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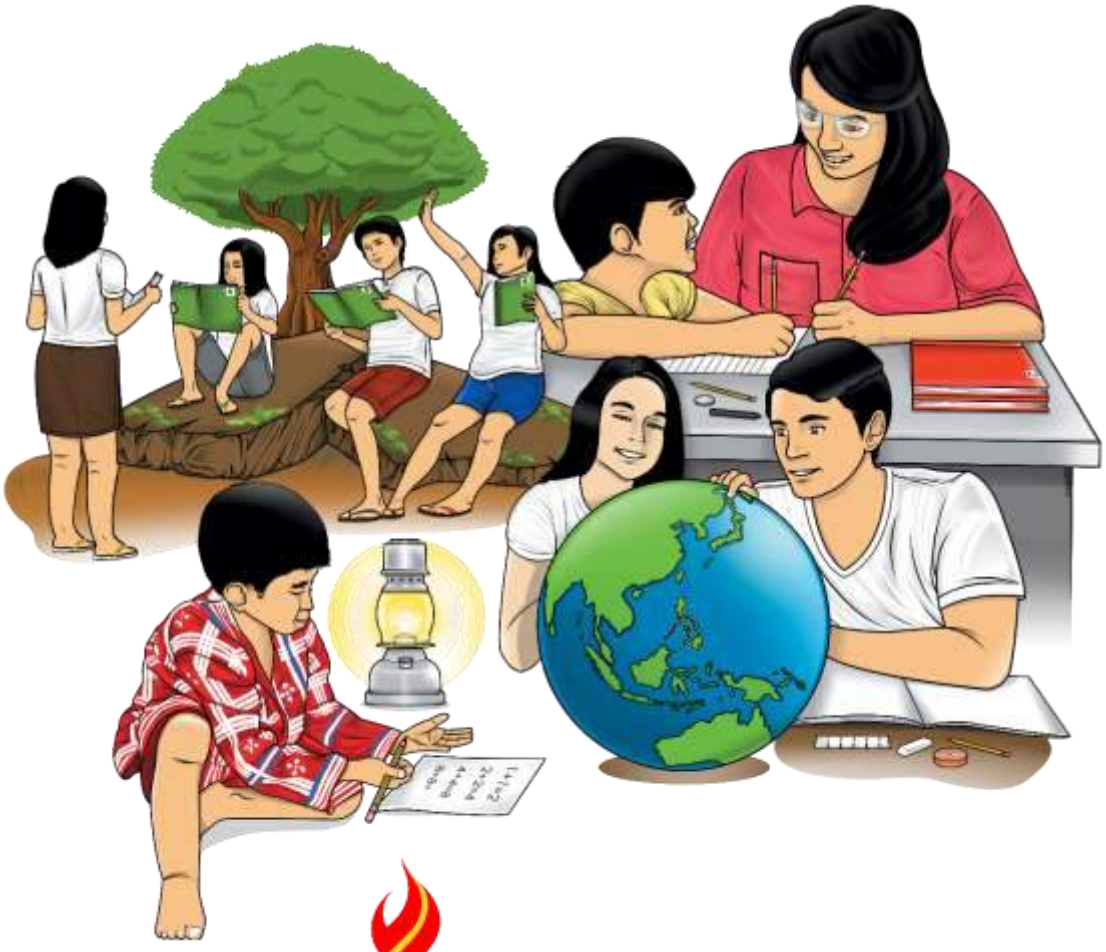
Science

Quarter 3 – Module 1: Measuring Motion in Terms of Distance and Time



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Science

Quarter 3 – Module 1: Measuring Motion in Terms of Distance and Time

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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 to help you to understand how to describe and to measure motion in terms of distance and time. 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 describe the motion of an object by tracing and measuring its change in position (distance traveled) over a period of time.

The module is divided into two lessons, namely:

- Lesson 1 – Motion
- Lesson 2 – Distance and Speed

After going through this module, you are expected to:

1. define motion;
2. understand the concepts of speed and time on distance traveled;
3. measure the speed of an object;
4. identify the measuring device used to measure distance; and
5. appreciate the importance of reference point in understanding motion.

What I Know

Directions: Read and understand the questions below. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following is abasic unit of distance?
   A. inch
   B. feet
   C. meter
   D. yard

2. Which is NOT a unit of speed?
   A. kilometer/hour
   B. meter/second
   C. miles/hour
   D. second/meter

3. Which is NOT used for measuring distance?
   A. measuring wheel
   B. meterstick
   C. tape measure
   D. stopwatch

4. Which is the reference point of a boy leaving fromhome to school?
   A. canteen
   B. classroom
   C. home
   D. school ground

5. Which of the following shows motion?
   A. a boy watching TV
   B. a dog barking at strangers
   C. pillows on bed
   D. a mother going to market

6. A car traveled 30 kilometers for 2 hours, what is its speed?
   A. 15.0km/h
   B. 28.0km/h
   C. 30.0km/h
   C. 60.0km/h

7. Which of the following demonstrates motion?
   A. A boy jogging in place
   B. A dog barking at the garage
   C. A girl running towards his father
   D. A boy running on a treadmill device

8. Why do we need measuringdevice to measurelength or distance?
   A. To have an accurate data
   B. To be familiar with the use of each tools
   C. To have experience using tools like ruler, meter stick, tape measure, etc.
   D. None of the above

9. Why do we need to use the metric system of measurement?
   A. Because it is used by many scientists.
   B. Because it is important to describe motion.
   C. Because it is necessary to describe movement.
   D. Because it is easier to understand each other's data.

10. How can a biker travel a great distance in a specified time?
    A. Pedal faster to increase the speed of the bike
    B. Pedal slowly to decrease the speed of the bike
    C. Increase the distance it will cover in the same time allotment
    D. Pedal faster to increase the distance it will take in a specified time.

Lesson 1 Motion

Everything appears to be in motion. Our daily activities keep us moving. We need to get moving in order to finish our tasks. We move objects by picking, pushing, and pulling them. We all take the same route to school, whether it's short or long. We will always be in motion in our daily lives.

What's In

Directions: Find the five (5) words that can be associated with MOTION. Words may appear straight across, backward straight across, up and down, down and up, and diagonally. Write the words that you have found in your science notebook.

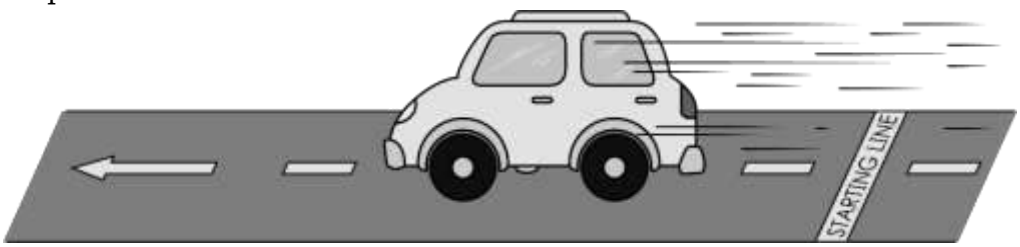
M	D	E	C	N	A	T	S	I	D
P	U	S	H	G	V	C	F	C	P
I	I	J	S	X	E	Q	O	X	N
Z	R	A	Y	V	A	M	R	P	C
W	U	E	M	I	T	F	C	H	C
R	K	Y	X	A	L	P	E	R	Q
B	N	I	L	S	U	U	N	L	P
R	C	T	Q	L	J	V	F	W	O
U	I	D	L	U	F	M	K	Q	A
D	A	S	A	O	V	I	T	C	P

What's New

PUSH AND GO

What you need:

toy car
meter stick or ruler
stopwatch



Illustrated by Elpidio S. Palacio Jr. and Jose Marie E. Baculi
Figure 1. A toy car showing motion

What to do:

1. Find a flat surface on the floor.
2. Mark a starting point on the floor.
3. Put the toy car on the starting line. See to it that the front end of the toy car is aligned to the starting line.
4. Gently push the toy car with your hand. Then, record the time it travels using your stopwatch and the distance using the meterstick or ruler.
5. Bring the toy car back to the starting line, but push the toy car with a greater force than the first trial. Write your data for the second trial in Table 1.
6. Repeat step number 5 for trials 3 - 5 with increasing forces applied. Record your data in Table 1. Write your observations in your science notebook.

Table 1. Distance and time traveled by the toy car.

Trial no.	Distance covered (cm)	Time covered (s)
1		
2		
3		
4		
5		

Guide Questions

Directions: Based on the activity, answer the following questions. Write your answers in your science notebook.

1. What action makes the toy car move?
2. In which trial did the toy car travel the shortest distance? Why?
3. In which trial did the toy car travel the longest distance? Why?

What is It

The illustrations in the previous activity indicate that force is exerted when you push the toy car. When you lift a sack of rice, you exert force by pulling the sack upward. When you push a stalled car, you exert force to move it forward. When you mop a floor using a rag, you exert force by moving the rag back and forth. When you close a door, you exert force by pulling on the doorknob. So, we define force as a push or a pull.

Forces may initiate and influence motion. When you exert force, therefore, motion is produced. Motion is a change of place or position in relation to time due to the applied force. How far it moves, or it is moved is the distance. Distance is measured in meter (m) same as for the length according to the International Bureau of Weights and Measurements (BIMP), but the standard unit for distance on a smaller scale is centimeter (cm) and kilometer (km) for the bigger one.

When there is movement, there is motion. Motion is also defined as a change in position with respect to a reference point. A **reference point** is a place or object used for comparison to determine if something is in motion. An object is in motion if it changes position relative to a reference point

The fastness and slowness of a motion at a certain distance can be calculated using the time it takes for an object to cover the distance. The second (s) is the basic unit of time, but for longer durations, minute (min or m) or hour (h) may be used.

What's More

Activity 1: Motion in Everyday Life

Directions: Give at least five (5) activities at home and school, where there is motion. Copy the table below and write your answer in your science notebook.

Home	School
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Activity 2: Illustrating Motion

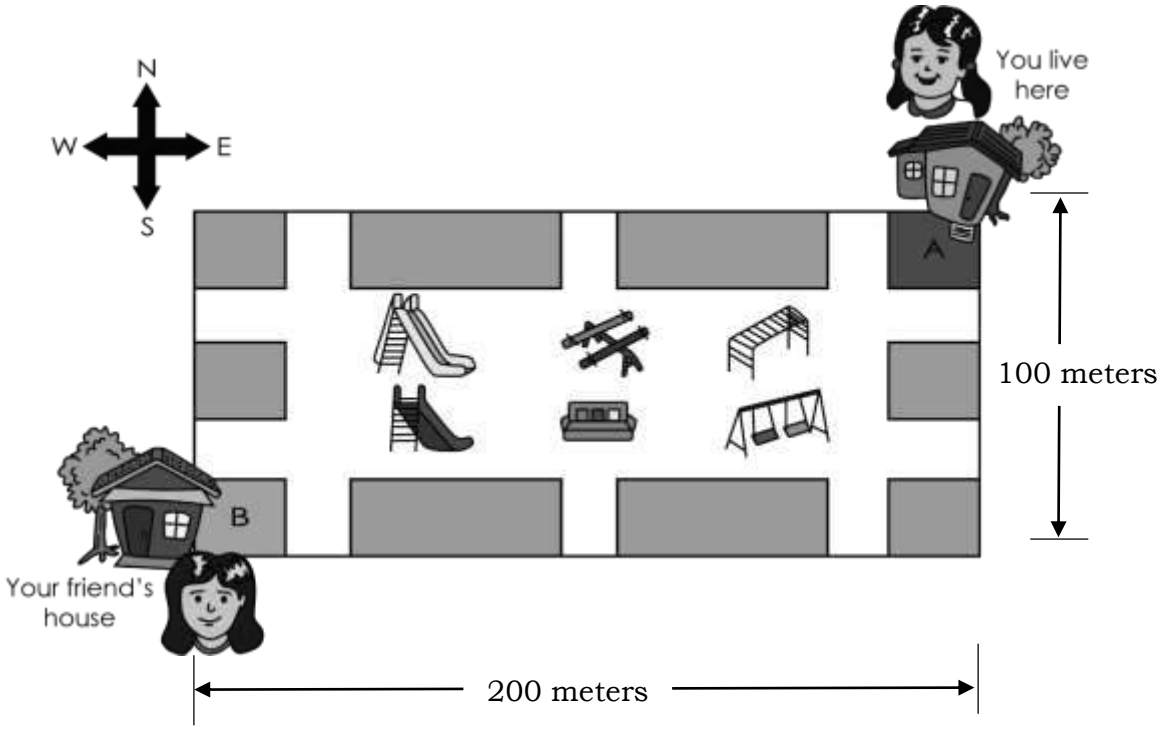
Directions: Draw an illustration that shows motion and reference point. Draw your illustration in your science notebook.

Lesson 2 Distance

In the previous lesson, you have learned about motion. In this lesson, you will learn how to measure the distance traveled by an object. You can tell how fast or slow you move, depending on the distance that you are taking.

What's In

Directions: Study the picture below. Answer the following questions in your science notebook.



Illustrated by Elpidio S. Palacio Jr. and Jose Marie E. Baculi
Figure 1. Map showing the distance traveled

Questions:

1. If you were to go to your friend's house, draw an arrow to show which route or way you can take.

2. If you're going to your friend's house and walk from west to south, will the other route take the same distance? Why?

3. How far do you think is your house from your friend's house?

4. How will you measure the distance between your house and your friends house?

What's New

Directions: Analyze the picture below. Answer the following questions in your science notebook.

Illustrated by Elpidio S. Palacio Jr. and Jose Marie E. Baculi
Figure 2. A skateboarder on the street

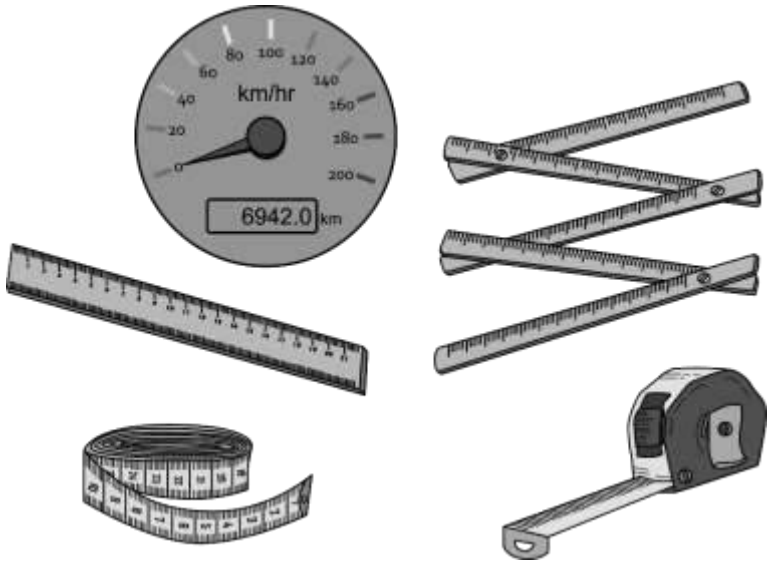
1. What did the boy do in order to move with the skateboard?
2. How can you measure the speed of the skateboarder?

What is It

Distance is a measure of how far or close two points are in relation to one another based on the actual travel of an object. It can be measured in a variety of ways, including time, landmarks, and body parts.

The total path length is commonly used to describe distance. It is the distance between a known reference point and a designated position. Distance is a scalar quantity, which means that it can only be expressed in magnitude. It is measured in units such as meters, kilometers, feet, and so on. The standard unit for distance, however, is the meter.

There are appropriate tools and ways to measure distance so that you can tell whether an object is far or near. Distance should always be exact, measured accurately, and based on a standard unit of measurement in science. Distance should be measured scientifically with a measuring device such as a ruler, meter stick, tape measure, measuring wheel, or ultrasonic distance measurer.



Illustrated by Elpidio S. Palacio Jr. and Jose Marie E. Baculi
Figure 3. Devices used in measuring distance

Measurement: The Metric System

We can better understand each other's data if we use a standard unit of measurement. Using different units of measurement can lead to misunderstanding and confusion.

Meter is the standard unit of measurement for distance or length in the metric system. When referring to a distant place, you simply just add the prefix kilo. If the length is very short, prefixes such as deci-, centi-, and milli- are used.

By conversion, we can get the following values used in the metric system of measurement:

METRIC SYSTEM CONVERSION

1 kilometer (km) = 1000 meters (m)

1 meter = 100 centimeters (cm)

1 meter = 1000 millimeter (mm)

Example:

Linda is traveling from town A to town B with a distance of 10 kilometers. How many meters was she able to travel?

Answer: 10000 meters

Speed: Distance over Time

Speed is the distance traveled over a certain period of time. A moving object's distance traveled is affected by its speed, or the rate at which it moves. The faster an object moves, the less time it takes to travel at a given distance. On the other hand, the slower the object moves, the longer it takes to travel the same distance.

Thus, the faster an object moves in a given time, the greater the distance it travels, and the slower it moves, the less distance it travels.

Speed is calculated by dividing the distance traveled by a moving object by the time it takes to travel the distance.

This can be expressed as:

$$\text{Speed} = \frac{\text{distance traveled}}{\text{time}} \quad \text{or} \quad S = \frac{d}{t}$$

The measurement of speed can be in meters per second (m/s) or kilometers/hour (km/h or kph), or miles per hour (mi/h).

For example, David was able to run 300 meters in just 60 seconds or 1 minute. What is his speed?

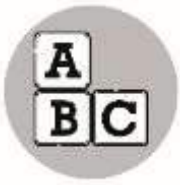
Solution: $speed = \frac{d}{t}$

$$= \frac{300m}{60\ s}$$

$$= 5\ {}^{m}/_{s}$$

The formula speed can be rearranged, just like any other equation. It can be rearranged in three ways:

1.) speed = distance ÷ time
2.) distance = speed × time
3.) time = distance ÷ speed



What's More

Activity 1: The Amazing Marble

What you need:

3 books of equal thickness

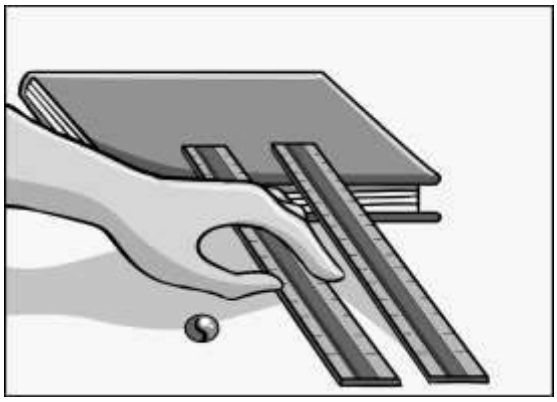
1 marble

2 rulers of the same size

1 tape measure

What to do:

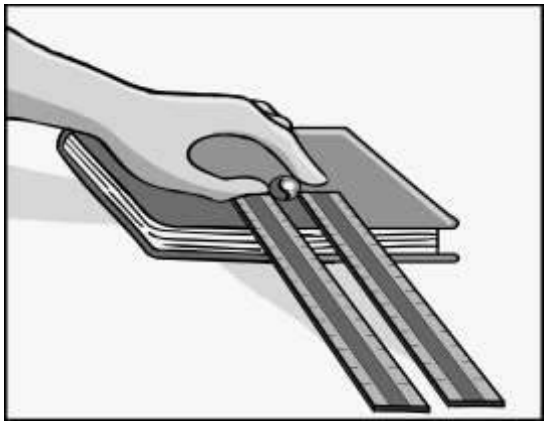
1. Gather all the materials needed.
2. Place the two rulers on a book at a distance that would allow a marble to pass between them. The rulers would act as a ramp for the marbles to pass through. See figure 4.



Illustrated by Reyson Joe G. Caňedo

Figure 4. Two rulers on a book

3. Allow the marble to pass between the rulers. Then, record the time it travels using your stopwatch and the distance using the meterstick or ruler.



Illustrated by Reyson Joe G. Caňedo

Figure 5. Marble between the rulers

4. Put another book on top of the book, repeat steps 2 and 3.
5. Put another book on top of the two books, repeat steps 2 and 3.
6. Record your data in Table 1.

Table 1. The distance travelled by the marble (cm)

Number of Books	**Distance travelled by the marble (cm)**	**Time Covered (s)**
1 book (setup A)		
2 books (setup B)		
3 books (setup C)		

Guide Questions:

Directions: Based on the activity, answer the following questions. Write your answers in your science notebook.

1. What setup resulted in the marble travelling the shortest distance? Why do you think the marble travelled the shortest distance using this setup?
2. What setup resulted in the marble travelling the longest distance? Why do you think the marble travelled the longest distance using this setup?
3. How can measuring distance help us compare things in motion?
4. What effect does height have on the distance a marble travels after being launched from a ramp?
5. What is the speed of the marble in the three setups?

