4

DepED
DEPARTMENT OF EDUCATION

Science

Quarter 3 – Module 1:
Effects of Force on Objects

ALTERNATIVE DELIVERY MODE
ADM

Science – Grade 4
Alternative Delivery Mode
Quarter 3 – Module 1: Effects of Force on Objects
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4

Science

Quarter 3 – Module 1:
Effects of Force on Objects

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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

Force is important in our daily life. We use it in all of our activities like walking on the road, lifting objects, throwing a ball, or moving objects to a particular direction. We use force in order for us to live and we apply it to different objects around us.

In this module, you will learn more about force and will know what happens to objects as force is applied to them. For you to learn these concepts, you will be performing exercises and activities which will enable you to explain the effects of force when applied to objects.

The lesson focuses on:

Lesson 1 – Explain the Effects of Force when applied to an Object **(S4FE-III a-1)**

After going through this lesson, you are expected to be able to:

1. determine the changes that happen to objects when force is applied to them; and
2. explain the effects of force on the shape, size and movement of objects.

What I Know

A. Directions. Examine the table below. The first column shows activities wherein force is applied to different objects. Copy the table in your Science notebook. Then you will determine what changes or what happens to the object as shown by the activity. Put a check mark (✓) in the appropriate column that best shows your answer.

Activity	What change/s happen/s to the object?		
	Size	Shape	Movement
1. cutting a piece of paper			
2. molding clay			
3. throwing a ball			
4. blocking a moving toy car			
5. folding a table napkin			
6. tearing a biscuit wrapper			
7. chopping firewood			
8. slicing bananas			
9. rolling a marble on the floor			
10. squeezing a lemon			

B. Directions: Read and understand each statement. Write **True** if it is correct and **False** if it is not. Write your answer in your Science notebook.

1. Force is a push or a pull.
2. Without force, a moving object will stop.
3. Without force, an object at rest will not move.
4. A force can change the size and shape of an object.
5. Force can cause an object to move, stop, or to change direction.

Now, pause for a while and see if you got the correct answers found at the last page of this module. If you got 13 to 15 correct answers, congratulations, you are already on the right track. If not, it's okay, the next activities will help you learn more about the lesson.

Lesson 1 Effects of Force when Applied to an Object

People and other living things cannot live without force. Force allows us to move our bodies and do our daily activities. We also apply force when we use different objects around us. A force acting on an object causes it to change in different ways. Do you want to know the changes that happen to objects when force is applied to them?

In this module, you will be familiarized with and be able to explain the changes that happen to different objects due to the application of force.

What's In

A. Directions: Identify the type of interaction among living organisms described in each statement. Choose your answer from the words in the box below. Write your answers in your notebook.

competition	mutualism	commensalism
predation	parasitism	

1. It exists when two different organisms benefit from one another.
2. It is a relationship wherein one organism thrives at the cost of the host.
3. It happens when two organisms fight for limited food resources for survival.
4. It is a relationship wherein an organism survives by killing and eating another organism.
5. It happens when an organism benefits from the other without harming the other organism.

B. Directions: Describe the effects of the interaction among organisms in their environment. In your notebook copy and complete the table below.

Organisms	Effects of interaction to the environment
1. bees and flowers	
2. bird and tree	
3. aphids and string beans	
4. snake and rats	
5. water plant and fish	

Very good! Now, be ready for more activities. Have fun!

What's New

Note to Parent/Learning Facilitator: Guide your children in doing this activity. Remind them of the precautionary measures. Tell them to be more careful in handling the materials while performing the activity**.**

For the Learner:

Directions: Perform the activities below and answer the guide questions. Write your answers in your Science notebook.

Activity 1. Oops, I Did It Again!

Problem: What is the effect of force on the size and shape of an object?

What you need: rubber ball, can, eggshell, stone, candy wrapper, box, rubber band, chair, bottle cap, paper, hair, biscuit, folder, wire

Directions: Prepare the materials. What actions can you do on the objects in order to change their shape, size, or both? Copy and fill out the table below in your Science notebook. The first object was done for you.

