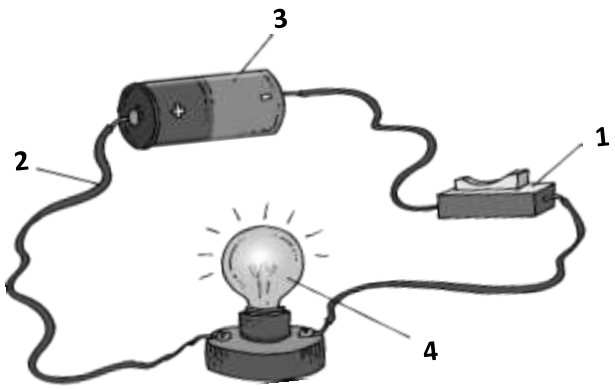


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Figure 1: Electric Circuit

Activity 2: "Make Me!"

What you need:

1/8 illustration board, one 1.5V AA battery,
small bulb with receptacle/ socket,
2 pieces 25 -30 cm copper wire, small switch, electrical tape

Notes to the Pupils

1. Be careful in handling materials especially the bulb.
2. Do not insert wires in an electrical outlet.
3. Do the activity with adult supervision.

What to do:

1. Make one simple circuit as shown in Activity 1- Figure 1.
2. Turn the switch on. Observe.

Guide Questions:

What are the parts and corresponding functions of a simple DC electric circuit? Write your answers by copying first the table in your Science notebook.

Parts of a Simple DC Electric Circuit	Function/s

Lesson 2 Open and Closed Circuit

An electric circuit is in many ways similar to your circulatory system. Your blood vessels - arteries, veins and capillaries are like the wires in a circuit. The blood vessels carry blood throughout the different parts of your body. The wires carry the electric current to various parts of an electric circuit.

What's In

Directions: Look around your house. Answer the questions that follow. Write your answers in your Science notebook.

1. How many appliances and gadgets do you have? List them.
2. How does electricity flow to your appliances and gadgets?

What's New

Directions: Unscramble the letters to find the message. Write your answers in your Science notebook.

L E C D O S 1. Status of a circuit that is complete and unbroken with flowing electric current

N U T R E R C 2. A flow of electrical charges

P E N O 3. Status of a circuit that has breaks or openings in which electric current cannot flow

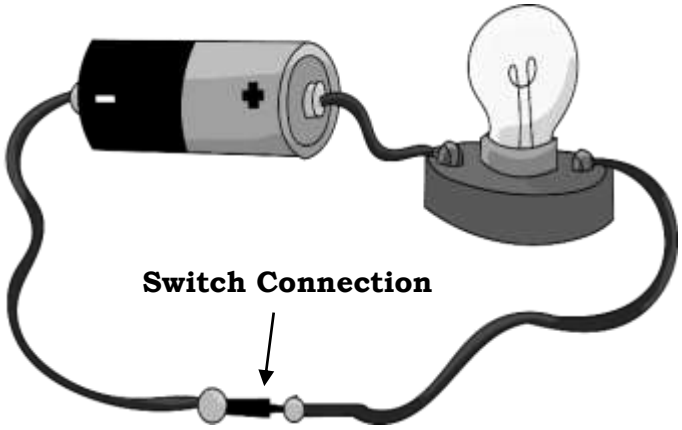
R I T C I U C 4. The unbroken path along which an electric current flows

T H C I S W 5. Opens and closes the circuit

What is It

Continuity of an Electric Circuit

1. **Closed Circuit (Switch On) -** A closed circuit makes the bulb light up because the path of electricity is complete. Electric current flows through the connecting wires from the power source to the device (ex. bulb) then back to the source again.



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

Figure 2: Closed Circuit

Figure 2 above shows an example of a closed circuit where the connection is not broken. In this set up, both wires are attached to the bulb, a wire is attached to the positive end of the battery, while the other part are connected to the negative end.