Activity 2: Moving Buses

Illustrated by Elpidio S. Palacio Jr. and Jose Marie E. Baculi

Figure 4. Moving buses

Study Table 2. Determine the speed of each moving vehicle using the formula:

Speed = distance/time

The time and distance of each vehicle are given as follows:

Table 2. Speed of the buses with the same distance travelled

Bus	Distance travelled	Time	Speed
A	50 meters (m)	5 seconds (s)	
B	50 m	10 s	
C	50 m	20 s	

Guide Questions:

Directions: Refer to Table 2. Answer the following questions. Write your answer on a separate sheet of paper.

1. Were the buses in motion?
2. Which bus moved the fastest? The slowest?
3. How did you determine the fastest moving bus? The slowest moving bus?
4. What formula did you use in calculating the speed?
5. Arrange the result from the slowest to fastest.

What I Have Learned

A. Directions: Complete the following sentences using the words inside the box. Write your answer on a separate sheet of paper.

motion	reference point	force
push or pull	greater	lesser

1. The change in an object's position is initiated and influenced by _____.
2. _____ is a change of location or position of an object.
3. All movement is compared with a background that is assumed stationary. This background is called _____.
4. Force can also be defined as _____.
5. The _____ the mass, the greater the force needed to move the object.

B. Directions: Complete the following sentences using the words inside the box. Write your answers on a separate sheet of paper.

speed	meter	distance
time	measuring	device
science		

1. _____ is the measure of how far or near two points are from one another based on the actual travel of an object.
2. The standard unit of measurement used for distance or length is _____.
3. The distance travelled by a moving object over a period of time is called _____.
4. In _____, distance should always be exact, measured accurately, and based on the unit of measurement.
5. Distances can be measured using different _____.

C. Directions**:** Write **T** if the statement is true and if it is false, write **F**. Write your answers on a separate sheet of paper.

1. The standard unit of measurement of distance or length in the metric system is miles.
2. Meter sticks, tape measures, and rulers are standard measuring devices used to measure distance.
3. In science, distance should always be exact, measured accurately, and based on the unit of measurement.
4. Speed can be calculated by multiplying the distance travelled by an object in motion by the amount of time it used to travel the distance.
5. The greater the speed, the lesser the distance travelled at a given time.

What I Can Do

A. Directions: Name at least five of your daily activities and classify if it involves motion or not. Write your answers in your Science notebook.

Table 3. Some of the daily activities involving motion and without motion

Activities Involving Motion	**Activities not Involving Motion**
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

B. Directions: Study and fill in the table below by calculating the speed. Write your answers in your Science notebook.

Table 4. Speed spent by different vehicles

Vehicle	**Distance**	**Time**	**Speed**
Car	90km	3 hours	
Truck	295 km	5 hours	
Bicycle	350 km	5 hours	
Tricycle	80 km	2 hours	
Train	200 km	10 hours	

Assessment

Directions: Answer the following questions. Choose the letter of the best answer. Write your answers on a separate sheet of paper.

1. Which of the following does not demonstrate motion?
   A. Ballerina dancing on the stage
   B. Mother walking on the street
   C. Ball rolling on the floor
   D. Pencil on the table

2. Why do we need to use the metric system of measurement?
   A. Because it is used by many scientists.
   B. Because it is important to describe motion.
   C. Because it is necessary to describe movement.
   D. Because it is easier to understand each other's data.

3. Which of the following is the standard unit of measurement used for distance or length?
   A. foot
   B. meter
   C. minute
   D. second

4. A jeepney travels 120 kilometers in 3 hours. What is the average speed?
   A. 40 km/h
   B. 43 km/h
   C. 60 km/h
   D. 120 km/h

5. It is the change of an object's position over the change of time.
   A. position
   B. motion
   C. speed
   D. location

6. It serves as the basis for which the movement of an object can be related to.
   A. reference point
   B. motion
   C. speed
   D. distance

7. A numerical description of how far the objects from each other.
   A. distance
   B. reference point
   C. speed
   D. motion

8. Which of the following demonstrates motion, with the other object as the frame of reference?
   A. a boy jogging in place
   B. a dog barking at the garage
   C. a girl running towards his father
   D. a boy running on a treadmill device

9. Why do we need to use an appropriate device in measuring lengths?
   A. To have an accurate data
   B. To be familiar with the use of each tool
   C. To have experience using tools like a ruler, meter stick, tape measure, etc.
   D. None of the above

10. Why do we need to use the metric system of measurement?
   A. Because many scientists use it.
   B. Because it is important to describe motion.
   C. Because it is necessary to describe movement.
   D. Because it is easier to understand each other's data.

Additional Activities

A. Directions: List down at least five (5) activities/situations where speed and time are related.

B. Directions: Put a check (✓) mark if the given situation shows motion and cross (***X***) mark if otherwise. Write your answers on a separate sheet of paper.

_____1. A farmer is plowing in the field with the help of the carabao.

_____2. A boy is running near the finish line.

_____3. A boy and a girl dancing together across the room.

_____4. My hands as it writes from the left to the right of a paper.

_____5. A cup on the table.

Answer Key

What I Know

1. c
2. d
3. d
4. c
5. d
6. a
7. c
8. a
9. d
10. a

Lesson 1
What's In

M	D	E	C	N	A	T	S	I	D
P	U	S	H	G	V	C	F	C	P
I	I	J	S	X	E	Q	O	X	N
Z	R	A	Y	V	A	M	R	P	C
W	U	E	M	I	T	F	C	H	C
R	K	Y	X	A	L	P	E	R	Q
B	N	I	L	S	U	U	N	L	P
R	C	T	Q	L	J	V	F	W	O
U	I	D	L	U	F	M	K	Q	A
D	A	S	A	O	V	I	T	C	P

Lesson 1
What's New

Possible answers. The answer on the table may vary depending on the force exerted by the pupils.

Trial no.	Distance covered (cm)	Time covered (s)
1	10	1
2	44	2
3	78	2
4	148	2
5	173	2

Guide Questions *(Possible Answers)*

1. Pushing the toy car makes it move.
2. Trial number 5. The toy car travels the longest distance because it is when I exerted the greatest force.
3. Trial number 1. The toy car travels the shortest distance because it is when I exerted the least force.

What's More

Activity 1. *Possible answer, answers may vary.*

Home	School
1. Walking to the living room	1. Sweeping the floor
2. A falling cauldron	2. Rolling a pencil
3. Chasing the ball	3. Playing patintero
4. Walking upstairs	4. Running to the canteen
5. Pushing a chair	5. Raising the flag

What's New

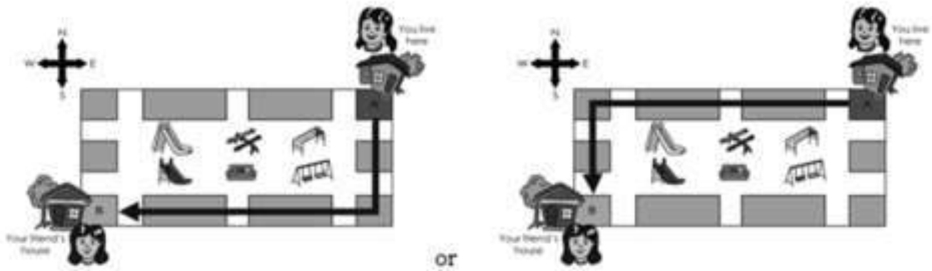
Measuring Motion

1. The boy pushed the skateboard in order to move.
2. By measuring the distance and time travelled of the boy.

Lesson 2

What's In *(Possible answers)*

1.



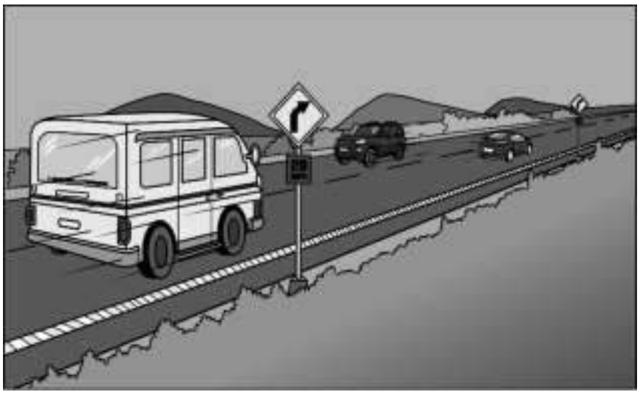
Illustrated by Elpidio S. Palacio Jr. and Jose Marie E. Baculi

2. Yes. Because the distance distance between my house to my friend's house is still 300 meters even if I take the other route.
3. The distance between my house to my friend's house is 300 meters.
4. By using a measuring device like a meterstick or a tape measure.

What's More

Activity 2.

Possible drawing. It may vary depending on the illustration of the pupil.



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What I Have Learned

A. 1.Force
2.Motion
3. Reference point
4.Push or Pull
5. Greater

B. 1. Distance
2. Meter
3. Speed
4. Science
5. Measuring tools

C. 1. False
2.True
3.True
4. False
5.False

What's More

Activity 1: The Amazing Marble

Table 1. The distance traveled by the marble (cm)

Number of Books	Distance travelled by the marble (cm)	Time Covered (s)
1 book (setup A)	40	4
2 books (setup B)	95	4.25
3 books (setup C)	140	4

Note: The answers on the table may vary based on the thickness of the book used in the activity.

Guide Questions:

1. Setup A. Having the least height of the ramp among the other setup, the marble was not able to travel faster.The slower it moves, the less the distance it travels.
2. Setup C. Due to the greatest height of the ramp among the other setup, the marble travelled longer and faster. The faster an object moves, the greater the distance it travels.
3. Measuring distance can tell how an object travel. If the object travel in a certain time then you can calculate the speed of the object, so you can compare things in motion.
4. The height of the ramp affects the speed and the distance travelled by the marble. The higher the ramp, the greater the speed of the marble and the greater distance it travels.
5. Speed of the marble
   (***Note:*** *The answers may vary, it must be based on the data given in table 1.)*
   1. 10 cm/s
   2. 22.35 cm/s
   3. 35 cm/s

Activity 2 Moving Buses

Table 2. Speed of the buses with the same distance travelled

Bus	**Distance travelled**	**Time**	**Speed**
A	50 meters	5 s	10 m/s
B	50 meters	10 s	5 m/s
C	50 meters	20s	2.5 m/s

Guide Questions

1. Yes. The buses are in motion.
2. Bus A move the fastest and Bus C moved the slowest.
3. By looking at the travelled time of the buses.
4. The formula in finding the speed is: speed= distance/time
5. The order from the slowest to fastest is:
   a. Bus C
   b. Bus B
   c. Bus A

Additional Activities

A. (Possible answers)

1. car racing 2.playing games 3.walking 4. swimming 5.running

B. 1.✓ 2.✓ 3. ✓ 4.✓ 5.X

Assessment

1.d 2.d 3.b 4.a 5.c 6.a 7.a 8.c 9.a 10.d

What I Can Do

Note: *Learner's answers may vary.*

A. Table 3. Some of the daily activities involving motion and without motion

Note: *Learner's answers may vary.*

Activities Involving Motion	Activities not Involving Motion
1.Playing ball	1.Looking at the sunset
2.walking in the street	2.standing near the window
3.Riding bicycle	3.sleeping
4.Washing dirty clothes	4.smelling
5.swimming in the beach	5.watching tv

B. Table 4. Speed spent by different vehicles

Vehicle	**Distance**	**Time**	**Speed**
Car	90km	3 hours	30 kph
Truck	295 km	5 hours	59 kph
Bicycle	350 km	5 hours	70 kph
Tricycle	80 km	2 hours	40 kph
Train	200 km	10 hours	20 kph

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5

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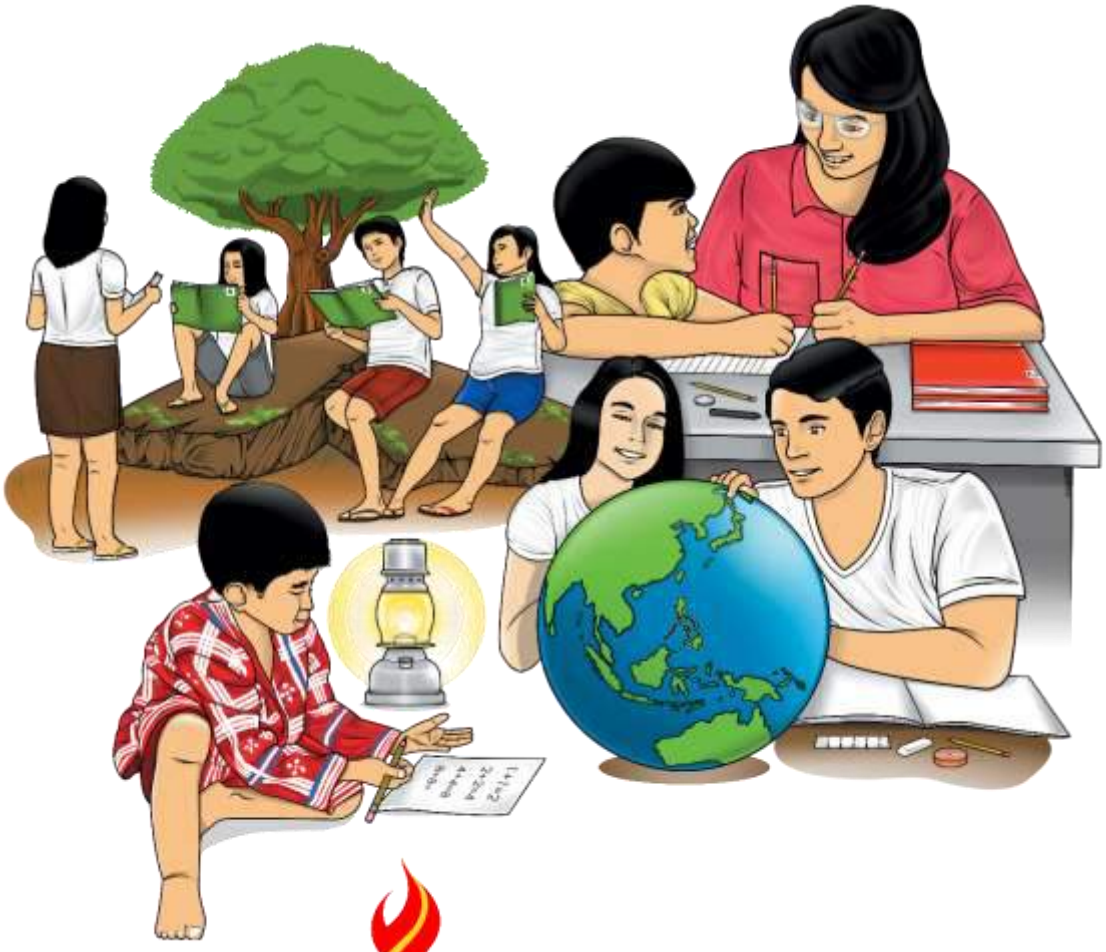
Science

Quarter 3 – Module 2:
Conductors of Heat and Electricity



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ADM

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Alternative Delivery Mode
Quarter 3 – Module 2: Conductors of Heat and Electricity
First Edition, 2020

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5

Science

Quarter 3 – Module 2:
Conductors of Heat and Electricity

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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. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of learners. 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.

Specifically, this lesson is to let you explore how materials conduct heat and electricity. However, for you to better understand the lesson, the module is divided into two lessons, namely:

- Lesson 1 – Conductors and Insulators
- Lesson 2 – Properties of Good Conductors

After going through this module, you are expected to:

1. define conductors and insulators;
2. describe the properties of materials that are good conductors of heat and electricity; and
3. classify materials that are conductors and insulators.

What I Know

Directions: Choose the letter of the correct answer. Write the chosen letter on a separate sheet of paper.

1. What do we call a material that allows electricity to pass through it?
   A. conduction
   B. conductor
   C. insulator
   D. metal

2. Which is an example of conductor?
   A. book
   B. cloth
   C. copper wire
   D. paper plate

3. What do we call a material that does not allow the electricity and heat to pass through it?
   A. conductor
   B. insulator
   C. iron
   D. wire

4. Which is an example of insulator?
   A. book
   B. copper
   C. metal fork
   D. silver

5. What do we call the transfer of heat in solid?
   A. conduction
   B. conductor
   C. insulator
   D. radiation

6. Why are cooking utensils made up of metal but the handles are made of plastic?
   A. Metal is hard while plastic is soft.
   B. Metal is expensive but plastic is cheaper.
   C. Metal is not brittle while plastic is brittle.
   D. Metal is a good conductor of heat while plastic is a poor conductor of heat.

7. Which of the following consists of objects that are good conductors of heat?
   A. steel, paper towel, paper
   B. gold, pencil, tape
   C. iron wire, thumb tacks, steel ruler
   D. aluminum cup, wood, cloth

8. What is the difference between a conductor and an insulator?
   A. An insulator is durable, while a conductor is not.
   B. A conductor is durable, while an insulator is not.
   C. An insulator allows heat to flow through it easily while a conductor does not.
   D. A conductor allows heat to flow through it easily while an insulator does not.

9. Which of the following is a good conductor?
   A. cloth
   B. metal
   C. plastic
   D. wood

10. All of the following statements are correct, EXCEPT one. Which one is it?
   A. Metals are non-ductile while non-metals are ductile.
   B. Metals are opaque while non-metals are transparent.
   C. Metals are lustrous while non-metals are not lustrous.
   D. Metals are good conductors of heat and electricity while non-metals are poor conductors of heat and electricity.

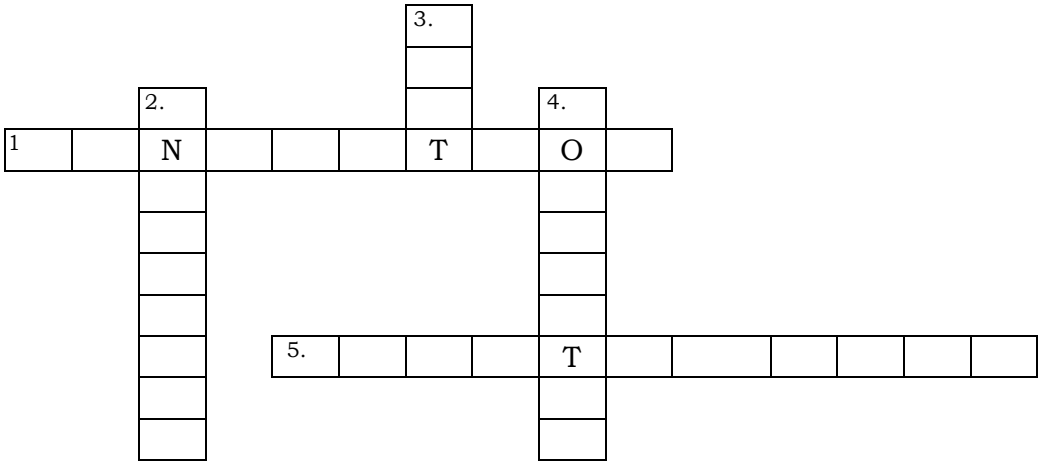
Lesson 1 Conductors and Insulators

Electricity is one of the important things in our lives. Our appliances and gadgets at home requires electricity to function. Have you ever wondered how does electricity reach your homes? Have you ever asked yourself why you don't get electrically shocked when you touch an electric cord?

Have you also wondered why a material becomes hot whenever it gets near to fire or even just putting it to a hot object? How is heat transferred from one object to another?

What's In

Directions: Solve the puzzle by using the clues below.



Across

1. heat transfer through direct contact
5. the flow of electrical power or charge

Down

2. materials that do not transfer electricity and heat
3. a form of energy that keeps us warm
4. materials that allow electricity and heat to transfer

What's New

Heat Transfer

Reminder: Take precautionary measures and ask assistance from an adult in doing this activity.

What you need:

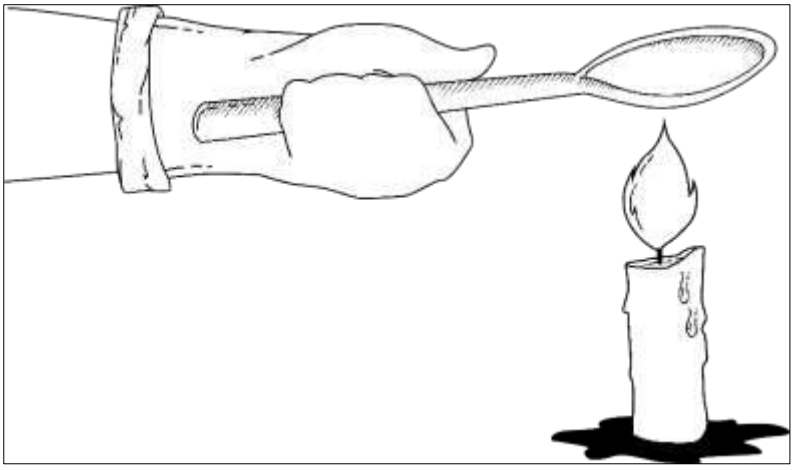
pot holder, metal spoon, match, candle

What to do:

1. Feel the metal spoon with your bare hands. How does it feel?
2. Light the candle with a match.
3. Hold the end of a metal spoon with a pot holder.
4. Heat the other end of the spoon in a candle flame for 5 minutes. Observe.