Objects	What action have I done to the object?	What happened to the object?	
		Changed in size?	*Changed in shape?*
rubber ball	*squeezed*	✓	✓
can			
egg shell			

stone			
candy wrapper			
box			
rubber band			
chair			
bottle cap			
paper			
hair			
biscuit			
folder			
wire			

Guide Questions:

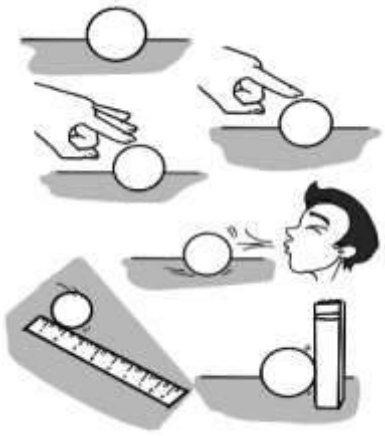
1. What do you think helped you made changes on the different objects?
2. What happened to the shape of some objects when force was applied to them?
3. What happened to the size of some objects when force was applied to them?
4. Is it possible that an object's shape and size will be affected by the application of the force at the same time? Cite an example.
5. Aside from humans, are there other things that could apply force on an object? Give some examples.
6. How will you describe the effect of force on objects based on the activity?

Activity 2. Look What You Made Me Do!

Problem: What is the effect of force on the movement of an object?

What you need: rubber ball, table or any flat surface

What to do: Demonstrate the following situations using the rubber ball on a table or any flat surface.



a. From at rest, make the object move.
b. Make the moving object move faster.
c. Make the moving object move slower.
d. Make the moving object change its direction.
e. Make the moving object stop.

Guide Questions:

1. What did you apply on the object in all situations?
2. Without force, will the object at rest move?
3. Without force, will the object in motion stop?
4. Without force, will the moving object change direction?
5. What did you do to make the object move faster? slower?
6. How does force affect the motion or movement of the object?

Congratulations!
You're done with the activities about the effects of force.

What is It

Points to Remember:

- A **force** is a **push or pull**, which occurs when two or more objects interact with each other.
- A force has amount and direction.
- **Effects of Force on Objects**

The **shape** of an object may change when force is applied on it. Kneading a dough, pounding pepper, compressing cotton, bending wire, twisting rope, stretching rubber band, or squeezing rubber ball are some ways of changing the shape of an object.

Also, when force is applied to an object, the object's **size** may change. Some situations where force is applied and changed the size of objects are the following: dropping a glass, pounding garlic, cutting a paper, sharpening a pencil, and grinding papaya.

The force applied on an object also affects its **movement**.

Force can change the state of rest or motion of an object. An example is when your hand pushes a marble gently on top of a table. The ball then sets into motion. Now, if you keep your hand on the opposite side of the moving ball, the moving ball comes into a state of rest.

Force can change the direction of movement of an object. An example is when a football player applies force by kicking the ball in different directions.

Force can change how fast or slow the movement of an object is. The ball travels farther when the force applied to it is stronger and the ball travels nearer when lesser force is applied to it.

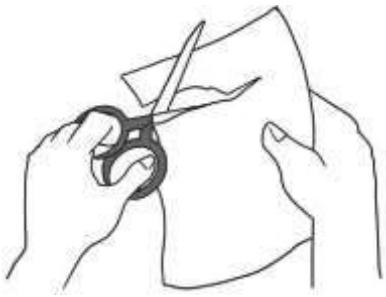
Now, I am glad you knew already that when a force is applied to an object, the object may change its size, shape, or movement.

What's More

Activity 1: What's the action?

Directions: Choose the word from the box that describes the action shown in these pictures. Write your answers in your notebook.

cutting	pulling	pushing	twisting	pounding

1. 

2. 

3. 

4. 

5. 

Activity 2: Push or Pull?

Directions: Determine whether the actions involve pushing, pulling or a combination of both by putting a check mark (✓) on the proper column of the table below. Copy the table and write the answers in your notebook.

Actions	Pushing	Pulling	Both pushing and pulling
1. bending			
2. lifting			
3. crumpling			
4. tearing			
5. throwing			

Activity 3: Changes in Size and Shape

Directions: Explain the changes that will happen to the size or shape of the given objects if force will be applied. Write your answers in your notebook.

1. sharpening a pencil
2. dropping a flower vase
3. pounding a Styrofoam cup
4. cutting a piece of cardboard
5. a bar soap dropped on the floor

Activity 4: True or False

Directions: Write **TRUE** if the statement is correct and **FALSE** if it is not, and then change the part of the sentence that makes it incorrect. Write your answer in your notebook.