2. **Open Circuit (Switch Off)-** Electricity does not flow in this kind of circuit because there is a gap or no complete path from one end of the circuit to the other end. If it is an open circuit, an electrical device does not work. In the case of Figure 3 below, the bulb does not light up.

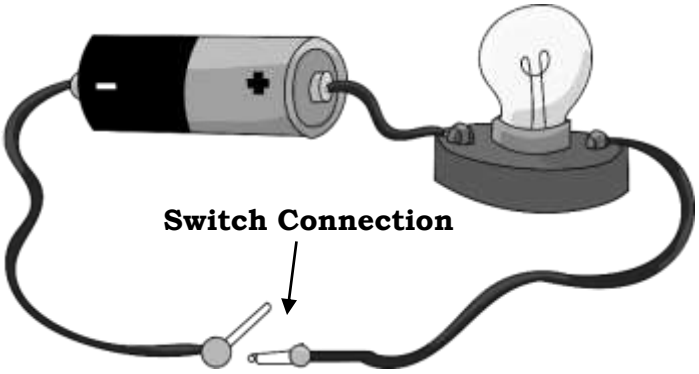


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Figure 3: Open Circuit

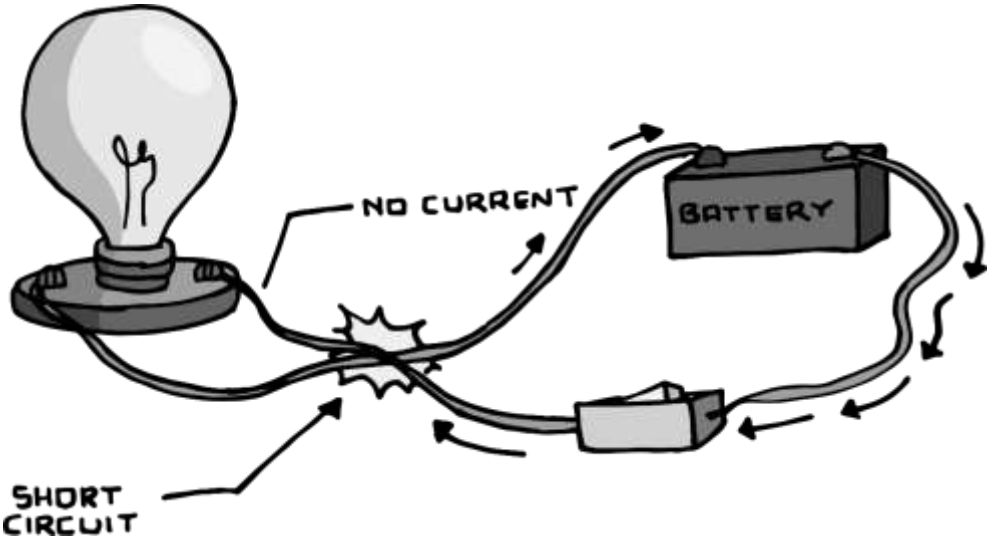
In summary, to turn on the lights, you must close the circuit by turning on the switch to connect the wires and other parts of the circuit. On the other hand, to turn off the lights, you must open the circuit by turning off the switch to disconnect them.

Besides switches, other causes of gaps or breaks in a circuit include drained, rusty, or wrong positions of batteries wherein similar terminals are connected, defective devices, and busted bulbs.

How Short Circuit Occurs

Short circuits are a major type of electrical accident that can cause serious damage to your electrical system. They occur when a low-resistance path not suited to carry electricity receives a high-volume electrical current. In simpler terms, short circuits happen when hot wire touches a conductive object it is not supposed to.

An electric cord contains two wires. One wire carries current from the power source to the load/ electrical devices. The other wire carries current back to the source. A damaged cord can cause a short circuit. A short circuit occurs when electric current follows a shorter path than is intended. For example, if the two bare wires in a damaged cord come into contact with each other, current flows directly from one wire to the other as shown in Figure 4 below.