Guide Questions:

1. What happens to the metal spoon when it was heated over the candle flame for 5 minutes? Why do you think it happened?
2. How will you describe the direction of the heat transfer in the activity?



Illustrated by Elpidio S. Palacio Jr. and Jose Marie E. Baculi

Figure 1. Heating metal spoon using a lighted candle

Notes to the Teacher

- Always remind the learners to be careful when doing the experiments. They can ask assistance from their elders.
- Experiment materials that are not available at home and cannot be provided by the parents shall be provided by the school or by the teacher.

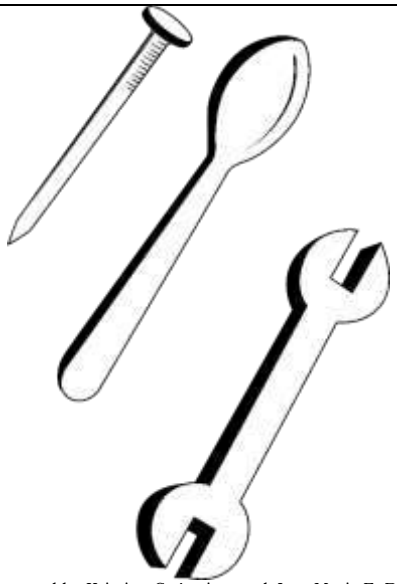
What is It

Heat can be transferred in many ways and one of which is through **conduction.** In conduction, heat is transferred from hotter to colder objects and they must be in direct contact or touching each other. In terms of medium of transfer, materials that are involved in conduction are generally in solid form.

But not all solids can facilitate heat conduction. Due to their composition or materials, certain objects allow heat and electricity to flow in them while others don't. Hence, we have the classification of materials as conductors or insulators. The characteristics of the said classification of materials are shown in the table that follows.

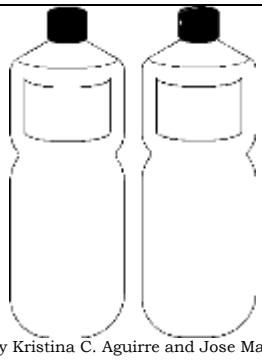
Table 1. Classification of materials as conductors and insulators

Conductors	**Insulators**
• Materials that allow heat and electricity to pass through them. • Most materials that conduct heat are metals because their electrons can flow easily. • Examples:	• Materials that do not transfer electricity. • The electrons of the insulators are not free flowing for they are tightly bonded with its atom. • Examples:  Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi wood



Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

Nail, metal spoon, and other metals



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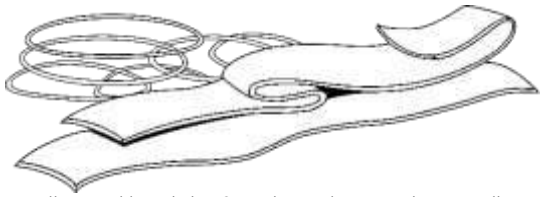
plastic



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Rubber

Conductivity depends on

- **Thickness –** the thicker, the better the conductor
- **Size –** the shorter the size, the better the conductor
- **Temperature –** with increase in temperature, electrons gain energy causing better conductivity

Other ways of heat transfer include convection and radiation. **Convection** is the transfer of heat from one place to another by the movement of fluids. For example, when a pot of water is heated, water begins to rise. As the water rises, cold water goes down. The process is repeated until all the water has the same temperature.

Radiation is the transfer of heat through empty space. Example is standing before a stove, where your body feels the heat from it.

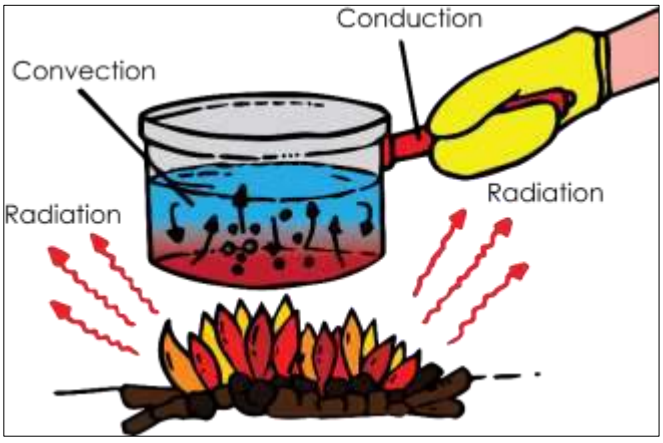

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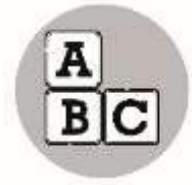
Figure 3. Heat transfer



What's More

Activity 1. Heat flow

Reminder: Take precautionary measures and ask assistance from an adult in doing the activity.

What you need:

hot water and bowl	metal paper clip
coin	toothpick
rubber band	metal fork
paper	pencil

What to do:

1. Put hot water in a bowl.
2. Place all the objects in the bowl.
3. After three minutes, get the objects using a tong. Touch each object and record your observations.

Guide Questions:

1. What happened to the materials that you put on the bowl of hot water?
2. Does all the object become hot?
3. What method of heat transfer happened?
4. Which among the materials are good conductors of heat and electricity?
5. Which among the materials are insulators of heat and electricity?

Activity 2

Directions: Classify the following materials accordingly. Write your answer on a separate sheet of paper.

scissors	paper	cement	cotton	paper clip
eyeglasses	water	pencil	coins	nails

Conductors	Insulators

Lesson 2 Properties of Good Conductors

You have learned in the previous lesson the difference between a conductor and an insulator. Have you ever tried putting at the same time a metal spoon and a plastic spoon on a cup of hot water? What kind of spoon becomes hot quickly? Why is it that there are materials that are good conductors of heat and electricity?

In this lesson, you will learn what materials are good conductors of heat and electricity.

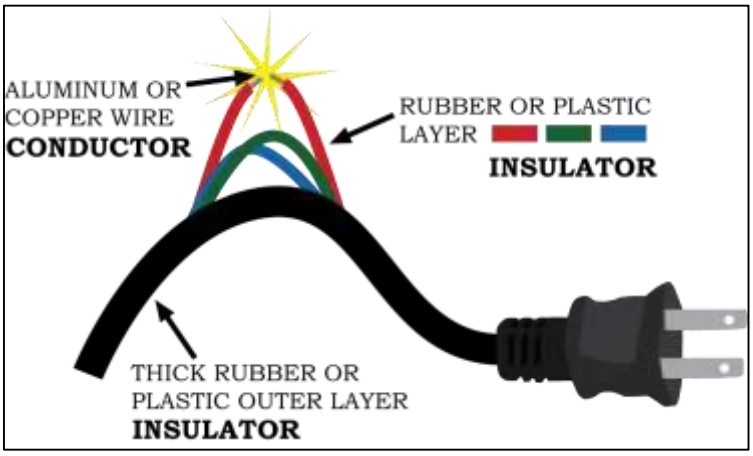
What's In

Directions: Write ***C*** if the material is conductor and ***I*** if the material is insulator.

1. Iron
2. Glass
3. Rock
4. Plastic
5. Silver
6. Metal hair clip
7. Metal spoon
8. Cloth
9. Nails
10. Paper clip

What's New

Directions: Study the picture below and answer the following guide questions.



Illustrated by Jose Marie E. Baculi

Guide Questions:

1. What material is used on the inner part of the wire?
2. What material is used for the outer part of the wire?
3. Why is copper commonly used in our electrical wirings?
4. What do you think will happen if there is no plastic or rubber that covers the wire?

What is It

Metals are good conductors of heat and electricity. It contains free electrons where it moves through the metal easily. Electrons gain kinetic energy when it collides with hot atoms and pass on energy when they collide with cold atoms.

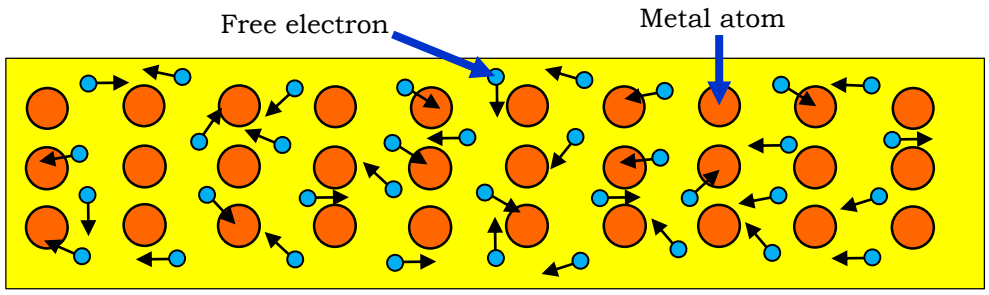
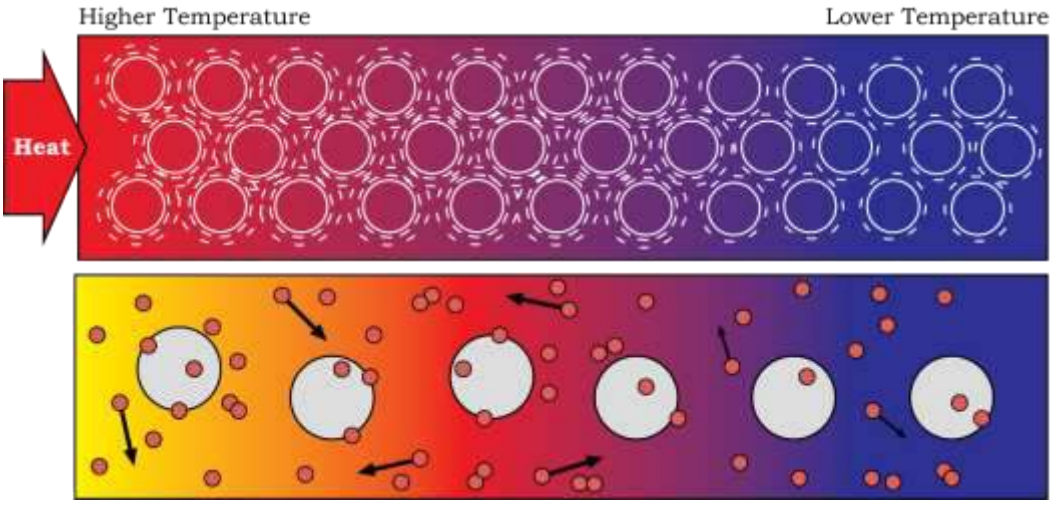


Figure 4. Movement of atoms Illustrated by Jose Marie Baculi

When metals are heated, atoms and free electrons vibrates that causes the transfer of heat and electricity faster.



Illustrated by Jose Marie E. Baculi

Figure 5: Movement of atoms when heated in a metal material

Copper and aluminum are metals so they are good conductors of heat and electricity. Stainless steel is an iron-based metal. Iron, gold, silver, brass, steel, copper, and nickel are also good conductors of heat and electricity.

Non-Metals do not have free electrons that is why they are not as good as metal when it comes to conduction of heat and electricity.

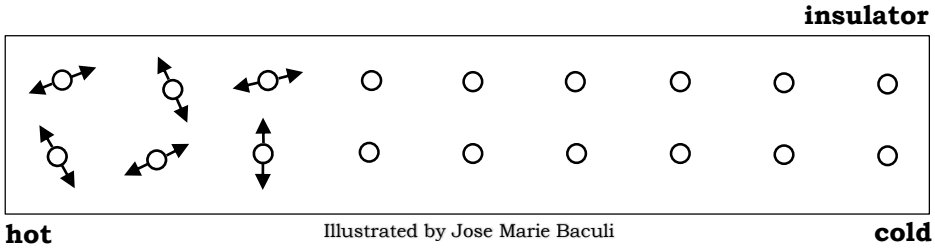


Figure 6: Movement of atoms when heated in a non-metal material

Good conductors are solids that have atoms that are very compact. The more compact the atoms the better conductors it will be.

Good Conductors	Poor Conductors
• gain heat **quickly** • increase in temperature **quickly** • lose heat **quickly** • decrease in temperature **quickly** • conduct heat from a hot to a cold object **quickly** • can be hammered • shinny	• gain heat **slowly** • increase in temperature **slowly** • lose heat **slowly** • decrease in temperature **slowly** • conduct heat from a hot to a cold object **slowly** • brittle

What's More

Activity 1: Test for Conductors

Reminder: Take precautionary measures and ask assistance from an adult in doing the activity.

What you need:

1 glass with salt water (glass A)
1 glass with tap water (glass B)
2 wooden skewers
4 big metal paper clips
2 dry cells
2 small light bulbs
Electrical wire (copper wire)

What to do:

1. Put wire on one end of the dry cell and a light bulb to the other end.
2. Use another wire and put one end of it in the same bulb then attach another end to the paper clip.
3. Put another wire to the end of the dry cell and attach the one end of the wire to another paper clip.
4. Hang the two clips on the wooden skewers and hang it across glass A. Make sure that the end part of the clips touches the water.
5. Do the same with glass B.

Guide Questions:

1. Which glass did the bulb light? Why?
2. Which liquid is the best conductor of electricity? Why?

Activity 2

Directions: Analyze the situation below and answer the given question. Write your answer on another sheet of paper.

Suppose you are going to watch a movie on a television, but the wire is unplugged and your hand is wet, what are you going to do so that the electricity will not pass through your hand/body? What precautionary safety measures will you observe in handling the electrical appliances?

What I Have Learned

Let us take a look at the concepts that you have learned from this module:

1. A conductor is a material that allows heat or electricity to pass through.
2. An insulator is a material that does not allow heat or electricity to pass through.
3. Copper, aluminum, iron, gold, silver, and steel are conductors of heat and electricity.
4. Conduction is the transfer of heat from one place to another through direct contact.
5. Non-metals do not have free electrons that is why they are not good conductors of heat and electricity.
6. Since metals are good conductors of electricity, electric wires are made of metals like copper.
7. Good conductors are solid materials that have atoms that are very dense.
8. Electricity can easily flow through good conductors.

What I Can Do

A. Directions: Identify if the material is an ***insulator*** or ***conductor.*** Write your answer on a separate sheet of paper.





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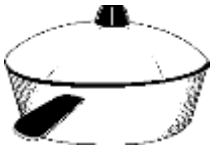
1.sweater 2. frying pan 3.bonnet / cap 4.rubber slippers 5. kettle





Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

6.light bulb 7. towel 8. cooking pot 9. gloves 10. wooden door

B. Directions: Read each statement below. Choose and write the letter of the correct answer on a separate sheet of paper.

1. What do we call a material that allows electricity to pass through it?
   A. conduction C. insulator
   B. conductor D. metal
2. Your mother wants to cook egg faster. Which of the following materials will she use?
   A. Aluminum pot C. Plastic pot
   B. Clay pot D. Rubber pot
3. Why are cooking utensils made up of metal and the handles are made of plastic?
   A. Metal is hard while plastic is soft
   B. Metal is expensive while plastic is cheaper.
   C. Metal is not brittle while plastic is brittle.
   D. Metal is a good conductor of heat while plastic is a poor conductor of heat.

4. Which of the following consists of objects that are good conductors of heat?
   A. steel, paper towel, paper
   B. gold, pencil, tape
   C. iron wire, thumb tacks, steel ruler
   D. aluminum cup, wood, cloth

5. Which is a good conductor?
   A. Fruits
   B. Metals
   C. Plastics
   D. Wood products

Assessment

A. Directions: Write **True** if the statement is correct and **False** if not. Write your answers on a separate sheet of paper.

1. A plastic is a great conductor of electricity.
2. Electricity can easily flow through conductors.
3. Glass and air allow electricity to pass through them.
4. Since metals are good conductors of electricity, electric wires are made of metals.
5. Wood, plastic, glass and rubber are conductors. They allow electricity to flow through them.

B. Directions: Enumerate at least five (5) properties of good conductors. Write your answers on a separate sheet of paper.

Additional Activities

Directions: Define conductors and insulators. Give five examples for each. Write your answers on a separate sheet of paper.

1. Conductors-
   Example:
2. Insulators-
   Example:

Answer Key

What I Know

1. b 2. c 3.b 4. a 5. a 6. d 7. c 8. d 9. b 10. c

Lesson I

What's In

						3.H								
						E								
		2.I				A		4.C						
1.C	O	N	D	U	C	T	I	O	N					
		S						N						
		U						D						
		L						U						
		A						C						
		T		5.E	L	E	C	T	R	I	C	I	T	Y
		O						O						
		R						R						

What's New

(possible answers)

1. The metal spoon became hot.
2. The heat of the spoon came from the lighted candle.

What's More

Activity 1:

Guide Questions: (Possible answers)

1. Some of the materials became hot.
2. Not all. Some of the materials became hot and some did not
3. Conduction
4. Coin, metal paperclip, and metal fork are good conductors of heat.
5. Rubber band, paper, toothpick, and pencil are insulators of heat.

Activity 2:

Conductors	**Insulators**
scissors nails water metal paperclip Coins	eyeglasses cotton paper cement pencil

Lesson 2

What's In

1. C 2. I 3.I 4. I 5. C 6. C 7. C 8. I 9. C 10. C

What's New

1. The copper is used in the inner part of the wire.
2. A rubber is used in the outer layer of the wire.
3. Copper is used because it is a good conductor of electricity.
4. So that we will not be electrocuted while plugging a wire.

What's More

Activity 2 (Possible answer)

It is dangerous to handle the plug of the television with wet hands. Doing this may result in receiving an electric shock. Therefore, hands must be dried first and something insulator like rubber slipper must be worn.

What I Can Do

1. insulator	6. conductor
2. conductor	7. insulator
3. insulator	8. conductor
4. insulator	9. insulator
5. conductor	10. insulator

What I Can Do

1. B 2. A 3. D 4. C 5. D

Assessment

A.	B. (Possible answers)
1. False	1. Conductors gain heat quickly.
2. True	2. It has high density.
3. False	3. It is ductile.
4. False	4. It is malleable.
5. True	5. It has high melting point.

Additional Activities: (Possible answers)

A. 1. Conductors are materials that allow the heat and electricity to pass through, example: steel, copper, metal spoon.

2. Materials that do not transfer electricity. They are made up of atoms with electrons that are tightly bond. If the electrons can't move, then no electricity is produced. Examples: rubber, plastic, wood.

B. 1. ✓ 2. ✓ 3. ✓ 4. X 5. ✓ 6. ✓ 7. X 8. ✓ 9. ✓ 10. ✓

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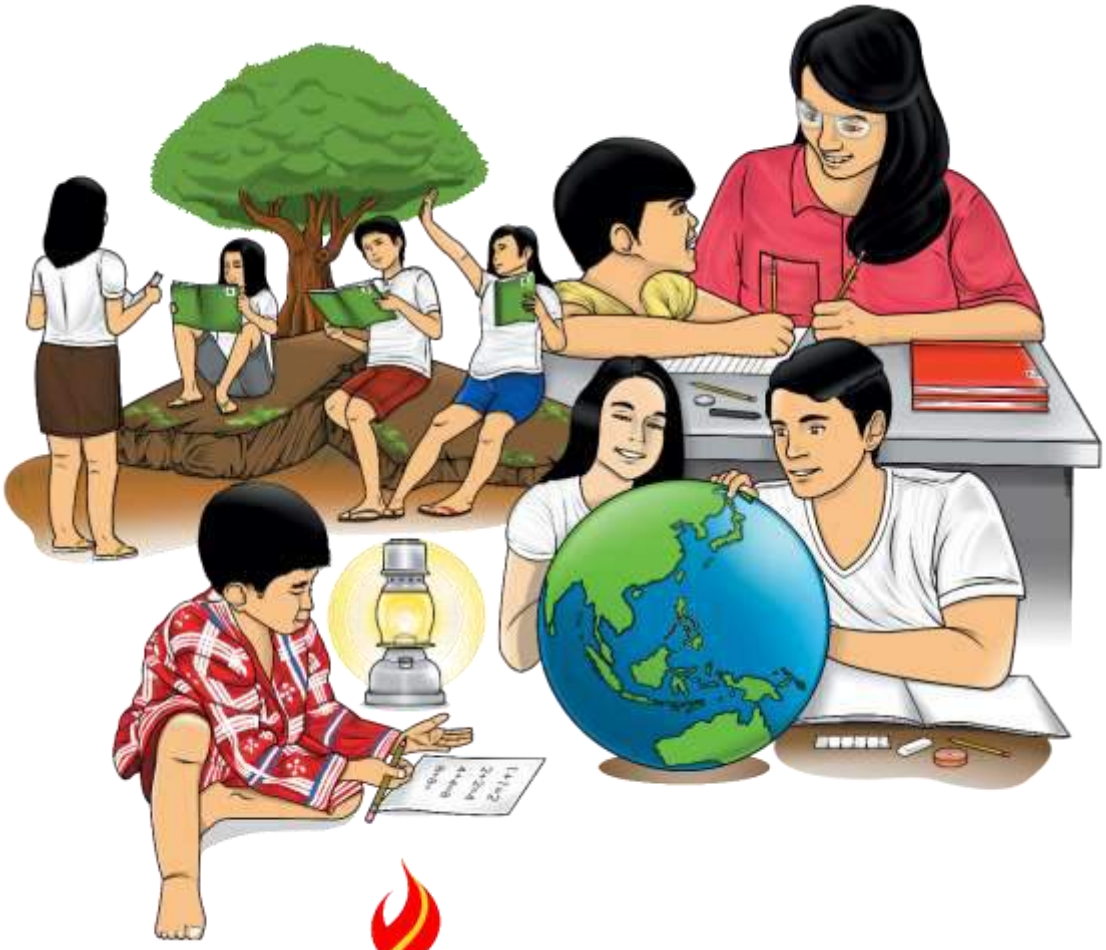
Science

Quarter 3 – Module 3:
Interaction of Light on Different Materials



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Science

Quarter 3 – Module 3:
Interaction of Light on Different Materials

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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 describe how light interacts with different materials. 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.