1. Without force, an object at rest will move.

2. Without force, a moving object will not stop.

3. Force can cause an object to be in continuous motion only.

4. The stronger the force applied, the farther the distance of the toy car travelled.

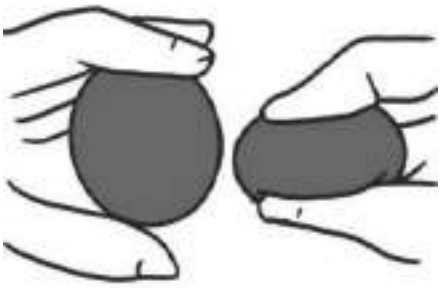
5. The amount of force does not affect how fast or slow the motion of the object is.

It seems like it's easier for you now. If not, it's okay. Review again your answers, stay positive and keep trying.

What I Have Learned

Directions: Complete the statement using the pictures below as clues. Write your answers in your notebook.

I have learned that force is a _____ or a _____. Applying force can change the object's _____, _____, and _____.



Very good! Now, it's time to apply what you have learned.

What I Can Do

Directions: Explain the effect on the objects when you apply force on them as shown in the given pictures. Write your answers in your notebook.

Object	What do you think a force can do to the object shown?
1. 	I think the force . . .
2. 	I think the force . . .
3. 	I think the force . . .
4. 	I think the force . . .
5. 	I think the force . . .

Wow! You did it! It is time to have a test of what you have learned from this lesson. Ready? Best of luck!

Assessment

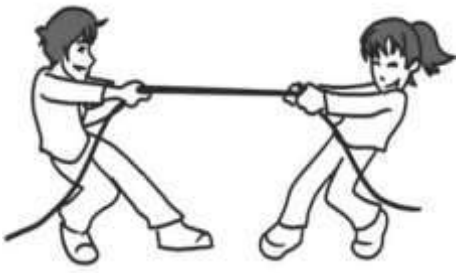
Directions: Write the letter of the best answer. Write your answers in your notebook.

1. It is a push or pull.
   a. force
   b. gravity
   c. mass
   d. speed

2. What is the effect of force when you slice a cake?
   a. Force changes the taste of the cake.
   b. Force changes the color of the cake.
   c. Force changes the shape of the cake.
   d. Force changes the shape and size of the cake.

3. What changes when you stretch a rubber band?
   a. chemical property
   b. color
   c. size
   d. movement

4. The picture shows that two players are pulling a rope with the same amount of force. What will likely happen?
   a. Both will fall.
   b. The girl will win.
   c. The boy will win.
   d. They will not move at all.



5. Which of the following is **TRUE** about force?
   a. Force can change the shape or size of an object.
   b. Force can only change the direction of an object.
   c. Force cannot change the speed of a moving object.
   d. Force can change the chemical properties of objects.

6. Which statement is **NOT** true about force?
   a. Slicing a banana changes its shape and size.
   b. A rolling ball on a surface will continue moving unless a force is applied on it.
   c. A ball moving on top of the table stops when you apply force opposite to the direction of its motion.
   d. In order to slow down or stop a heavy object, the force applied must be lesser than the mass of that given object.

7. It is an act of applying force to move something towards you.
   a. a pull
   b. a push
   c. a push and a pull
   d. none of the above

8. What do you think will happen to the speed of the object when the force is applied in the opposite direction to the direction of motion?
   a. increases
   b. decreases
   c. remains the same
   d. none of the above

9. If you are to push a cart, a big box, and a bicycle to a certain distance from the starting line, which do you think will require greater force?
   a. bicycle
   b. big box
   c. cart
   d. all of them

10. The greater the mass of an object, the greater is the force needed to _____ the object.
    a. move
    b. push
    c. stop
    d. all of them

11. Suppose you push a door and your friend on the other side of the same door is also pushing it. How will you describe the force and the effect of your actions to the door?
    a. The door pushes you and your friend.
    b. The door pushes your friend away from you.
    c. The force is unbalanced and the door may break.
    d. The force is balanced and the door does not move.