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

Figure 4: Short Circuit

The current will bypass the load or device and take the shortest route. This may cause the wires to overheat and can lead to damage in appliances, electrical shock, or even start a fire. And if you are not taking any preventative measures against short circuits, you are only increasing the risk of these situations happening.

What's More

Activity 1. "Describe Me!"

What you need:

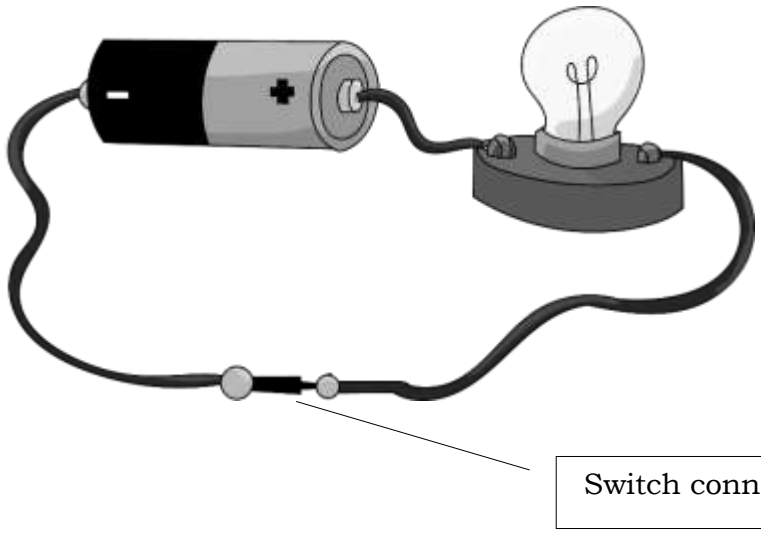
one piece 1.5 V AA battery
small bulb with receptacle/ socket
two (2) pieces 20 cm copper wire

Notes to the Pupils

1. Be careful in handling materials especially the bulb.
2. Do not insert wires in an electrical outlet.
3. Do the activity with adult supervision.

What to do:

1. Construct a simple electric circuit.
2. Connect the materials as shown in the diagram below. Observe what happens.
3. This time, remove the switch connection. Again, observe what happens.



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

Guide Questions:

Directions: Based on your observations, answer the following questions in your Science notebook.

1. What happened to the bulb after you connected the switch to the wires? Why?
2. How did you know that electricity flow in the circuit?
3. What happened to the bulb after you disconnected the switch to the wires? Why?

Activity 2: "Spot the Difference"

Directions: In your Science notebook, draw a **closed circuit** and an **open circuit** and label its parts.

closed circuit

open circuit

Guide Questions:

Directions: Answer the following questions in your Science notebook.