Specifically, this module will help you describe the ability of the material to block, absorb or transmit light to its use.

The module is divided into two lessons, namely:

- Lesson 1 – How Light Interacts with Different Materials
- Lesson 2 – Transparent, Translucent and Opaque Materials

After going through this module, you are expected to:

1. describe how materials block (reflect), absorb and transmit (refract) light;
2. cite examples of materials that can block, absorb, and transmit light;
3. describe the uses of materials that can block, absorb, and transmit light;
4. differentiate characteristics of transparent, translucent and opaque materials; and
5. identify examples of materials that are transparent, translucent, and opaque.

What I Know

Directions: Choose the letter of the best answer. Write your answer on a separate sheet of paper.

1. Which of the following is true about visible light?
   A. Visible light is not real.
   B. Visible light can never harm you.
   C. Visible light can't be seen.
   D. Visible light is radioactive and causes skin cancer.

2. When is a shadow formed?
   A. when light passed an object
   B. when light is absorbed
   C. when light is blocked
   D. when there is no light

3. When does reflection happen?
   A. When light curves in a circular path
   B. When light bounces off a shiny, smooth surface
   C. When light spreads out as it passes through a gap
   D. When light bends as it moves through different materials

4. What happens when light strikes a transparent surface, such as window glass or plastic wrap?
   A. The light will bend
   B. The light will bounce back
   C. The light will be absorbed and heated
   D. The light can pass through or be transmitted

5. In which of the following materials can light NOT pass through?
   A. wooden door
   B. clear cellophane
   C. glass with water
   D. clear glass jalousie window

6. Which of the following materials will allow light to pass through?
   A. wax paper
   B. cardboard
   C. black art paper
   D. plastic cover

7. What happens to light when it strikes translucent materials?
    A. The light is blocked.
    B. The light is absorbed.
    C. The light passes through.
    D. The light is both transmitted and absorbed.

8. What happens when opaque materials absorb light?
    A. The material heats up.
    B. The material bounces off the light.
    C. The material scatters the light.
    D. The material transmits light.

9. A cardboard does not allow light to pass through. What kind of material is it?
    A. paper material
    B. transparent material
    C. translucent material
    D. opaque material

10. What material are used in the tinted glass of cars?
    A. absorbent
    B. opaque
    C. translucent
    D. transparent

Lesson 1 How Light Interacts with Different Materials

Can you imagine living in a world without light where you can't see anything, and you can only sense most objects by sound, touch, and smell? How do you think you would feel?

What's In

Activity: "Movement of Light"

What you need: pencil, 2 pieces of cardboard, flashlight

What to do:

1. Use a pencil point to punch a hole into the two cardboards carefully.
2. Hold the cards upright on a flat surface so that the holes are lined up.
3. Place a flashlight directly behind the last card. Turn it on and aim the light to the hole of the cardboard.
4. Bend your body so that you are at eye level with the first card. Observe the hole of the first card.

Guide Questions:

Directions: Answer the following questions. Write your answers in your science notebook.

1. Can you see the flashlight's beam when the two holes are lined up?
2. What will happen if you move one of the cards? Will you still be able to see the light?
3. Draw/ illustrate how light travels.

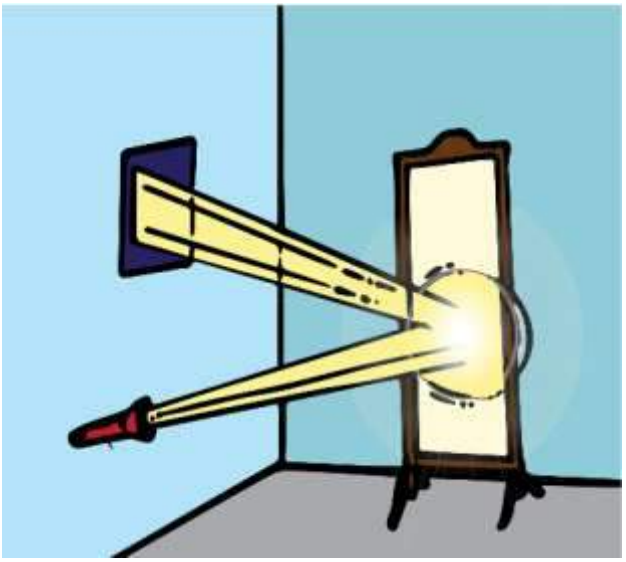
What's New

Activity: "Bouncing Back"

What you need: mirror and flashlight

What to do:

1. Stand in front of the mirror. Turn the flashlight ON and direct it to the mirror.
2. Observe what happens to the flashlight's beam.
3. Pick a spot. Make the light bounce off the mirror and shine on that spot (ex. a wall or any surface) like in the illustration below.



Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

Guide Questions:

Directions: Answer the following questions. Write your answers in your science notebook.

1. How were you able to light up the spot? Do you have to move the mirror, the flashlight, or both?
2. What happened to the beam of light when it hit the mirror?
3. What did you observe when you moved the mirror?

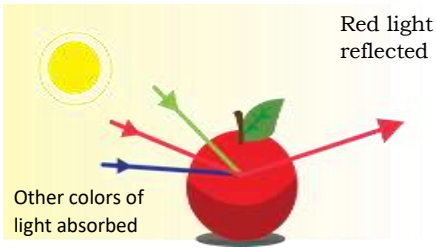
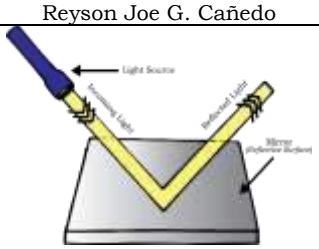
What is It

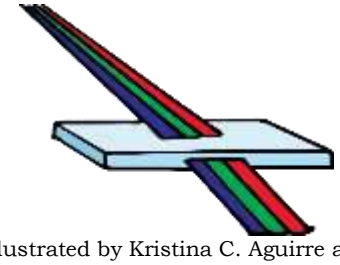
The light that your eyes react to is named ***visible*** or ***white light***. It is a kind of energy that will be seen once reflected off the surface of an object and is responsible for the sense of sight. It travels in straight lines. The primary source of visible light is the sun.

However, the visible or white light is not simply made of one color only; it includes all the wavelengths of light that the human eye can detect. White light consists of colors called the light spectrum or commonly called the rainbow colors. It is referred to as visible light because it permits us to see completely different colors.

But how will it happen? To understand the process, we should study light more and the way it interacts with different objects. This branch of science is ***Optics***. Optics is a branch of physics that deals with the behavior and properties of light, the interaction between light and matter, and instruments that detect light. It includes the study of absorption, transmission, reflection, and refraction of light.

Table 1. Ways on How Light Interacts with Different Materials

Light Interaction	Definition	Sample Illustration
Blocking	An object blocks the light from a source forming a shadow.	 Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi
Absorption	When light is blocked, the material takes in light, changing it into energy that heats the matter.	 Illustrated by Elpidio S. Palacio and Reyson Joe G. Cañedo
Reflection	When an object blocks light, some parts of it bounce back from the object.	 Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

Light Interaction	Definition	Sample Illustration
Transmission	Light passes through some materials.	 Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi
Refraction	Light bends as it passes through different materials.	 Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

Almost everything that can be seen depends on the light in many ways. For example, we see most plants as green because leaves absorb all colors of visible light except green. Regardless of the colors of the objects we see, it is precisely the colors that those objects bounce back.

It even needs light to see everything on the screen of televisions, video games, and computers. Without light, we would not see how beautiful the world is like rainbow colors, sunset, sunrise, or full moon in the night sky!

What's More

Activity 1. "Going Through"

What you need:

- a glass of water (3/4 full)
- crayons
- white bond paper
- pencil

What to do:

1. Take the glass of water and white bond paper to a part of the room with enough sunlight (near a window is good).
2. Hold the glass of water above the paper and let sunlight pass through it, bend, and form a rainbow of colors on the bond paper.

3. Try holding the glass of water at different heights and angles to see if it has a different effect.
4. Draw your observation on the paper and put colors based on what you see.

Guide Questions:

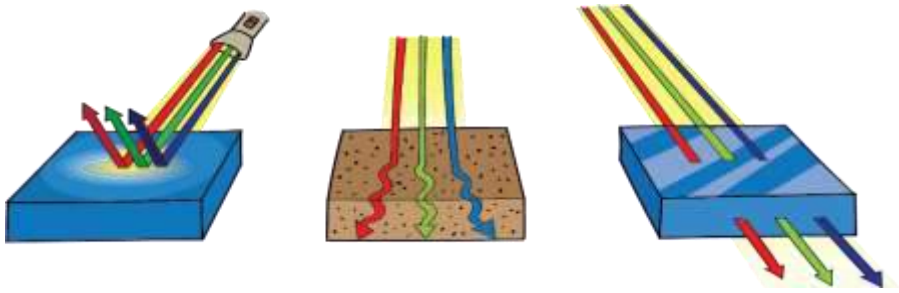
Directions: Based on the result of the activity conducted, answer the questions below. Write your answers on a separate sheet of paper.

1. What did you see on the paper when sunlight passed through the glass of water?
2. What do you think caused the sunlight to refract or bend?
3. What was the effect when the glass was held at different heights and angles?
4. The activity showed refraction of light. In your own words, what is the refraction of light?

Activity 2. "Closely Related"

What to do:

Study the diagrams below.



Reflection **Absorption** **Transmission**

Illustrated by Elpidio S. Palacio and Reyson Joe G. Cañedo

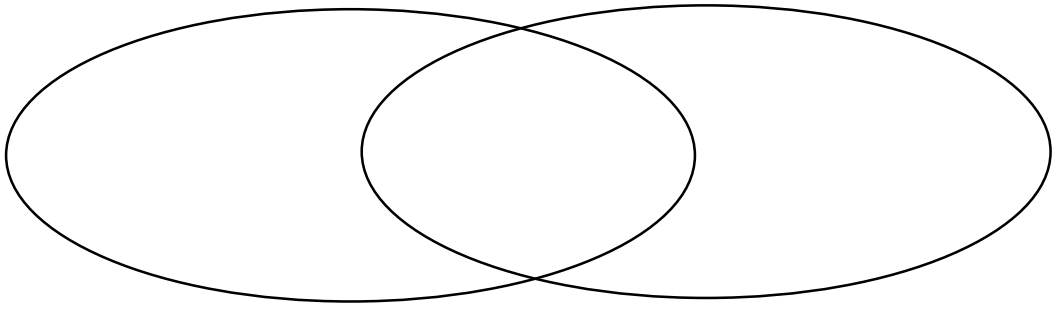
Guide Questions:

Directions: Using the Venn diagrams below, compare and contrast the following interactions. Choose the correct terms from the box for your answer for each item. Copy and complete the diagrams on a separate paper.

1.

bend through	bounce back	light
need materials	pass through	see colors

Reflection *Similarities* **Refraction**

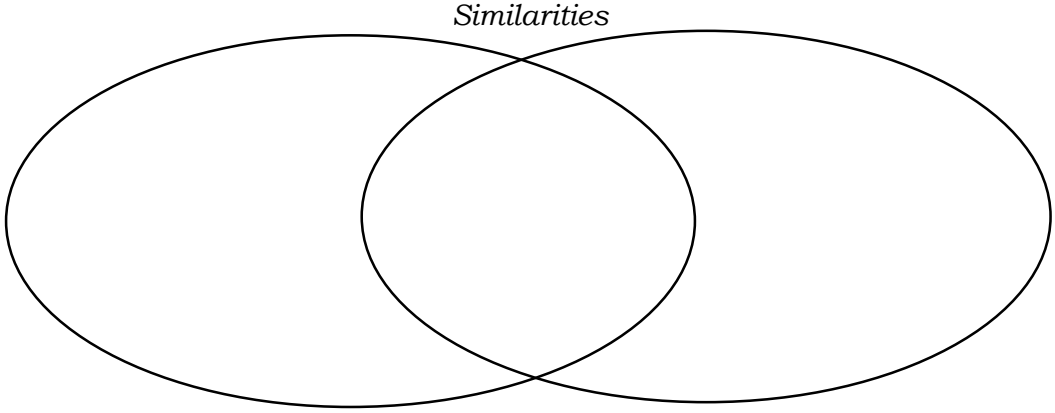


2.

take in	light	need materials	pass through

Absorption **Transmission**

Similarities



Lesson 2 Transparent, Translucent, and Opaque Materials

You have learned in the previous lesson how light interacts with different materials. In this lesson, you will learn that light behaves differently as it strikes other materials.

What's In

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

1. Rainbow is made up of _____ colors. (*five, seven, eight*)
2. A cabinet made of _____ reflect light. *(rock, wood, glass)*
3. A mirror will show your _____. *(reflection, shadow, energy)*
4. A shadow is formed when light is _____. *(reflected, transmitted, blocked)*
5. To protect travelers' eyes from too much light from the sun, they wear _____. (*sunglasses, goggles, mask*)

What's New

Directions: Copy the table below, then give the possible use/s of the given materials. Write your answers in your science notebook.

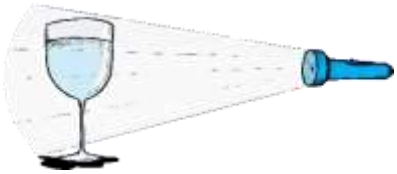
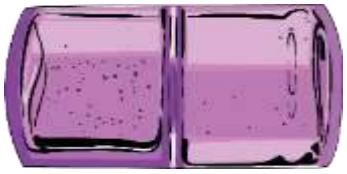
Table 2. Possible uses of the materials

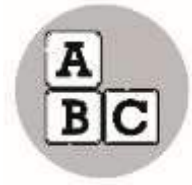
Materials	Use/s
Sunglasses	
Frosted glass	
Glass bottles	
Umbrella	
Curtains	
Concrete wall	

What is It

When the light hits different materials, the light behaves differently. It depends on whether the material is transparent, translucent, or opaque. It serves as the foundation for how materials are used in our daily lives.

Table 3. Types, descriptions, and uses of materials based on how they interact with light

Kinds of Materials	Description	Illustration	Uses
Transparent	- The material transmits light easily because of its smooth and clear surface. - It allows all light to pass through them. - Transmission and refraction happen in these materials.	 Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi	Able to see things behind the materials clearly.
Translucent	- The material only allows some light to pass through them. - It scatters the light from its source. - Some of the light is transmitted, while others are absorbed and reflected by the material. - Translucent materials can transmit, absorb, and reflect light.	 Illustrated by Elpidio S. Palacio and Reyson Joe G. Cañedo	Still able to look at things at the back of the materials, but they are not clearly visible.
Opaque	- These materials do not allow light to pass through them because they block light and cast shadows. - A shadow is a dark space where light is blocked. - Some amount of the light is reflected while these kinds of material absorb some.	 Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi	Cannot see the things behind the material, produce shadows, know the color of things, form images (ex. a figure like an object as seen on the mirror)



What's More

Activity 1. "Light and Shadow"

What you need: source of light and paper doll (object)

What to do:

1. Lit or turn on the source of light.
2. Aim the light towards a wall or surface.
3. Put the paper doll between the light source and the wall/ surface.
4. Adjust the paper doll where it can block the light.
5. Hold the paper doll closer to the light.
6. Then move it farther from the light.
7. Let light hit the side of the paper doll. Take note of your observations.

Guide Questions:

Directions: Based on the activity conducted, answer the following questions below. Write your answers in your science notebook.

1. What is formed on the wall? Describe it.
2. How does the shadow look when the object is closer to the light?
3. How does the shadow look when the object is farther from the light?
4. When light hits the side of the object, how does shadow look like?
5. How does a shadow form?

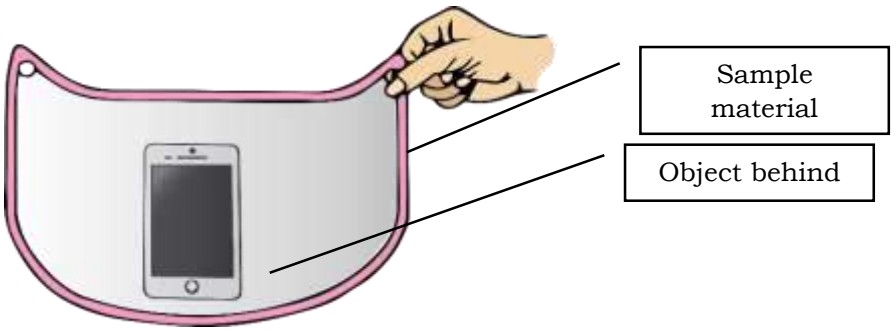
Activity 2. "Opaque, Translucent and Transparent Materials"

What you Need:

Leather (rubber if not available), bond paper, colored cellophane, book, mirror, plastic cup, eyeglasses, cloth, cement/ wooden wall, clear glass

What to Do:

1. Expose the sample materials to a light source, one at a time.
2. Put an object behind each sample material. See sample set up below.



Illustrated by Elpidio S. Palacio and Reyson Joe G. Cañedo

3. Observe the interactions of light with the materials. Did the light pass through the material? Can you see the object at the back of the material?
4. Based on the interaction of light with the material (*ex. bond paper*), identify whether it is opaque, translucent, or transparent.

Guide Questions:

Directions: Read and analyze the table below. Put a check (✓) mark on the appropriate column whether the material is transparent, translucent, or opaque. Copy the table and write your answers in your science notebook.

Table 4. Kinds of materials as to how they interact with light

Material	Transparent	Translucent	Opaque
Leather/ rubber			
Bond paper			
Colored Cellophane			
Book			
Mirror			
Plastic cup			
Eyeglasses			
Cloth			
Cement wall			
Clear glass			

What I Have Learned

A. Directions: Read, understand, and complete the sentences below. Choose your answer for each item from the words inside the box. Write your answers in your science notebook.

Sunlight	Visible light	Refraction
Reflection	Absorption	Transmission

1. _____ is the bending of light as it passes through different materials.
2. _____ is the bouncing back of light when it hits an object.
3. _____is the transfer of light energy to materials rather than being reflected or transmitted.
4. _____ happens when light passes through the materials.
5. _____ allows us to see objects around us and their colors.

B. Directions: Arrange the following jumbled letters to show the correct words of the given definition. Write your answers in your science notebook.

1. It refers to the bending of light as it passes through different materials. **(FRACTIREON)**
2. It is the bouncing of light when it hits an object. **(TIONFLECRE)**
3. It is the taking in of light and not reflecting it. **(SORPABTION)**
4. It is the passing of light through some materials. **(SIONMISTRANS)**
5. It allows us to see color that is not absorbed by the objects. **(GHTLI BLESIVI)**

C. Directions: Identify the term being described using the words inside the box. Write your answers in your science notebook.

Transparent	Translucent	Opaque	Shadow

1. Smooth and clear materials that transmit light easily.
2. Allow all light to pass through them.
3. Materials that can transmit, absorb and block the light.
4. Scatter the light from its source.
5. Permit some light to pass through them.
6. Do not let light pass through them.
7. Formed when some light is blocked.
8. Water is an example of this material.
9. Some light is absorbed, and some are reflected.
10. Things behind this object cannot be seen.

What I Can Do

A. Directions: Read and carefully analyze the situation and answer each question or problem following the rubrics below. Write your answers on a separate sheet of paper.

1. You have a clear glass window in your room. As the sun rises, the sunlight enters your room, disturbing your sleep and making your room warmer. You do not want to make your room dark either. What will you do?
2. Your family wants to set up a flower garden. You have various orchids that need to be continuously exposed to a little amount of sunlight to grow and produce flowers. What will you suggest to your parents?
3. You heard over the radio that the solar eclipse would be happening at 10:00 AM. People were advised not to look directly at the sun. What are the safest ways to view a solar eclipse?

RUBRICS

Criteria	1	2	3	4
Quality of Writing	Very poorly organized and no idea at all	Give 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 punctuation errors, minor grammatical errors	No spelling, punctuation, or grammatical errors

B. Directions: Classify the materials found in the box below under the appropriate column. Copy the table on a separate sheet of paper. Complete or fill it in with your chosen answers that correspond with the proper heading.

glass window	wax paper	concrete wall
wooden door	plastic cup	glass window
fishbowl	frosted glass	metal spoon
mirror	tissue paper	eyeglasses
plastic container	umbrella	clear water bottle

Transparent	**Translucent**	**Opaque**

Assessment

Directions: Match the descriptions in Column A with the concepts in column B. Write the letter of the correct answer on a separate sheet of paper.

Column A	**Column B**
1. The major source of light	A. absorption
2. Formed when some light is blocked	B. fluorescent
3. The light that the human eye can see	C. opaque
4. It is the passing of light through certain materials	D. reflection
5. Materials that do not allow light to pass through	E. refraction
6. Materials that allow all light to pass through them	F. shadow
7. When light hits an object, it bounces back.	G. sun
8. Materials that allow only some light to pass through them	H. translucent
9. The light is bent as it passes through different transmission materials	I. transmission
10. The taking in of light and not reflecting it by some materials	J. transparent
	K. visible light

Additional Activities

Directions: Read and answer the following. Write your answers on a separate sheet of paper.

A. List down at least three objects found in school, at home, or around you that are transparent, translucent, or opaque materials.

B. Illustrate/draw or paste pictures of materials that can do each of the following concepts to light. Do this on separate sheets of paper.
   1. absorption
   2. transmission
   3. reflection; and
   4. refraction

Answer Key

What I Know

1.D 2. C 3.B 4.A 5.A 6.D 7.D 8.A 9.D 10.C

Lesson I. How Light Interacts with Different Materials

What's In

Movement of Light

Guide Questions: (Possible answers)

1. Yes. I can see the flashlight's beam when the two holes are lined up.
2. I will not see the light.
3. 

Illustrated by Elpidio S. Palacio

What's New

Bouncing Back

Guide Questions (possible answers):

1. I may move the mirror or the flashlight or both of them to light the spot.
2. The light bounces back when it hit the mirror.
3. The light still bounces back from the mirror but the lighted spot changes.

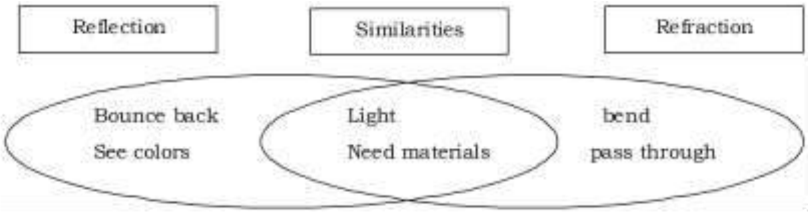
What's More

Activity 1. Going Through

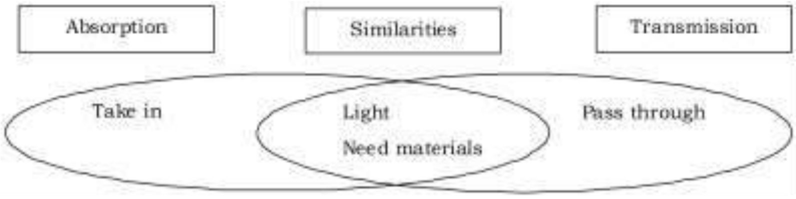
1. Different colors of light are seen on the paper.
2. The different kind of material that light passes through (air, glass and water); and also the height and angle of the glass affects the light.
3. The light passes through but is scattered in different angles too.
4. Refraction is the bending of light when it passes through different materials.

Activity 2. Closely Related

1.



2.



What I Have Learned

A. 1. Refraction
2. Reflection
3. Absorption
4. Transmission
5. Visible Light

B. 1. REFRACTION
2. REFLECTION
3. ABSORPTION
4. TRANSMISSION
5. VISIBLE LIGHT

Activity 2. Opaque, Translucent, and Transparent Materials (Possible Answers)

Material	Transparent	Translucent	Opaque
Leather/ rubber			✓
Bond paper			✓
Colored Cellophane		✓	
Book			✓
Mirror			✓
Plastic cup		✓	
Eyeglasses	✓		
Cloth			✓
Cement wall			✓
Clear glass	✓		

What's More

Activity 1. Light and Shadow

Assessment (Possible Answers)

1. A shadow is formed on the wall. The shadow takes on the shape of the object.
2. The shadow appears larger when it is closer to the light.
3. The shadow looks smaller when it is farther from the light.
4. When light is slanted, the shadow is longer, when the light comes from above, the shadow is shorter.
5. A shadow is formed when an object blocks the light.

What's New (Possible Answers)

Materials	Use/s
Sunglasses	Protect the eyes from too much light from the sun.
Frosted glass	Allow some light to pass through and used as decorative.
Glass bottles	Used to hold liquid; contents can be seen inside.
Umbrella	Used to shield from sunlight and rain.
Curtains	Used to cover windows and doors so as to block light.
Concrete wall	Used to cover the wall of houses, and do not allow light, heat or cold to pass through.

Lesson 2. Transparent, Translucent and Opaque Materials

What's In

1. seven 2.wood 3.reflection 4.blocked 5.sunglasses

Additional Activities (Possible answers)

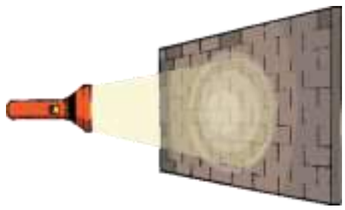
A.

Materials	**Transparent**	**Translucent**	**Opaque**
At home	1. glass 2. eyeglasses 3. water	1.plastic cup 2. colored cellophane 3. plastic cabinets	1. shoes 2. mirror 3. table
At school	1.glass window 2. clear bottle water 3. aquarium	1.frosted glass 2. colored plastic envelope 3. light bulb	1.books 2.chairs 3. wooden cabinets

B. Illustration (Possible Answer)

Absorption

Transmission



Illustrated by Elpidio S. Palacio and Jose Marie E. Baculi

Refraction

Reflection

Illustrated by Elpidio S. Palacio and Jose Marie E. Baculi

Assessment

1. G 2. F 3. K 4. I 5. C 6. J 7. D 8. H 9. E 10. A

What I Can Do

A. (Possible answers)

1. To make the room cooler without making it darker, put curtains in the window that have light colors.
2. Make a shade house for the orchids.
3. The safest way to view the solar eclipse is to use a solar filter glasses.

B.

Transparent	**Translucent**	**Opaque**
Glass window	Wax Paper	Concrete wall
Fishbowl	Plastic cup	Wooden door
Water	Frosted glass	Metal spoon
Eyeglasses	Tissue paper	Mirror
Clear water bottle	Plastic container	Umbrella

What I Have Learned

C.
1. Transparent
2. Transparent
3. Translucent
4. Translucent
5. Translucent
6. Opaque
7. Shadow
8. Transparent
9. Opaque
10. Opaque

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"Visible Light | Science Mission Directorate". 2010. *Science.Nasa.Gov*. Accessed April 16, 2021.https://science.nasa.gov/ems/09_visiblelight.

"Optics - Optics and Information Theory". 2021. *Encyclopedia Britannica*. Accessed April 25, 2021. https://www.britannica.com/science/optics/Optics-and-information-theory.

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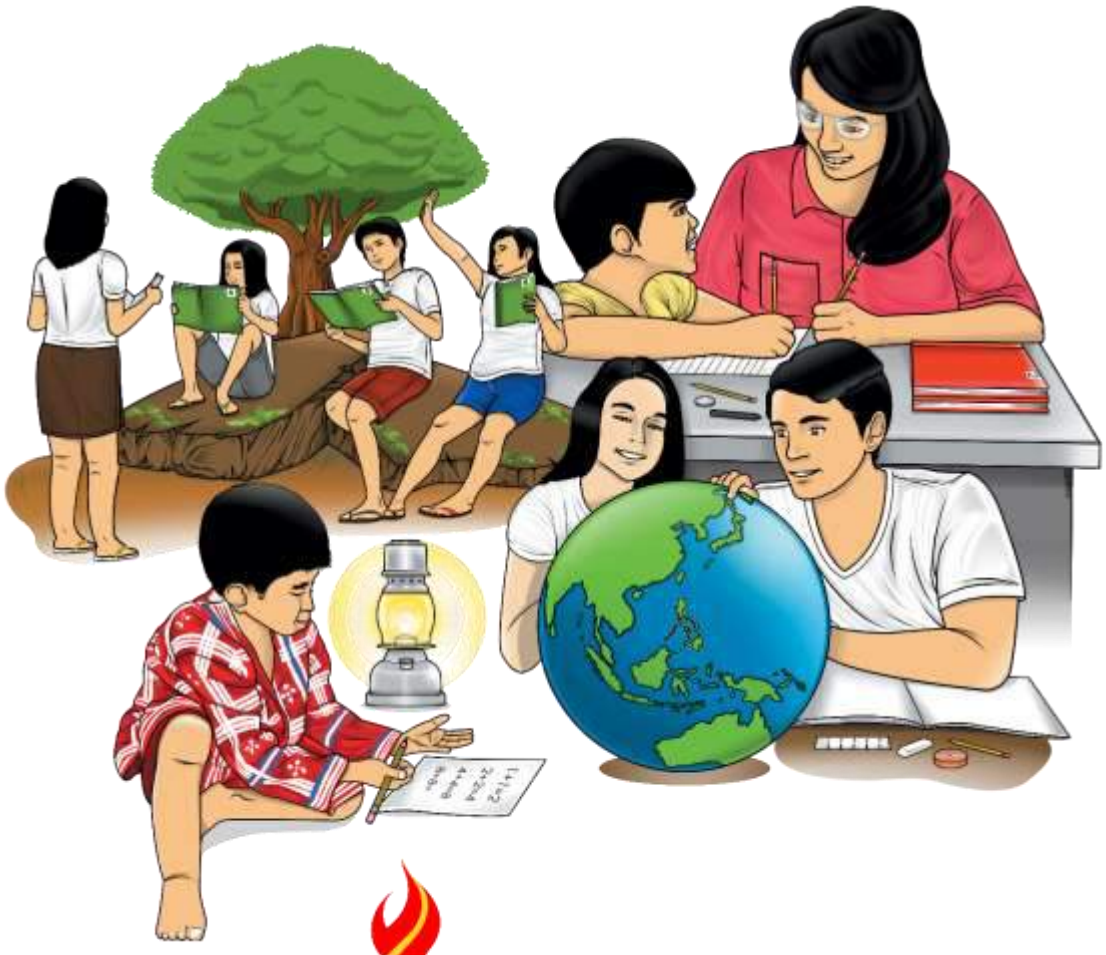
Science

Quarter 3 – Module 4:
Electric Circuit



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5

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

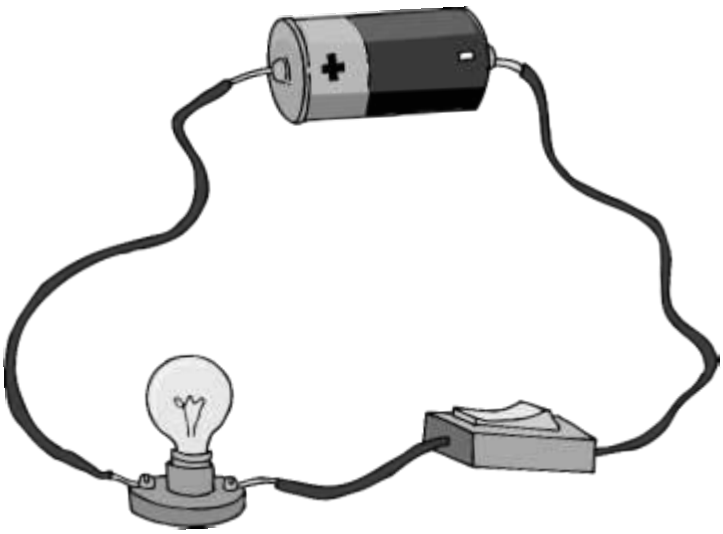
Look around your house and observe what electricity does for you. Electricity is important to everyone. Everybody benefits from it. Almost all homes use electricity. Using electricity lightens our load. It makes work easier, faster and better, especially for busy persons. Doesn't electricity power up 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

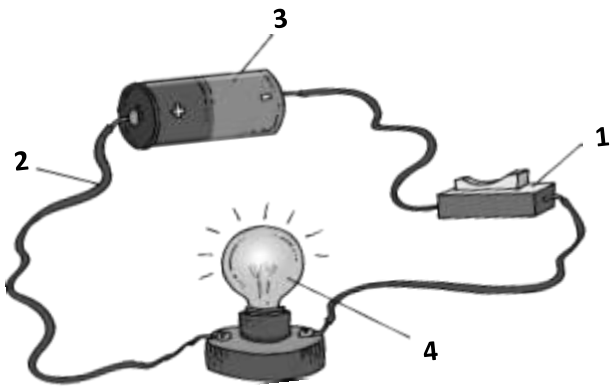
A complete electrical circuit has the following parts:

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.



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

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.

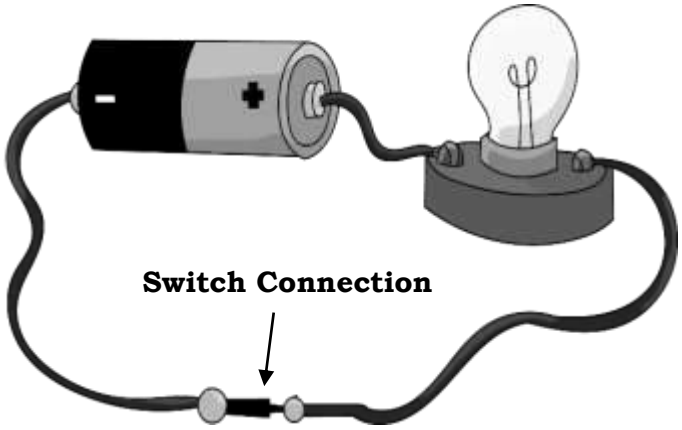


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Figure 2: Closed Circuit

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.

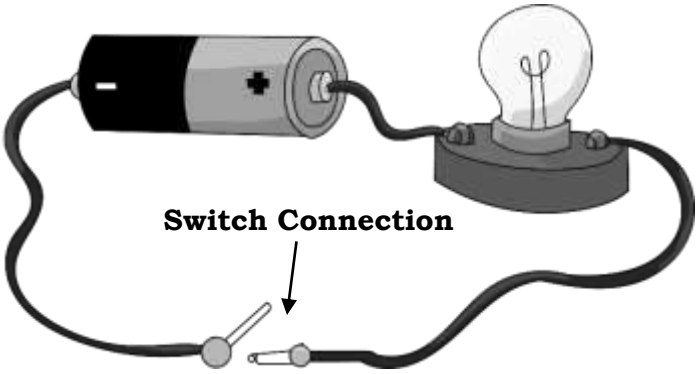

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Figure 3: Open Circuit

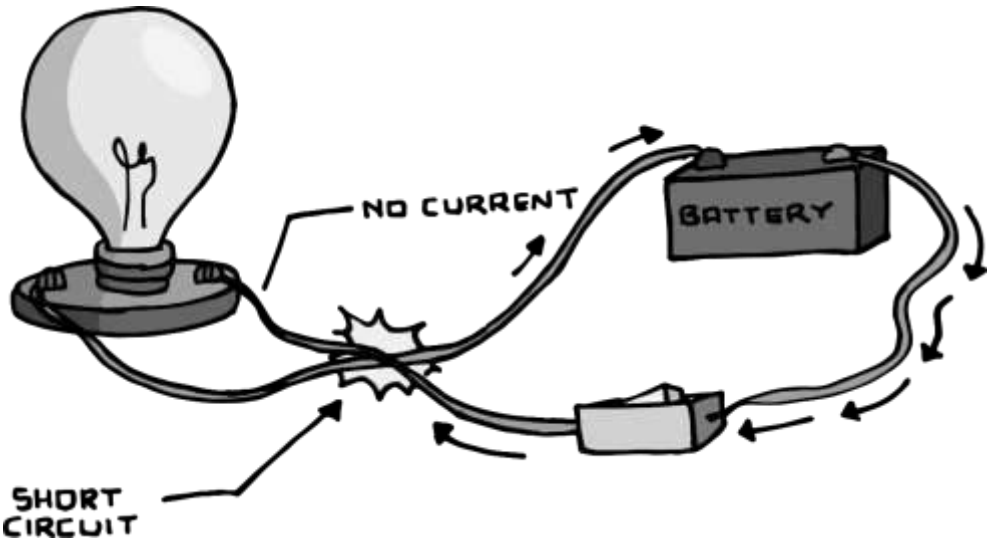
In summary, to turn on the lights, you must close the circuit by turning on the switch to connect the wires and other parts of the circuit. On the other hand, to turn off the lights, you must open the circuit by turning off the switch to disconnect them.

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:

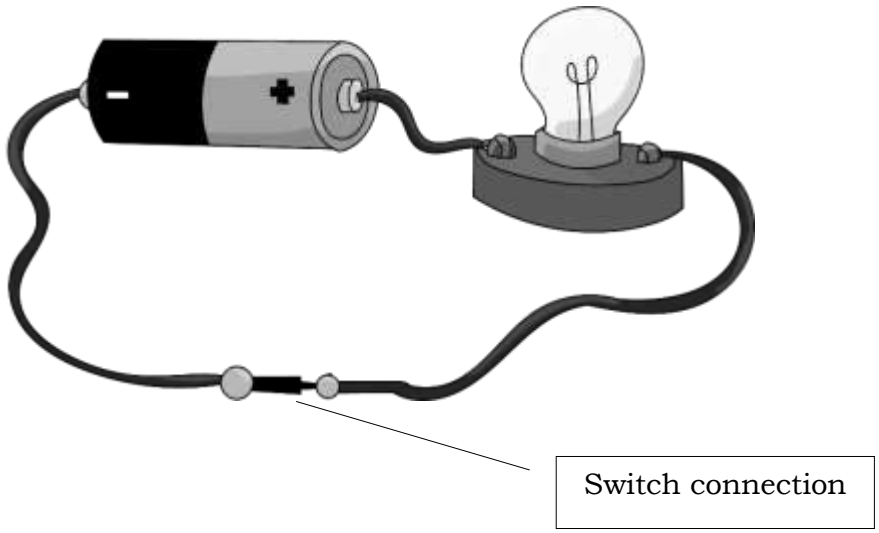
one piece 1.5 V AA battery
small bulb with receptacle/ socket
two (2) pieces 20 cm copper wire

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?

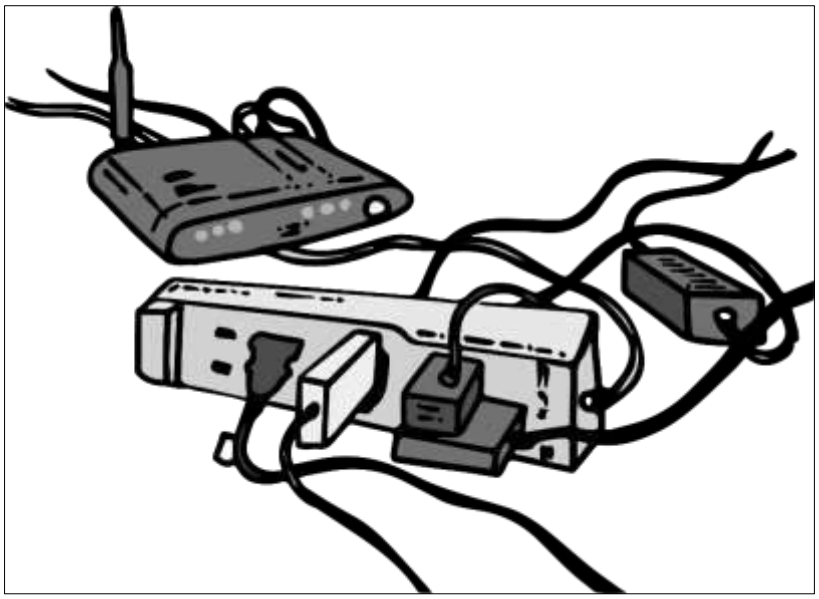
Lesson 3 Electrical Safety Measures

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

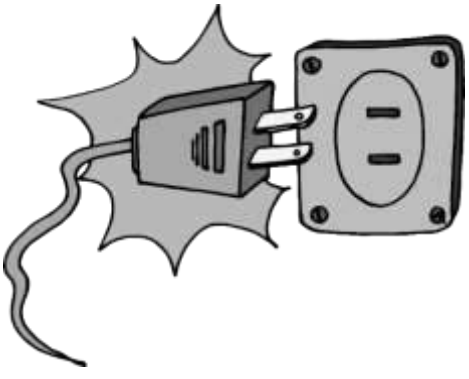
Do you know why some people experience electric shock or get electrocuted?