1. How does an open circuit differ from a closed circuit?
2. Why do we need a switch in an electric circuit?

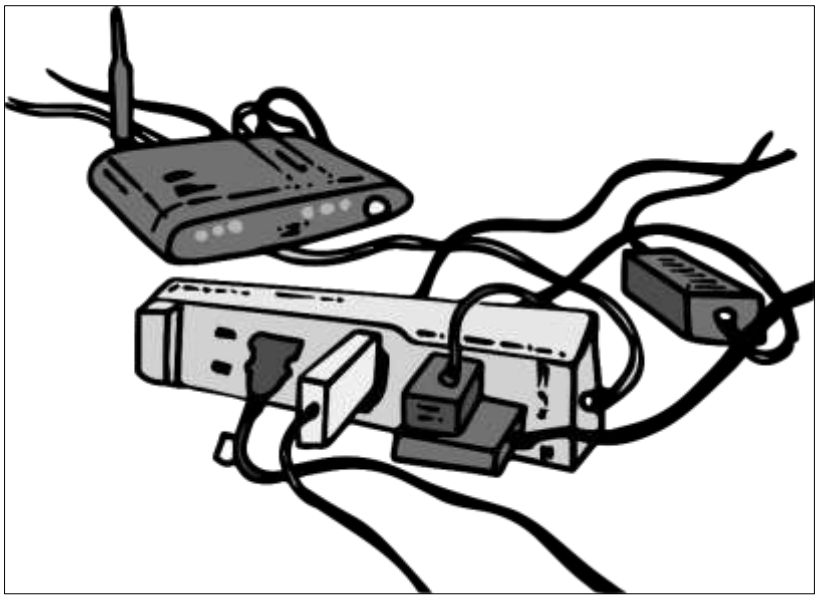
Lesson 3 Electrical Safety Measures

Electricity is very important in the world and in our daily living. It is safe to use but becomes dangerous in careless hands. It may cause fire, damage and accidents. Misuse or mishandling of electrical circuits or electrical connections can result to serious injuries and even death.

What's In

Electricity is very useful to us. However, when it is used carelessly, it can also be very dangerous. Electricity can cause electric shock and burns. At worst, it can kill people. In this lesson, you will learn ways to avoid electrical accidents at home.

The situation below is commonly seen at home, in school and in some working places. Is it safe? Why do you think?



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

It is vitally important to take safety precautions when working with electricity. Some ground rules need to be followed first.

What's New

What do you think happened to the person in the picture?

Illustrated by Reyson Joe Cañedo

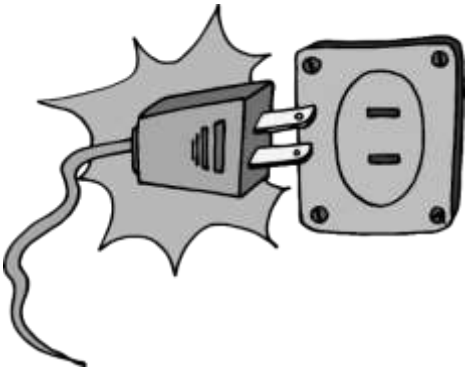
Do you know why some people experience electric shock or get electrocuted?

Our bodies are good electrical conductors. Our bodies can conduct electricity better when our skin is wet. That is why, it is not advisable to insert a metal or plug into an electrical outlet with wet bare hands.

What is It

Using Electricity Safely

Electricity is certainly useful, but it can cause injuries if not used properly. Even with electrical safety features, electricity is still dangerous. Contact with electric current can cause severe burns and even death. Serious fires can break out if electrical wires or appliances overheat. A common cause of electric hazards and fires is a **short circuit**.



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

Safety Rules in Using Electricity

Follow the safety rules below to reduce the risks of injury or fire from electricity:

1. Pull the plug, not the wire.
2. Never use wet outlets or those dipped into the water.
3. When you are not using your appliances, turn them off.
4. Never stick/ insert a metal or any object into an electric outlet.
5. Do not place electric appliances near water. It can cause electrocution.
6. Stay away from electric power lines when flying a kite. Do not climb on power posts too.
7. Do not plug too many appliances into an outlet. An overloaded outlet, called an "octopus connection," can cause fire.
8. Do not touch light switches or plugs of appliances when your hands are wet or when you are standing on a wet surface.
9. Call a qualified electrician if you want to repair your faulty wiring or broken appliances. Do not repair them yourself if you are not trained to do so.
10. Cover electrical outlets with plastic caps especially if there are children in your home. This will prevent them from putting things inside or playing with the outlets. The plastic caps can be bought in most appliance or electrical stores.

Fuses and circuit breakers

Fuses and **circuit breakers** are devices that ensure safety when faults and problems in a circuit arise.

A **fuse** is an electrical safety device that operates to provide overcurrent protection of an electrical circuit. Its essential component is a metal wire or strip that melts when too much current flows through it, thereby stopping or interrupting the current.