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.

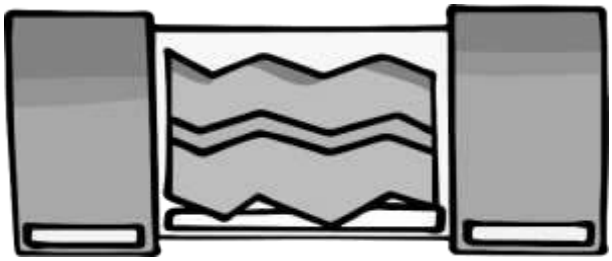


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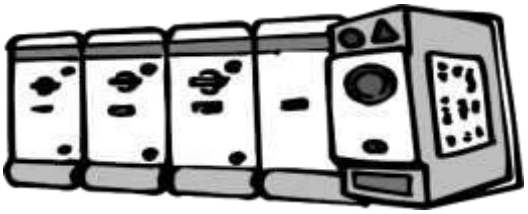
Figure 5. Fuse

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.



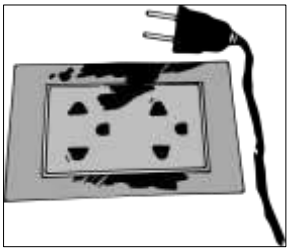
Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo
Figure 6. Circuit Breaker

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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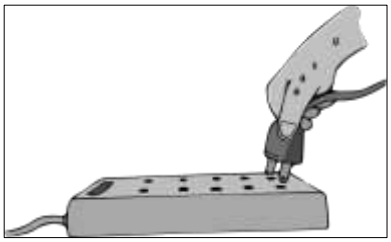
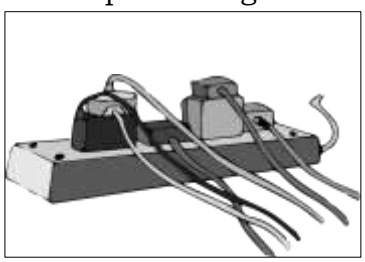
3. Wet hands in plugging



Illustrated by Kristina C. Aguirre and Reyson Joe Cañedo

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

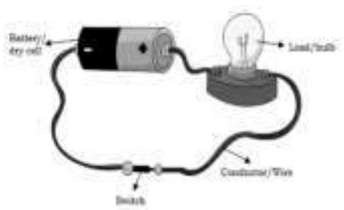
What's More

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

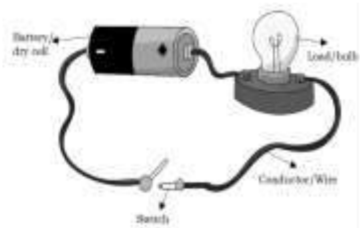
Activity 2

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.

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5

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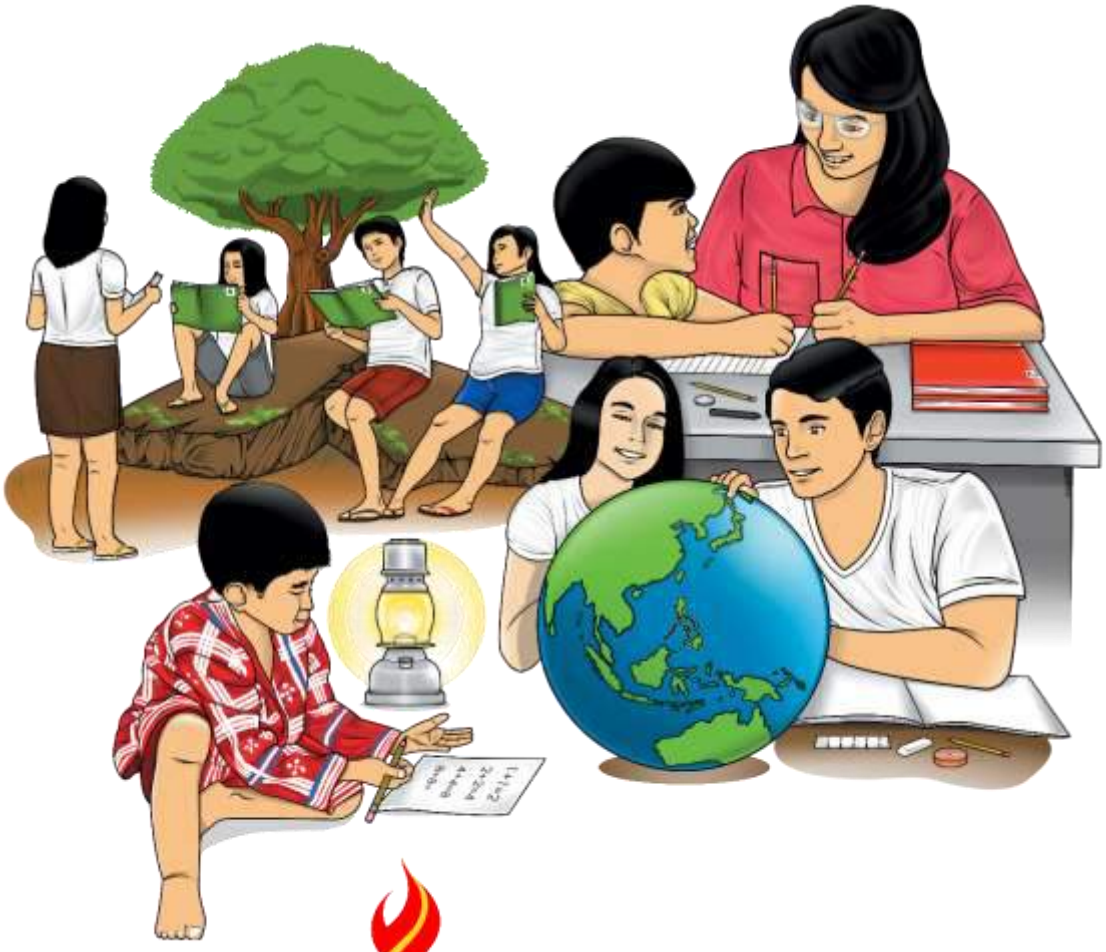
Science

Quarter 3 – Module 5:
Series and Parallel Circuits



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ADM

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5

Science

Quarter 3 – Module 5:
Series and Parallel Circuits

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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 series and parallel circuits. 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 determine the effects of changing the number or type of components in a circuit.

The module is divided into two lessons, namely:

- Lesson 1- Series Circuit
- Lesson 2- Parallel Circuit

After going through this module, you are expected to:

1. describe current electricity and electric circuit;
2. identify the parts/ components of an electric circuit;
3. construct a series and parallel circuit;
4. differentiate series and parallel circuits; and
5. cite the advantages and disadvantages of series and parallel circuits.

What I Know

Directions: Read and understand the sentences well. Write **True** if the sentence is correct. Write **False** if the statement is incorrect. Write your answers in your notebook/answer sheets.

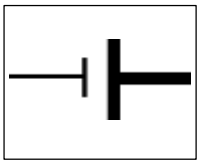
1. An electrical circuit encompasses a closed-loop that gives a return way for the current.
2. A series circuit allows electric current to flow through a single path.
3. In a series circuit with many bulbs, when a bulb is spent, busted, or loosely connected, the other bulbs will still light.
4. Current electricity is electricity that does not move.
5. In a simple electric circuit, the source of electricity is the bulb.
6. There are many wiring connections in a parallel circuit.
7. The electric current in the parallel circuit remains the same to all its paths.
8. One of the advantages of the parallel circuit is that the appliances or the bulbs operate independently.
9. If more bulbs will be added to the parallel circuit, the light of the bulbs will dim.
10. In a parallel circuit using a dry cell, all wires for the positive terminal should be connected to the positive terminal of the dry cell.

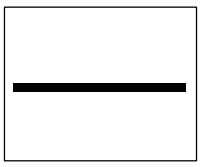
Lesson 1 Series Circuit

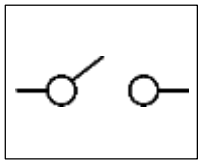
What's In

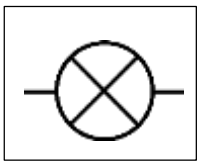
Directions: Study the figures. Identify the names of the electrical symbols below by choosing your answers from the box. Write your answers in your notebook/answer sheet.

lamp/bulb	switch	dry cell	connecting wire

1. 

2. 

3. 

4. 

Notes to the Teacher

- Always remind the learners to be careful when doing the activities that require physical manipulation of materials. They can ask assistance from their elders.
- Activity materials may be provided by you if the learners to cannot provide such, or modify the activity, if needed.

What's New

Energy has many forms. One of these is electricity. Electrical energy is one of the energies that's most valuable to us. It makes life more comfortable and convenient for all of us.

At night, we can see and do things. Thanks to electricity. For our appliances to work and for our homes to be lighted, electricity must travel in a circuit.

A circuit is a path in which electrons can move.

Directions: Find at least ten (10) words that can be associated with the word ELECTRICITY. Write the words that you have found in a separate sheet of paper.

V	A	M	O	X	V	L	Z	W	K	W	U	Y	Z	Y	V	N	H	Y	C
S	A	D	S	A	I	I	X	U	C	L	C	A	H	N	X	L	I	Z	L
U	Z	L	E	X	Y	S	G	M	I	O	W	S	J	R	X	U	D	U	S
F	F	X	Z	C	H	E	G	V	K	X	N	N	X	D	O	S	K	M	J
P	Z	I	V	T	N	G	U	I	R	H	B	D	K	C	N	O	H	T	G
L	E	L	L	A	R	A	P	P	T	F	D	Q	U	R	Y	O	T	Y	W
G	W	C	L	R	U	T	T	A	N	Y	A	Q	S	C	V	C	M	D	Z
C	Q	K	I	E	F	L	A	S	K	S	Q	T	U	F	T	S	A	I	I
M	F	V	E	R	B	O	G	N	I	C	O	B	Q	T	G	O	L	U	G
E	R	V	Y	V	C	V	X	C	M	S	X	W	V	K	L	R	R	W	Y
D	D	H	O	B	N	U	U	P	K	M	E	M	C	F	T	H	S	Z	X
G	C	K	H	B	K	R	I	Q	V	X	U	R	V	N	C	E	R	T	Y
X	I	D	L	F	R	C	N	T	F	X	U	R	Q	Z	R	I	O	R	D
C	M	Z	F	E	B	E	W	O	C	X	Y	A	E	I	U	L	O	V	M
Z	N	Q	N	U	X	B	K	Q	R	U	Y	K	E	C	W	I	M	I	D
P	A	T	B	H	H	T	C	Y	D	T	T	S	B	J	N	P	A	X	F
D	L	N	O	X	U	W	D	B	H	J	C	V	Q	B	S	U	X	C	Z
F	Q	O	Y	Y	J	F	B	I	H	W	B	E	Z	V	P	T	D	W	D
R	L	K	X	W	I	T	F	J	H	M	K	D	L	C	E	X	X	G	U
V	Q	E	L	E	C	T	R	I	C	A	L	E	N	E	R	G	Y	H	C

What is It

The word "electricity" is derived from the Greek word "elektron," which means "amber." Electricity is thought to have been discovered in ancient Greece when someone rubbed a piece of amber and it picked up light materials such as feathers and hair. Of course, this is possible due to the fact that friction can generate electricity.

Static and current electricity are the two kinds of electricity. **Static electricity** is produced when electrical charges build up on the surface of a material, usually as a result of friction or rubbing of materials together. The electricity produced by the continuous flow of electrons is known as **current electricity.**

Alessandro Volta, an Italian scientist, discovered current electricity. It is made up of moving electrons that flow through electrical wires connected to lights, machines, or appliances to make these devices work. Current electricity is the kind of electricity that we often use in many activities. It flows through a complete circuit.

An electric circuit is a network that has a closed-loop, giving a return path for the current. There are two types of circuits, namely: series circuit and parallel circuit.

As we go on with our discussion on series and parallel circuits, let us first go over some basic terms that we need to familiarize with:

- **Current –** The flow of electrons. Electricity has work to do, and when the electrons are flowing around a circuit, that's current at work.
- **Circuit –** A closed continuous path for electricity to flow. Composed of power source, connecting wires, load, and switch.
- **Resistance –** The restriction or opposition to the flow of electric current. This is what electricity encounters when it flows along with physical material.
- **Voltage –** It is the measure of work required to move a unit charge from one location to another, against the force which tries to keep electric charges balanced. In the context of electrical power sources, voltage is the amount of potential energy available (work to be done) per unit charge, to move charges through a conductor.

Parts of an Electric Circuit

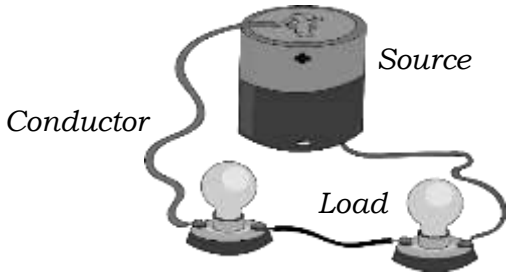
A circuit has parts or components. These are the conductor, the source, and the load.

1. The **conductor** (ex. connecting wires) serves as the pathway for the electrical current to pass from the source to the different parts/components in a circuit.
2. The **source** (ex. dry cell, battery) contains positive and negative electrons. It is the source of electrical energy in the circuit.
3. The **load** (ex. bulb) determines if the electricity that flows in the circuit is closed or complete.

There are three kinds of electric circuits based on the connections: 1) series circuits, 2) parallel circuits, and 3) combination circuits. For our lesson, we will focus on the first two circuits.

A **series circuit** is a circuit that allows electric current to flow through a single path. The available electric current flows through each load but there is only one complete path.

If one bulb is loose or does not work, the circuit is open, and the current does not flow. The rest of the bulbs will not light. The defective bulb has to be replaced, or the loose bulb should be screwed tight for the current to flow again. Remember that current is a rate at which electric charge flows past a point in a circuit.



Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

Figure 1. Series Circuit

For the devices in a series circuit to work, each device must work. If one goes out, they all go out.

Changing the number or type of components in a series circuit has an impact on the circuit's overall performance. When it comes to how current and resistance operate in a series circuit, there is a universal rule to remember: the more work (resistance) a series circuit does, the more its current will decrease.

As you add more resistance to a circuit, like a few bulbs or even resistors, at that point the more work for your power source or battery. Let's say you take the circuit presented above that had two light bulbs. What do you think would happen in the event that you add another light bulb to this circuit? Will the bulbs shine as bright? No. Once you plug in the third bulb, all light bulbs will get equally dim since you have added more resistance to your circuit which decreases the flow of current. Adding another light bulb in arrangement decreases the current since our battery now has more work to do.

Advantages and Disadvantages of Series Circuit

Advantages	Disadvantages
• More power source (ex. batteries/ dry cells) can be added to increase the voltages • Does not require lots of wiring connections	• Only one pathway for an electric current to flow through • When one bulb burns out, the other bulbs will not function anymore. • Increasing the number of loads, decreases the current that passes through each bulb.

What's More

Activity 1. Constructing a Series Circuit

Materials Needed:

- two (2) 1.5 V AA dry cells

Photo taken by Joel Christian R. Salentes

- three (3) pieces 6 V bulbs (used in flashlights)

Photo taken by Joel Christian R. Salentes

- three (3) pieces bulb sockets

Photo taken by Joel Christian R. Salentes

- 1-meter copper wire or connector wires

Photo taken by Joel Christian R. Salentes

- electrical tape

Photo taken by Joel Christian R. Salentes

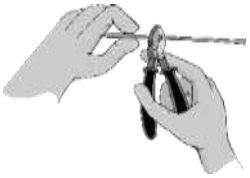
- pliers

Photo taken by Joel Christian R. Salentes

What to Do:

Note: *Be careful in handling your materials, especially the bulbs. Ask help from an elder in conducting the activity.*

1. Gather all the materials needed.

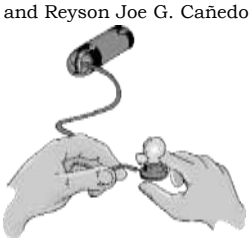


2. Cut the wire into four pieces (6 inches long).

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

3. Carefully remove approximately ½ inch of the insulation from both ends of all your wire pieces.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo



4. Attach one (1) of the wires to the positive terminal of the dry cell. Connect the other side of the wire to the either side of the bulb socket.

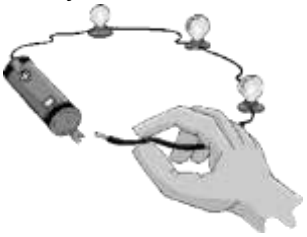
Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

5. Attach another wire to the other side of the bulb socket to connect another bulb socket.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

6. Attach another wire to connect either side of the last bulb socket.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo



7. Attach another wire to connect the other side of the bulb socket to the negative terminal of the dry cell.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

8. Observe and study the light of the three bulbs.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

9. Detach any of the bulbs from a socket. Observe what will happen to the other bulb.

10. Without disconnecting the bulbs, connect another dry cell to the first dry cell. Observe the flow of energy when another dry cell was added.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

Guide Questions 1

Directions: Based on the activity, answer the following questions. Write your answers in your notebook/ answer sheet.

1. Were you able to construct a series circuit? How?
2. Was electricity flowing in the circuit? How did you know?
3. Of the three bulbs connected in the circuit, which bulb was the brightest? Why do you think so?
4. What happened when a bulb was detached from the circuit? Why did it happen?
5. What do you notice with the light of the three bulbs when another dry cell was added?

Activity 2. Series Circuit on Paper

Directions: Draw the actual set-up of the series circuit that you have constructed in Activity 1. Label/name its parts. Do this in your notebook/answer sheet.

Guide Questions 2.

Directions: Answer the following questions correctly based on your drawing. Write your answers in your notebook/ answer sheet.

1. In your drawing of the series circuit, which is the source of electrical energy?
2. Write/list down one of the components/ parts of a circuit that when changed, affects the total performance of the circuit.
3. What component of the series circuit serves as a pathway for electrical energy?

Lesson 2 Parallel Circuit

What's In

Directions: Read and understand the sentences well. Write **True** if the sentence states truthfulness. Write **False** if the statement does not reflect the truth. Write your answers in your notebook/ answer sheets.

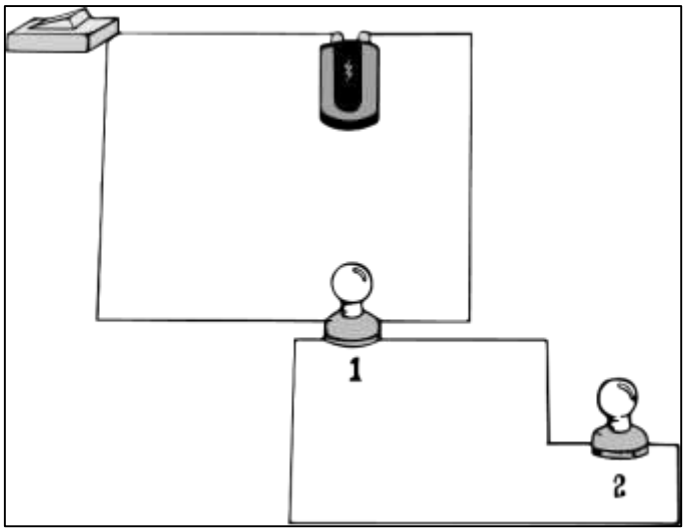
1. A parallel circuit has similarities with a series circuit.
2. A parallel circuit requires many wiring connections.
3. In a parallel circuit, individual devices can be controlled.
4. A parallel circuit allows electric current to flow through two or more pathways.
5. When one bulb burns out in the parallel circuit, the other bulbs will continue to glow.

What's New

Parallel wires carry energy from the power source to our homes. Lamps, flat irons, radios, television sets, and electric fans are all wired in parallel. The circuit is closed or broken by the switch on each appliance. Since the appliances are self-contained, this is advantageous. If one fails, the others will continue to work.

However, unlike in a series circuit, the voltage in a parallel circuit remains the same at all points in a parallel circuit.

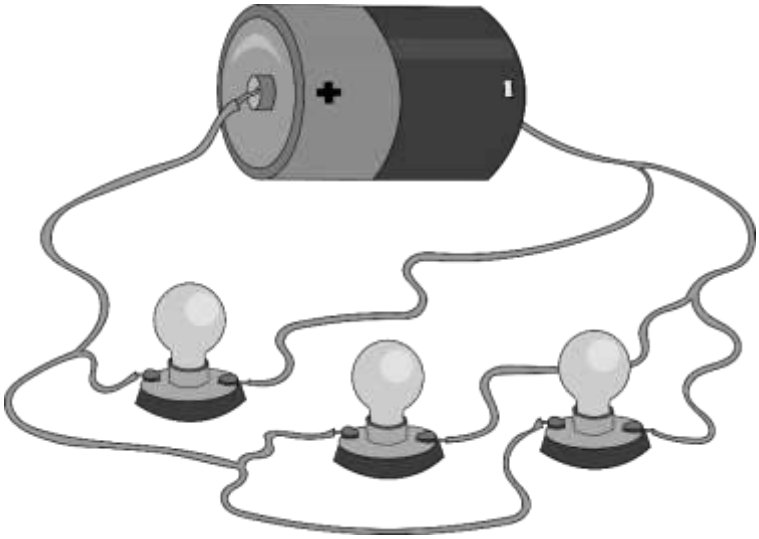
Observe the illustration below. If we turn the switch on, which bulb will light first? Why?



Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

What is It

A **parallel circuit** is a circuit that contains two or more paths for an electric current to flow through. The electrical devices are connected in a branched manner making each one independent from all other connections in the circuit.



Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

Figure 2. Parallel Circuit

Even if there are three bulbs, there are three complete circuits. None of them is affected by the others. The addition of more bulbs to the set does not dim the light of the bulbs.

If an individual bulb in a parallel branch is unscrewed from its socket, there is still current in the overall circuit and the other branches. In a three (3) bulb parallel circuit, removing the third bulb from its socket has the effect of transforming the circuit from a three-bulb parallel circuit to a two-bulb parallel circuit.

All negative terminals are connected in a parallel connection using dry cells, and all positive terminals are similarly connected. The bulb is then attached to the free ends. The circuit's total voltage is the same as a single dry cell.

When you add more resistors to a parallel circuit, the total current increases while the overall resistance decreases. When you add more light bulbs to your circuit, you'll need to draw more current to power them all.

Advantages and Disadvantages of Parallel Circuit

Advantages	Disadvantages
• Two or more pathways for an electric current to flow through • When one bulb burns out, the other bulbs will continue to glow. • Individual devices can be controlled	• Requires many wiring connections

What's More

Activity 1. Constructing Parallel Circuit

You Will Need:

- two (2) 1.5 V AA dry cells

Photo taken by Joel Christian R. Salentes

- three (3) pieces 6 V bulbs (used in flashlights)

Photo taken by Joel Christian R. Salentes

- three (3) pieces bulb sockets

Photo taken by Joel Christian R. Salentes

- 1 ½ meter copper wire or connector wires

Photo taken by Joel Christian R. Salentes

- electrical tape

Photo taken by Joel Christian R. Salentes

- pliers

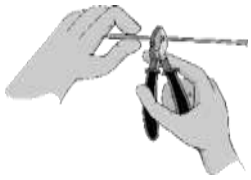
Photo taken by Joel Christian R. Salentes

What to Do:

Note: *Be careful in handling your materials, especially the bulbs. Ask help from an elder in conducting the activity.*

1. Gather all the materials needed.

2. Cut the wire into six pieces (8 inches long).

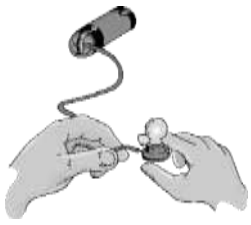


Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

3. Carefully remove approximately ½ inch of the insulation from both ends of all your wire pieces.

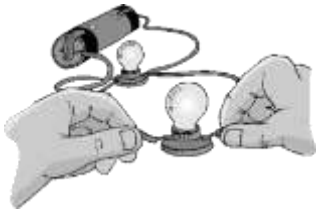
Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

4. Attach one (1) end of the wire to the positive end of the dry cell. Then, put and coil the other end of the wire to either side (metal part) of the 1st bulb socket. Attach one (1) end of another wire to the negative end of the dry cell. Then, put and coil the other end of the wire to the other side (metal part) of the 1st bulb socket.



Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

5. Get another wire piece and put and coil its one end on either side (metal part) of the 1st bulb socket while the other end of the wire must be put and coiled to either side (metal part) of the 2nd bulb socket. Moreover, get another wire piece. Put and coil its one end on the other side (metal part) of the 1st bulb socket. Then, put and connect the other end of the wire to the other side (metal part) of the 2nd bulb socket.



Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

6. Finally, use the last two remaining wires to connect the 2nd bulb socket and the third one. To connect the two bulb sockets, put and coil one end of the wire on either side (metal part) of the 2nd bulb socket while the other end of the wire must be put and coiled to either side (metal part) of the 3rd bulb socket. In addition, for the last wire piece, put and coil its one end on the other side (metal part) of the 2nd bulb socket. Then, put and connect the other end of the wire to the other side (metal part) of the 3rd bulb socket.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

7. Detach each of the bulbs from their respective socket one at a time. Observe what happens to the other bulbs that were not removed from their sockets.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

8. Without removing the bulbs and wires from the bulb sockets, add another dry cell to the set-up. Connect the second dry cell in parallel with the first.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

9. Observe once again the lights of the bulbs.

Illustrated by Ryan A. Machate and Reyson Joe G. Cañedo

Guide Questions 1

Directions: Based on the activity, answer the questions below. Write your answers in your notebook/answer sheet.

1. Were you able to construct a parallel circuit? How?
2. Was electricity flowing in the circuit? How did you know?
3. Was there a difference in the brightness of light among all light bulbs with only one dry cell? Why or why not?
4. Was there a change in the brightness of light when another dry cell was added? Why or why not?

Activity 2. Parallel Circuit on Paper

Directions: Draw the actual set-up of the parallel circuit you have constructed in Activity 1. Label/name each part. Do this in your notebook/ answer sheet.

Guide Questions 2

Directions: Answer the following questions correctly based on your drawing. Write your answers in your notebook/answer sheet.

1. In a parallel circuit with three dry cells as a source of energy, how are the wires connected to the dry cell? Why?
2. Based on your drawing, give one advantage of the parallel circuit.

What I Have Learned

A. Directions: Read and understand the sentences well. Identify the ideas/ concepts being described. Choose the correct answer from the choices provided in the box below. Write your answers in your notebook/answer sheet.

series circuit	increase	number of resistors	work
decrease	current electricity	bright	is the same

1. A circuit that allows electric current to flow through a single path is known as _____.
2. In a parallel circuit with constant voltage or the same power source, the _____ of the number of bulbs increases the total current.
3. The kind of electricity that is made up of moving electrons flowing through a complete circuit is called _____.
4. In a series circuit, the electric current that passes through each bulb _____.
5. In order for the devices in a series circuit to work, each device must _____.

B. Directions: Read and understand the sentences well. Identify the ideas being described to form generalizations. Choose the correct answers from the box below. Write the answers in your notebook/answer sheets.

electrical devices	parallel circuit	operate
Voltage	series circuit	

1. A _____ contains two or more paths for an electric current to flow through.
2. In a parallel circuit, _____ are connected in a branched manner making each one independent from all other connections in the circuit.
3. _____ in a parallel circuit remains the same regardless of the number of paths of the same resistance given a constant number of dry cells or source is present.
4. One of the advantages of a parallel circuit is that appliances _____ independently.

What I Can Do

A. Directions: Read and understand the given situation. Choose the appropriate action that corresponds to each situation by putting a (✓) before each statement and (**x**) if otherwise. Write your answers on your answer sheet.

Your mother requested you to check the Christmas lights before it will be hanged in the window as a sign of hope during the COVID-19 pandemic to show that darkness cannot beat the light. When you plugged in the connection, you found out that all the red-colored bulbs in the circuit did not light. Which of the following statements should you do to make the Christmas lights work?

1. add more red-colored bulbs to the set-up
2. find out which of the red bulbs are burnt up by testing each
3. check/ inspect the wire for possible wear and tear
4. buy a new set of Christmas lights
5. ensure that each bulb is screwed tight to its receptacle

B. Directions: Read and understand the situation below. Answer the question in the last part of it. Write your answer in your notebook/ answer sheets.

One late afternoon, Mrs. Reyes was in the kitchen preparing their evening meal. Suddenly, the light in the kitchen went out. Mrs. Reyes checked the switch, but the light remained out, so she concluded that the bulb is burnt/spent. She observed though that the other parts of their house are lighted. What could be the reason why the lights in the other parts of the house were functioning even if the light in the kitchen was out? Explain briefly.

Assessment

A. Directions: Read and understand the sentences well. Identify the ideas being described by choosing the correct answers from the box provided below. Write the answers in your notebook/ answer sheets.

home lightings	resistance	electrical circuit
series circuit	spent or loose	retained

1. The wire connection in the _____ is an example of parallel circuit.
2. The _____ has a closed-loop that gives a return path for the current.
3. A _____ allows electric current to flow through a single path.
4. In a series circuit, when a bulb is _____, the other bulbs will not light.
5. As you add more _____ to a circuit, like some bulbs or resistors, then there will be more work for your power source to give.

B. Directions: Read and understand the sentences well. Choose the letter of the correct answer to each of the questions. Write the answers in your notebook or answer sheets.

1. Which circuit contains two or more paths for an electric current to flow through?
   A. parallel circuit
   B. series circuit
   C. close circuit
   D. open circuit

2. What will happen to the voltage across the paths in a parallel circuit if more independent bulbs are added and the number of dry cells or source is the same?
   A. the voltage will remain the same
   B. the voltage will decrease
   C. the voltage will increase
   D. the voltage will fluctuate

3. In a parallel circuit, why is it that when a bulb burns out or is loose, the other bulbs still light up?
   A. because each connection in the circuit is independent from the others
   B. because electric current is allowed to pass through a single path
   C. because electric current can be stopped from flowing
   D. because the electric current does not flow

4. Below are advantages of the parallel circuit, except one. Which is it?
   A. Parallel circuit requires many wiring connections.
   B. Two or more pathways allow electric current to pass through
   C. Individual devices can be controlled
   D. When a bulb burns out, other bulbs continue to glow

5. Which of the following statement is true about parallel circuit at home?
   A. when the electric fan is switched off, the TV set will not function
   B. when a light is switched on, other lights will also glow
   C. appliances at home cannot function simultaneously
   D. appliances at home can function/operate independently from other appliances

Additional Activities

A. Differentiate series from parallel circuit through the total performance of each circuit when the number of the identified part or component is changed.

1. Series circuit – another dry cell was added to the three dry cells in the set up
2. Parallel circuit – another bulb was added to the three bulbs connected in the set up

B. Give at least one of the items asked below:
1. Advantage of series circuit
2. Disadvantage of parallel circuit

Answer Key

LESSON 1

What's In

1. dry cell 2. Connecting wire 3. Switch 4. Lamp/bulb

What's New

V	A	M	O	X	V	L	Z	W	K	W	U	Y	Z	Y	V	N	H	Y	C
S	A	D	S	A	I	I	X	U	C	L	C	A	H	N	X	L	I	Z	L
U	Z	L	E	X	Y	S	G	M	I	O	W	S	J	R	X	U	D	U	S
F	F	X	Z	C	H	E	G	V	K	X	N	N	X	D	O	S	K	M	J
P	Z	I	V	T	N	G	U	I	R	H	B	D	K	C	N	O	H	T	G
L	E	L	L	A	R	A	P	P	T	F	D	Q	U	R	Y	O	T	Y	W
G	W	C	L	R	U	T	T	A	N	Y	A	Q	S	C	V	C	M	D	Z
C	Q	K	I	E	F	L	A	S	K	S	Q	T	U	F	T	S	A	I	I
M	F	V	E	R	B	O	G	N	I	C	O	B	Q	T	G	O	L	U	G
E	R	V	Y	V	C	V	X	C	M	S	X	W	V	K	L	R	R	W	Y
D	D	H	O	B	N	U	U	P	K	M	E	M	C	F	T	H	S	Z	X
G	C	K	H	B	K	R	I	Q	V	X	U	R	V	N	C	E	R	T	Y
X	I	D	L	F	R	C	N	T	F	X	U	R	Q	Z	R	I	O	R	D
C	M	Z	F	E	B	E	W	O	C	X	Y	A	E	I	U	L	O	V	M
Z	N	Q	N	U	X	B	K	Q	R	U	Y	K	E	C	W	I	M	I	D
P	A	T	B	H	H	T	C	Y	D	T	T	S	B	J	N	P	A	X	F
D	L	N	O	X	U	W	D	B	H	J	C	V	Q	B	S	U	X	C	Z
F	Q	O	Y	Y	J	F	B	I	H	W	B	E	Z	V	P	T	D	W	D
R	L	K	X	W	I	T	F	J	H	M	K	D	L	C	E	X	X	G	U
V	Q	E	L	E	C	T	R	I	C	A	L	E	N	E	R	G	Y	H	C

SERIES PARALLEL CIRCUIT
CURRENT ELECTRON VOLTAGE
RESISTANCE CONDUCTOR LOAD
ELECTRICAL ENERGY

What I Know

1. True 2. True 3. False 4. False 5. False
6. True 7. False 8. True 9. False 10. True

LESSON 2

What's In

1. True 2. True 3. True 4. True 5. True

Guide Questions 2

1. The source of the electric energy in the series circuit is the **dry cell.**
2. The part of the circuit that affects its total performance when changed is the number of **dry cells.**
3. The pathway for the electrical energy in the circuit is the **wire.**

What's More

Guide Questions 1

Note: *Learner's answers may vary.*

1. Were you able to construct a series circuit? How?
   - ✓ Yes. I was able to construct a series circuit by following the instruction or the procedure correctly.
   - ✓ No. I was not able to construct a series circuit. I did not follow the instruction correctly.
2. Was electricity flowing in the circuit? How did you know?
   - ✓ Yes. Electricity was flowing in the circuit because the bulbs lit when the wires were connected to the dry cell.
   - ✓ No. Electricity was not flowing in the circuit because the bulbs did not light when the wires were connected to the dry cell.
3. Of the three bulbs connected in the circuit, which bulb was brightest? Why do you think so?
   - ✓ The bulbs glow with the same brightness since current is the same everywhere in a series circuit.
4. What happened when a bulb was detached from the circuit? Why did it happen?
   - ✓ When a bulb was detached from the circuit, all the other remaining bulbs did not light anymore since there is only one pathway for the current to flow.
5. What did you notice with the light of the three bulbs when another dry cell was added?
   - ✓ When another dry cell was added to the circuit, the lights of the bulbs became brighter.
   - ✓ like when a single bulb was used.

What I Have Learned

A.
1. series circuit
2. increase
3. Current electricity
4. is the same
5. Work

B.
1. parallel circuit
2. Electrical devices
3. Voltage
4. Operate

Guide Questions 2

1. In a parallel circuit with three dry cells as the source of energy, how are the wires connected to the dry cells? Why?
   - ✓ In a parallel circuit with three dry cells as the source of electricity, the wires are connected in such a way that all negative terminals are connected together, and all positive terminals are similarly linked to the positive and negative terminals of the dry cells.
2. Based on your drawing, **give at least one** advantage of parallel circuit.
   - ✓ (The answer of the learners could be **any one** of these.)
     - ➢ Each bulb has its own complete circuit from the source and back.
     - ➢ Each bulb/appliance operates independently.
     - ➢ There are two or more pathways for an electric current to pass through.
     - ➢ When one bulb burns out, the other bulbs will continue to glow.
     - ➢ Individual devices can be controlled.

What's More

Guide Questions 1.

Note: *Learner's answers may vary.*

1. Were you able to construct a parallel circuit? How?
   - ✓ Yes, I was able to construct a parallel series circuit by following the instruction or the procedure correctly.
   - ✓ No. I was not able to construct a parallel series circuit. I did not follow the instruction correctly.
2. Was electricity flowing in the circuit? How did you know?
   - ✓ Yes. Electricity was flowing in the circuit because the bulbs lit when the wires were connected to the dry cell.
   - ✓ No. Electricity was not flowing in the circuit because the bulbs did not light when the wires were connected to the dry cell.
3. Was there a difference in the brightness of light among all light bulbs with only one dry cell? Why or why not?
   - ✓ Yes. There was a difference in the light of each bulb because some glowed bright while others lit dimly.
   - ✓ No. There was no difference in the light of each bulb because all the bulbs have the same degree of brightness.
4. Was there a change in the brightness of light when another dry cell was added? Why or why not?
   - ✓ No. There was no change in the light of the bulbs when another dry cell was added because even if there are three or more dry cells connected in parallel, a total voltage will still be equal to that of a single dry cell.

Additional Activities

A. Differentiate series from parallel circuit through the total performance of each circuit when the number of the identified part or component is changed.

1. Series circuit – another dry cell was added to the three dry cells in the set up
   ANSWER: When another dry cell was added to the set-up, the total performance of the bulbs in the series circuit changed. They glowed brighter (but differently from one another) compared to when there were only 3 bulbs in the set-up.
2. Parallel circuit – another bulb was added to the three bulbs connected in the set up
   ANSWER: When another bulb was added to the parallel circuit, its total performance did not change because all the bulbs still lit up. Meaning, the electric current was distributed evenly to the bulbs in the circuit.

B. Write at least one of the items asked for below:

1. <u>Advantage of series circuit</u> --- Series circuit does not require many wiring connections and circuit components
2. <u>Disadvantage of parallel circuit</u> --- Parallel circuit requires many wiring connections and components

Assessment

A. 1. Home lightings
2. electric circuit
3. series circuit
4. Spent/ loose
5. resistance

B.

1. A 2. A 3. A 4. A 5. D

What I Can Do

A. 1. X 2. ✓ 3. ✓ 4. X 5. ✓

B. Lights in the house are connected in parallel, they can be controlled individually.

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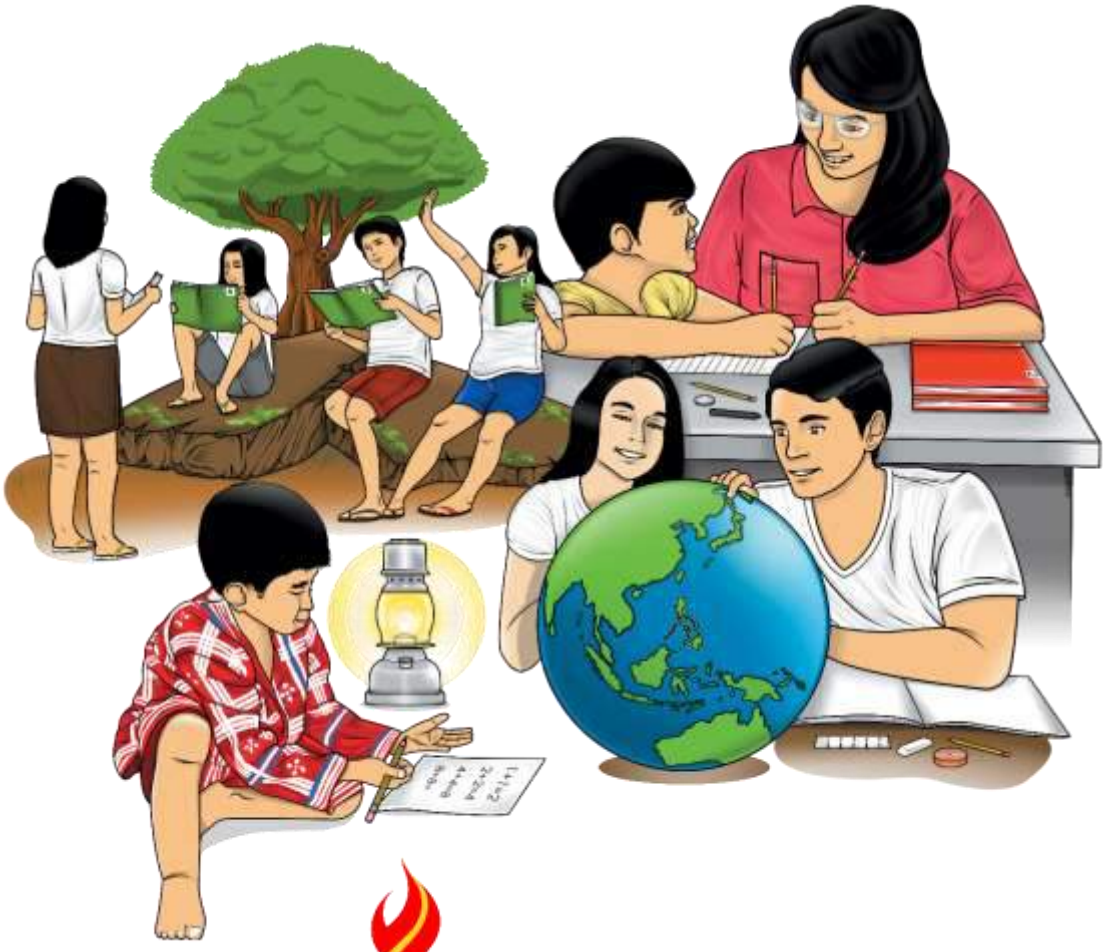
Science

Quarter 3 – Module 6:
Factors Affecting the Strength of an Electromagnet



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ADM

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5

Science

Quarter 3 – Module 6:
Factors Affecting the Strength of an Electromagnet

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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 to help you learn the factors affecting the strength of an electromagnet. 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.