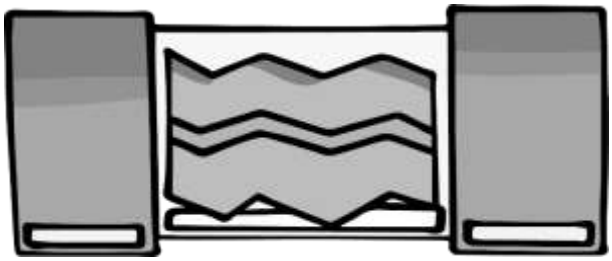


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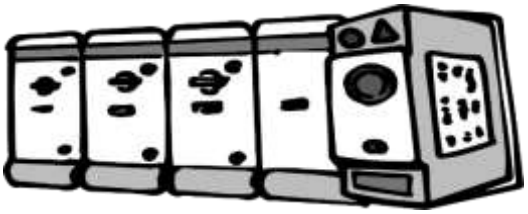
Figure 5. Fuse

A **circuit breaker** is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit. Its basic function is to interrupt current flow after a fault is detected. Unlike a fuse, which operates once and then must be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation.



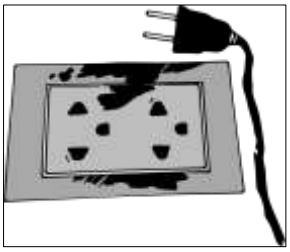
Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo
Figure 6. Circuit Breaker

What's More

Activity 1. "Safety Measures"

Directions. Study the pictures below. Write a check (✓) mark if it shows safety measures in using electricity and (**X**) mark if it is not. Write your answers in your Science notebook.

1. Bare electric wires



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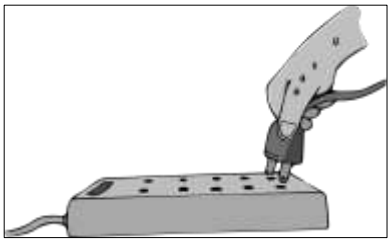
3. Wet hands in plugging



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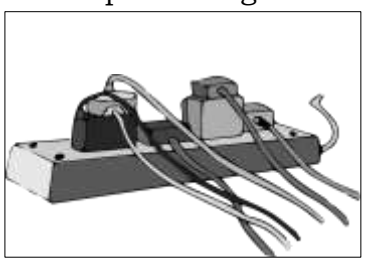
2. Octopus wiring



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

4. Never stick a metal in an electric outlet.

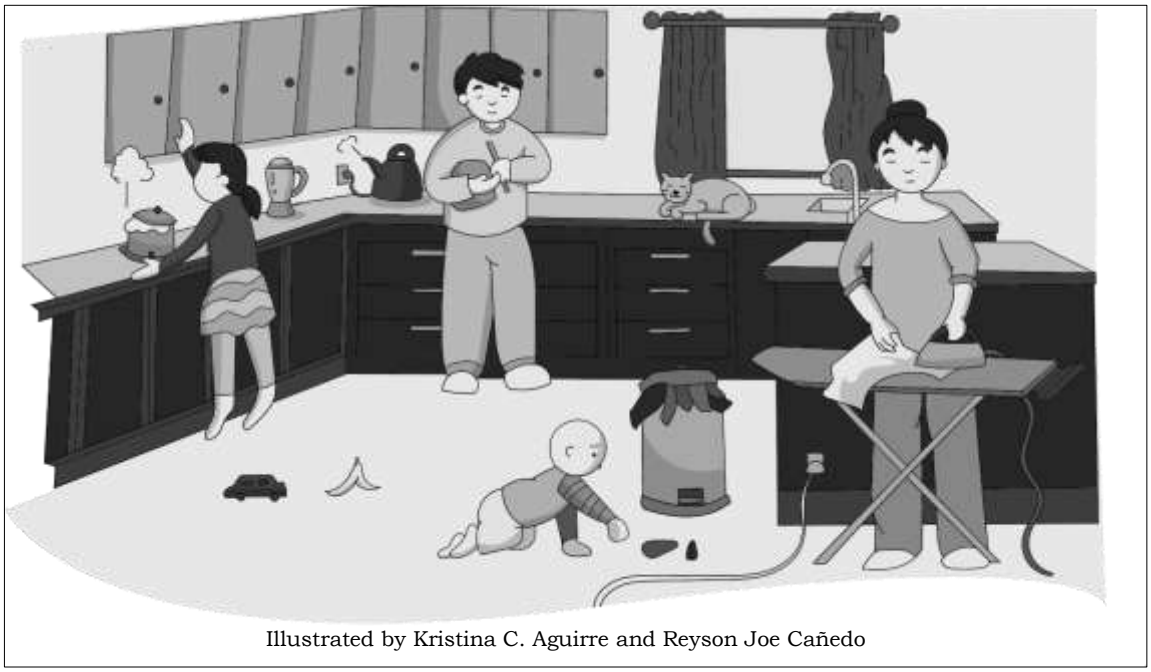
Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