Specifically, this module will help you describe an electromagnet and its properties and design, an experiment to determine the factors affecting its strength. As you go through this module, you are expected to:

1. describe what an electromagnet is;
2. construct a simple electromagnet and identify its parts;
3. enumerate the factors affecting the strength of an electromagnet; and
4. identify some uses of electromagnets.

What I Know

Directions: Read and understand the sentences well. Write **True** if the sentence is correct and **False** if it is not. Write your answers in your Science notebook/ answer sheets.

1. In magnets, similar poles attract.
2. Electromagnets can't lift heavy objects.
3. The strength of an electromagnet is permanent.
4. A magnet is a material that pulls/attracts metallic objects.
5. An electromagnet is a temporary magnet.
6. Magnetism is the property of the magnet to attract metallic objects.
7. The more coil the iron nail or core has, the lesser the magnetism or attraction.
8. When the electricity stops flowing in an electromagnet, magnetism continues to flow.
9. Electromagnetism is the ability of the wire to carry electricity to produce a magnetic current.
10. The iron nail or core is the part of the electromagnet where magnetic flux made by the current is concentrated.

Lesson 1

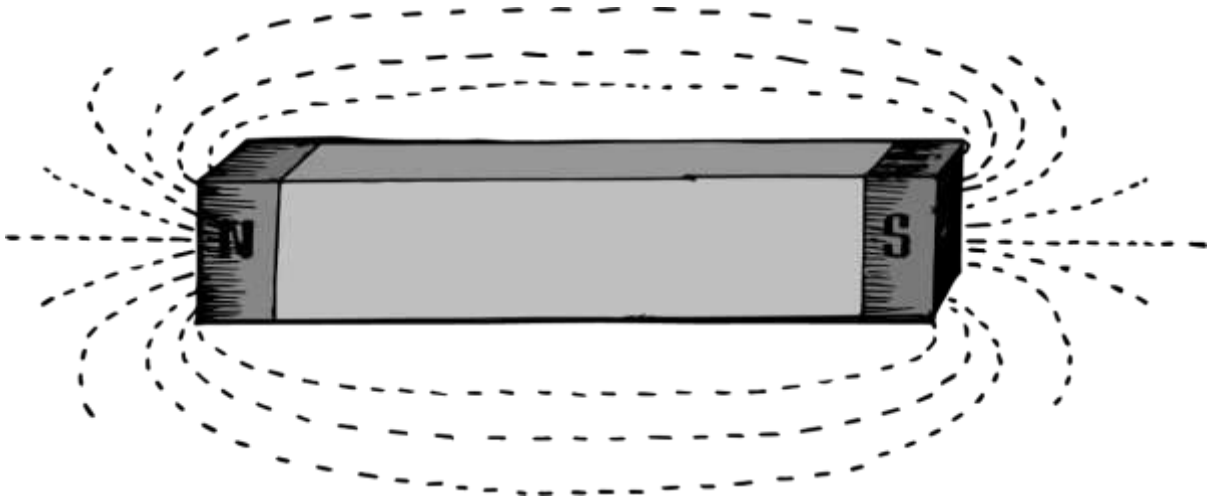
Factors Affecting the Strength of an Electromagnet

What's In

A **magnet** is a material that can attract metallic objects such as steel, nickel, cobalt, and most especially, iron. This property of magnets can be described as magnetism. This attraction happens because magnets have two ends that have opposite characteristics – the **North** and **South poles**. Hence, magnets follow the fundamental law that *opposites attract and like poles repel*.

Microscopically, the molecules in magnets are arranged in a certain order. When the polarities of the molecules are aligned, that all the north poles point in one direction, that piece of material is said to be magnetized. The effect of the magnetized piece is that its magnetic fields make a kind of circuit that enters at one end and exits at the other. This idea is graphically shown in Figure 1 below.

Below shows how the said orientation of molecules creates a magnet:



Illustrated by Ryan A. Machate and Jose Marie E. Baculi

Figure 1. Simple illustration of a magnet

However, not all materials or metals are magnetic. Sometimes, they have to be combined with other materials to create a magnetic effect. The simple device that can show how this effect is done is called an **electromagnet**.

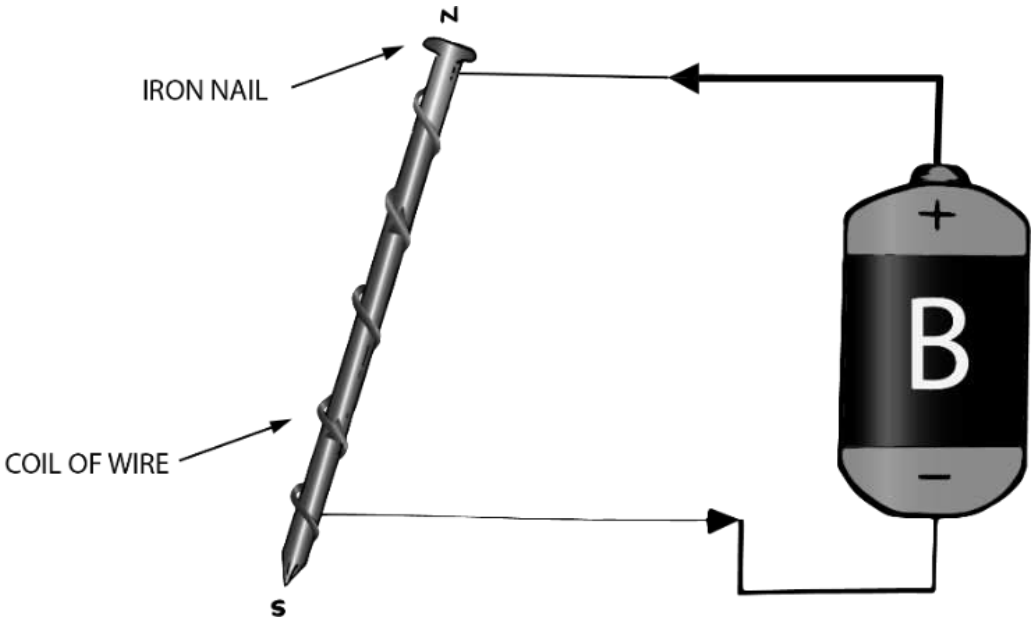
What's New

CONSTRUCTING A SIMPLE ELECTROMAGNET

You will Need:

Dry cell
3-inch iron nail
Thin electrical wire
Thumbtacks/ safety pins/ metal paper clips

(**Suggestion**: Decide on one common metal object (e.g. thumbtacks) throughout the activity for more accurate results.)



Illustrated by Ryan A. Machate and Jose Marie E. Baculi

What to Do:

(Note: Make sure that the iron nail does not have any rust. Be careful in handling materials. If possible, do the activity with the presence of an elder.)

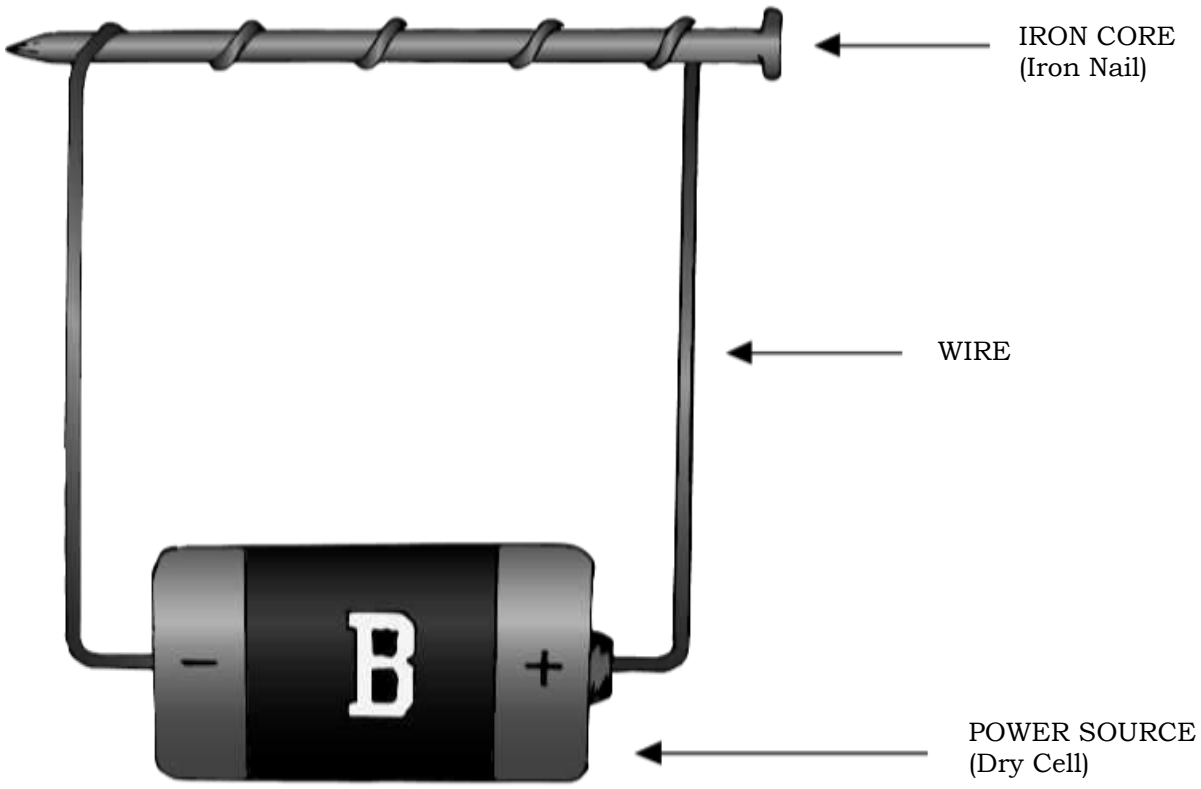
1. Make an electromagnet by winding the electrical wire five times around the nail.
2. Connect both ends of the wire of the electromagnet to the dry cell.
3. Test the electromagnet by placing some thumbtacks near the nail. Did the nail attract the thumbtacks? How many thumbtacks did the electromagnet attract?

What is It

What is an Electromagnet?

An **electromagnet** is a type of magnet in which an electric current produces the magnetic field. Electromagnets usually consist of wire wounds into a coil. Professor Hans Christian Oersted coined the term **electromagnetism** in 1820. It refers to the ability of a wire to carry electric current to produce a magnetic current.

The illustration below shows a simple electromagnet with its parts. What are the three main parts of the electromagnet? What does each part do?



Illustrated by Ryan A. Machate and Jose Marie E. Baculi

An electromagnet is temporary and is called an artificial magnet. It is a magnet that is only magnetic when an electric current is flowing through it. If the flow of the current is cut off, the property of magnetism stops.

The Parts of an Electromagnet

A basic electromagnet has three main parts: an iron core, insulated wire and a power source.

1. Iron core. Its purpose is to concentrate the magnetic flux produced by the current in the area outside the wires.

2. Wire/ Insulated wire. The wire serves as the passage of the electric current creating a magnetic field. The number of turns of wire represents the power of the electromagnet. The cable and wires need to be insulated as it prevents the current from coming into contact with other conductors. It preserves the wire material against environmental threats and resists electrical leakage.

3. Power source. It serves as the source of electricity that flows to the wire to create a magnetic field. The amount of current also affects the strength of the electromagnet.

How to Make an Electromagnet Stronger

An electromagnet can be made stronger in three ways:

a. by having more coils of wire on the iron nail or core;
b. by increasing the amount of current supplied; and
c. by using soft iron as the core.

The more coils the iron nail or core has, the stronger the electromagnet. Similarly, when soft iron is used as the core, the electromagnet is stronger than when other materials are used. Furthermore, the greater the number of dry cells, the more electrons flow in the electromagnet, resulting in stronger magnetism.

This is the advantage of an electromagnet from a permanent magnet. When there is a need to strengthen it, all the factors mentioned can be manipulated. An electromagnet operates only when there is a flow of electricity in the coil of wire. Its magnetism can be turned on and off.

Illustrated by Ryan A. Machate and Jose Marie E. Baculi

Figure 2. A simple electromagnet

Uses of Electromagnets

Using electromagnets, you can create all sorts of things, including motors, solenoids, hard disks and tape drives, speakers, and many others.

Electromagnets have many uses.

1. It is used to transmit signals, as in the telegraph, telephone, radio, and television.
2. It is also used for industrial purposes, such as in motors, generators, and transformers.
3. The electromagnet in a crane is used to lift heavy objects like metals, steel bars, scrap iron, and cars.
4. Electromagnets are used in bells, buzzers, chimes, circuit breakers, and other electrical appliances in our homes.
5. Electromagnets run electric toys.

What's More

Activity 1: More Coil

You Will Need:

2 pieces of 2-inch iron nail

½ meter copper wire

1 piece of big dry cell

Safety pins or thumbtacks

What to Do:

1. Coil the wire around the nail five (5) times.
2. Attach the ends of the wire to the opposite ends of one (1) dry cell.
3. Test the electromagnet by placing the nail near the safety pins/ thumbtacks.
4. Observe what happens. How many safety pins/ thumb tacks did the magnet attract?
5. Add another five (5) coils around the nails. Repeat procedure numbers 2 and 3.
6. Observe what happens. Record the number of safety pins/ thumb tacks attracted to the magnet.
7. Increase the coils to fifteen (15). Repeat procedures 2 and 3. Record the number of safety pins/ thumbtacks that are attached to the magnet.
8. This time wind the wire five times more around the nail. Again, connect the ends of the wire to the dry cell.
   a. How many thumbtacks did the electromagnet attract?

b. Was there an increase in the number of thumbtacks attracted by the electromagnet?

9. What factor made the electromagnet stronger?

Guide Questions 1

Directions: Based on the activity conducted, complete the table below. Write your answers in your Science notebook/answer sheet.

Number of Coils	Number of Safety Pins attracted
5	
10	
15	
20	

1. How did the increase in the number of coils affect the strength of the electromagnet? Explain your answer briefly.
2. How did the increase in the number of coils change the strength of an electromagnet?

Activity 2: More Power

You will need:

1 piece of a 3- inch iron nail

1-meter copper wire

3 pieces of big dry cells

Safety pins or thumbtacks

What to Do:

1. Coil the wire around the nail ten (10) times.
2. Attach the ends of the wire to the opposite ends of one (1) dry cell.
3. Test the electromagnet by placing the nail near the safety pins/ thumbtacks.
4. Observe what happens. How many safety pins/ thumbtacks did the magnet attract?
5. Disconnect the wires. Connect/ add another dry cell to the first dry cell. Repeat procedure numbers 2 and 3.
6. Observe what happens. Record the number of safety pins/ thumbtacks attracted to the magnet.
7. Again, disconnect the wires before adding another dry cell to the setup. Repeat procedures 2 and 3. Record the number of safety pins/ thumbtacks that are attached to the magnet.

8. Was there an increase in the electric current as more dry cells were added? Why?
9. What factor made the electromagnet stronger?

Guide Questions 2

Directions: Based on the activity conducted, complete the table below. Write your answers in your Science notebook/answer sheet.

Number of Dry Cells	Number of Thumbtacks Attracted to the Magnet
1 dry cell	
2 dry cells	
3 dry cells	

1. As the number of dry cells increases, how did it affect the strength of the electromagnet? Explain your answer briefly.
2. As the number of dry cells increases, how did it change the strength of an electromagnet?

What I Have Learned

Directions: Read and understand the paragraph below. Choose your answers from the box by filling in the blanks. Write your chosen answers in your Science notebook/answer sheet.

attracted	iron	magnet
magnetism	magnetic field	nail
switch	wire	

An electromagnet is a device made temporarily magnetic by electricity. It is produced by making electricity flow through a coil of 1. _____. The wire is winded around a piece of 2. _____. It serves as a core which is usually made of 3. _____. When electric current flows through the wire, the wire and the iron became a 4. _____. Both produce a 5. _____. Any magnetic substance that is located within the field is 6. _____ to it. Without electricity, it loses its 7. _____.

What I Can Do

Directions: Read and understand the given situation below. Choose the appropriate actions that correspond to the situation by putting a check (✓) mark and a cross mark (**x**) if not. Write your answer in your Science notebook/ answer sheet.

One afternoon your Science class had just finished the experiment on electromagnets when your classmate accidentally bumped the table with instructional materials causing the box of thumbtacks to spill its contents into the sandbox. How are you going to gather all the thumbtacks using what you learned from the lesson?

1. Ask everyone to help gather the thumbtacks.
2. Pick the thumbtacks one by one.
3. Construct an electromagnet.
4. Use an electromagnet to gather the thumbtacks.
5. Make the electromagnet stronger so that many thumbtacks will be magnetized.

Assessment

Directions: Read and understand the sentences below. Fill in the blanks with the correct word to complete the idea of the sentence. Write your answers in your Science notebook/answer sheet.

opposite poles	iron nail	magnetic field	strength	magnets
electromagnet	dry cell	magnetism	increasing	transmits

1. Magnets has a property that attracts objects called _____.
2. In the field of communication, electromagnet _____ signals.
3. The _____ of electromagnets can be increased or decreased.
4. In a simple electromagnet setting, the _____ serves as the core.
5. The _____ of electromagnets exist only when electricity is flowing.
6. The source of electric current in the simple electromagnet set-up is the _____.
7. Magnets follow the fundamental law that _____ attract similar poles repel.
8. An _____ is a magnet whose magnetic properties are produced by electricity.
9. Metallic objects such as steel, nickel, cobalt, and iron are attracted to _____.
10. One way of making electromagnets stronger is by _____ the number of coils around an iron nail or core.

Additional Activities

Directions: List down at least five practical uses of the electromagnet.

1.
2.
3.
4.
5.

Answer Key

What I Know

1. False
2. False
3. False
4. True
5. True
6. True
7. False
8. False
9. True
10. True

Lesson 1
What's New

For Item No. 3.
Did the nail attract the thumbtacks?

- Yes. The nail attracted the thumbtacks.
- No. The nail did not attract the thumbtacks.

How many thumbtacks did the electromagnet attract?

- The number of thumbtacks may vary depending on the strength of the electromagnet.

Lesson 1
What's More
Activity 1. More Coil

4. (Write the **number**) thumbtacks were attracted to the electromagnet.
6. (Write the **number**) thumbtacks were attracted to the electromagnet.
7. (Write the **number**) thumbtacks attached to the electromagnet.
8. a. (Write the **number**) thumbtacks attached to the electromagnet.
   b. Yes. There was an increase in the number of thumbtacks that were attracted to the electromagnet.
9. The increase in the number of coils on the iron nail or core made the electromagnet stronger.

Lesson 1
Guide Question 1.

Number of Coils	Number of Safety Pins/ Thumbtacks attracted
5	The number/ answer may vary.
10	The number/ answer may vary.
15	The number/ answer may vary.
20	The number/ answer may vary.

1. The increase in the number of coils increases the strength of the electromagnet because the number of safety pins/ thumbtacks also increased every time that the number of coils were increased.
2. As the number of coils increases, the strength of the electromagnet also increases

Activity 2. More Power

4. (Indicate the number of safety pins/ thumbtacks) safety pins/ thumbtacks were attracted to the electromagnet.
6. (Indicate the number of safety pins/ thumbtacks) safety pins/ thumbtacks were attracted to the electromagnet.
7. (Indicate the number of safety pins/ thumbtacks) safety pins/ thumbtacks were attracted to the electromagnet.
8. Yes, there was an increase in the electric current as more dry cells were added because there was an increase in the number of safety pins/ thumbtacks that were attracted to the electromagnet.
9. Power or number of batteries used

Lesson 1

Additional Activities

(Answers may vary/ can be interchanged)

Electromagnets have many uses.

1. They are used to transmit signals, as in the telegraph, telephone, radio, and television.
2. They are also used for industrial purposes such as in motors, generators, and transformers.
3. The electromagnet in a crane is used to lift heavy objects like metals, steel bars, scrap iron, and cars.
4. In our homes. Electromagnets are used in bells, buzzers, chimes, circuit breakers, and other electrical appliances.
5. Electric toys are run by electromagnets

Lesson 1
What I Have Learned

1. wire
2. nail
3. Iron
4. magnet
5. magnetic field
6. attracted to it
7. Magnetism

Lesson 1
What I Can Do

Uses of Electromagnet:

1. x
2. x
3. ✓
4. ✓
5. ✓

Lesson 1
Assessment

1. magnetism
2. transmits
3. strength
4. iron nail/ core
5. magnetic fields
6. dry cell/ batteries
7. opposite poles
8. electromagnet
9. magnets
10. increasing

Lesson 1

Guide Questions 2

Number of Dry Cells	Number of Thumbtacks Attracted to the Magnet
1 dry cell	The number/ answer may vary.
2 dry cells	The number/ answer may vary.
3 dry cells	The number/ answer may vary.

1. The more dry cells were added, the strength of the electromagnet increases because the number of safety pins/ thumbtacks that were attracted to the electromagnet also increased.
2. As the number of the dry cells in an electromagnet increases, its strength also increases.

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