5. Flying kite near electric power lines

Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

Activity 2. "Dangers in the Kitchen"

Directions: Study the picture below. Can you spot the dangers in the kitchen? Write your answers in your Science notebook.



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

What I Have Learned

Directions: Choose the correct word inside the parenthesis to complete each sentence. Write your answers in your Science notebook.

1. Never put fingers into an empty (kit, switch, socket).
2. Turn off electrical (appliances, plug, post) when not in use.
3. (Plug, Keep, Unplug) electrical appliances during brownouts.
4. Avoid using too many appliances in one (outlet, house, room).
5. Call a qualified (electrician, plumber, goldsmith) if you want to repair your faulty wiring or broken appliances.

What I Can Do

Directions: Answer each question briefly. Write your answers on the space provided.

1. What should you not do when your hands are wet or when you are standing on wet surfaces?

   _____

2. What should you do when you are not using your appliances?

   _____

3. How should you disconnect an appliance from an electrical outlet?

   _____

Assessment

A. Directions: Read and understand the sentences. Encircle the letter of the correct answer.

1. Which of these is a source of electrical energy?
   a. switch
   b. Battery
   c. light bulb
2. Which of these controls the flow of electric current?
   a. battery
   b. switch
   c. light bulb
3. When the switch is "ON" the electric circuit is…
   a. open
   b. closed
   c. broken
4. Which of the circuits will current flow?
   a. open circuit
   b. short circuit
   c. closed circuit
5. Which of the following measures can prevent fire caused by electricity?
   a. Touch a switch with dry hands.
   b. Avoid walking under low dangling wires.
   c. Have a regular inspection of electrical cords

B. Directions: Match the concepts in Column A with its description in Column B. Write the letters of the correct answers in your Science notebook.

Column A	Column B
1. a complete path of electricity	A. battery
2. a source of energy in a circuit	B. circuit
3. a circuit where electricity flows freely	C. closed circuit
4. a circuit where electricity cannot flow	D. light bulb
5. connect the light bulb and the battery	E. open circuit
	F. wires

Additional Activities

Directions: Write a brief essay or a short paragraph with at least 5 sentences about how you use electricity at home in proper and safe ways. Write your answers in your Science notebook.

Rubrics for Short Essay

	1	2	3	4
Quality of Writing	Very poorly organized and no idea at all	Gives some new information but poorly organized	Somewhat informative and organized	Very informative and organized
Grammar, Usage, and Mechanics	Many spelling and grammatical errors	A number of spelling, punctuations or grammatical errors	Few spelling and punctuations errors, minor grammatical errors	No spelling, punctuations or grammatical errors

Answer Key

What I Know

1. Circuit
2. Electric Current
3. Fuse
4. Insulators
5. Conductors
6. Power Source
7. Short circuit
8. Closed circuit
9. Open Circuit
10. Switch

What's More
Guide Question 1

1. Switch
2. Connector/ Conductor/ wire
3. Power Source/ dry cell/ battery
4. Load / bulb

Lesson 1

What's New

(Possible answer)

-The energy from the battery makes the bulb light up.

Lesson 1

What's In

(Possible answer)

1. Television
2. Electric fan
3. Refrigerator
4. Washing machine
5. Cellphones

(Guide Question 2)

Parts of Electric Circuit	**Function**
Power Source	A source of energy
Connector/ Conductor/ Wire	Where current flows
Load	An output device that uses electricity
Switch	Controls the flow of electricity/ current

Activity 2 Guide Questions

1. Closed circuit has a complete path of electricity while the open circuit has a gap or broken path of electricity.

2. Switch controls the flow of electricity. It connects or breaks the path of current.

Lesson 3

What's More

Activity 1

1. X
2. X
3. X
4. ✓
5. X

Activity 2 (possible answers)

1. An active wire near the baby
2. A boiling pot in front of a girl

Lesson 3

What I Have Learned

1. socket
2. appliances
3. Unplug
4. Outlet
5. electician

What I Can Do

(Possible answers)
1. Never plug-in electrical appliances when hands are wet.
2. Unplug the appliances when not in use.
3. Pull the plug not the wire of the appliances

Lesson 2

What's In

1. (Possible answers)
   a. refrigerator
   b. television
   c. electric fan
   d. washing machine
   e. cellphones

2. Electricity flow to the appliances or gadgets by closing the path of the circuit.

Lesson 2

What's New

1. CLOSED
2. CURRENT
3. OPEN
4. CIRCUIT
5. SWITCH

Lesson 2

What's More

Activity 1 Guide Questions

1. The bulb lights up because all parts of the circuit are connected.
2. The bulb lights up.
3. The light turned off because all parts are disconnected

Lesson 2

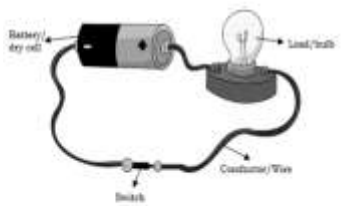
What's More

Activity 1 Guide Questions

1. The bulb lights up because all parts of the circuit are connected.
2. The bulb lights up.
3. The light turned off because all parts are disconnected

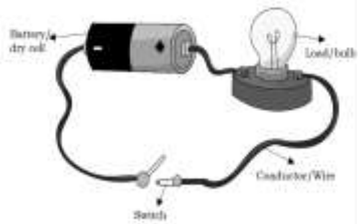
Activity 2

Closed Circuit



Activity 2

Open Circuit



Lesson 3

What's In

(Possible answer)
No, because too many appliances plug-in in one extension wire will result in circuit overloading that may lead to fire.

What's New

(Possible answer)
The person in the picture experiences electric shock or electrocution.

Assessment

A.

1. b
2. b
3. b
4. c
5. c

B.

1. B
2. A
3. C
4. E
5. F

Additional Activities

Electrical appliances and gadgets are very common in our homes today. Use electrical devices only when they are needed. Plug them into separate wall outlets, not to only one extension wire. Turn them off and unplug from the outlets when not in use. When left unplugged, it may add up to our electric bill and increase the risk of fire at home. Unplugging appliances when not in use can save electricity and help our environment. Repairing and replacing damaged electrical appliances and gadgets is also a good habit.

References

Online Sources

"Electricity and Its uses". 2011. *Deped LR Portal*. Accessed March 26, 2021. https://lrmds.deped.gov.ph/detail/1499

“Electric Circuit”. 2014. *Deped LR Portal*. Accessed March 26, 2021. https://lrmds.deped.gov.ph/detail/6367

“Constructing a Model of an Electric Circuit”.2014. *Deped LR Portal*. Accessed March 26, 2021. https://lrmds.deped.gov.ph/detail/6364

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