12. Which among the following objects will require a greater force to move?
    a. refrigerator
    b. television
    c. study table
    d. monoblock chair

13. A marble that is standing still will move when _____.
    a. touched by a person
    b. there is a strong wind
    c. bumped by a small slow moving marble
    d. more or stronger force is applied on the marble

14. Why do you need to use force in moving a ball up a ramp?
    a. to add force to the ball
    b. to let the ball roll on the ramp
    c. to allow the ball to stay on the ramp
    d. to move the ball away from the ramp

15. If an object is in motion and more force is applied to it, the object will begin moving _____.
    a. slower
    b. at a constant speed
    c. faster
    d. at a lesser speed

Additional Activities

Directions: In your notebook write 2-3 sentences citing the importance of the effects of force on the size, shape, and movement of objects.

_____
_____
_____
_____
_____
_____

Congratulations! You did great! Now, you may proceed to the next module. Good luck, keep learning and have fun!

Answer Key

What I Know

A.

Activity	What change/s happen to the object?		
	size	shape	movement
1. cutting a piece of paper	✓	✓	
2.molding clay	✓	✓	
3. throwing a ball			✓
4. blocking a moving toy car			✓
5. folding a table napkin	✓	✓	
6. tearing a biscuit wrapper	✓	✓	
7. chopping firewood	✓	✓	
8. slicing bananas	✓	✓	
9. rolling a marble on the floor			✓
10. squeezing a lemon	✓	✓	

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

What's In

A.
1. mutualism
2. parasitism
3. competition
4. predation
5. commensalism

B.

Organisms	Effects of interaction to the environment
1. bees and flowers	-bees will feed on the nectars and help in pollination process
2. bird and tree	-bird nests on the tree, eats the fruits and help propagate seeds
3. aphids and string beans	-aphids affect the growth of the string beans
4. snake and rats	-snake eats the rats and the rats' population will decrease
5. water plant and fish	-water plant gives off oxygen to the fish while the fish gives off carbon dioxide needed by the water plant

What's New

Activity 1: Oops I did it Again!

Objects	What action has been done?	What happened to the object?	
		Changed in size?	*Changed in shape?*
rubber ball	squeezed	✓	✓
can	squeezed	✓	✓
eggshell	crushed/pounded/ cracked	✓	✓
stone	crushed/pounded	✓	✓
candy wrapper	tore	✓	✓
box	cut/ folded	✓	✓
rubber band	stretched	✓	✓
chair	broke/cut	✓	✓
bottle cap	flatten/ cut	✓	✓
paper	cut/folded/tore/ crumpled	✓	✓
hair	cut	✓	✓
biscuit	broke/ crushed	✓	✓
folder	folded/cut/tore	✓	✓
wire	bent/cut	✓	✓

Answers to Guide Questions:
1. force
2. changed
3. The size changed.
4. Yes/ examples are pounding, breaking, or cutting objects
5. Yes/ things like tools and machines, animals, and other natural forces like wind and water
6. Force can change the size and shape of an object.

Activity 2: Look What You Made Me Do!
Answers to Guide Questions:
1. force
2. no
3. no
4. no
5. Applying greater amount of force/ lesser amount of force
6. Force can change the movement of the object. It can make things move or stop moving. It changes the direction of a moving object. It also makes the movement faster or slower.

What's More

Activity 1- What's the action?

1. cutting
2. pounding
3. pushing
4. pulling
5. twisting

Activity 2- Push or Pull?

Actions	Pushing	Pulling	Both pushing and pulling
1. bending			✓
2. lifting		✓	
3. crumpling	✓		
4. tearing			✓
5. throwing	✓		

Activity 3- Changes in Size and Shape

1. Pencil changes in size and shape.
2. The vase will be broken down into smaller pieces, changing its size and shape.
3. The Styrofoam cup changes in size and shape.
4. The cardboard changes its size and shape.
5. The bar soap will be broken or might be deformed, changing its size and shape.

Activity 4- True or False

1. FALSE
Without force, an object at rest **will not move.**
2. TRUE
3. FALSE
Force can cause an object to be in continuous motion. (remove "only")
4. TRUE
5. FALSE
The amount of force **affects** how fast or slow the motion of the object is.

What I Have Learned

I have learned that force is a push or a pull. Applying force can change the object's size, shape, and movement.

What I Can Do

1. Force changes the movement of the push cart.
2. Force changes the size and shape of the cloth.
3. Force changes the size and shape of the mango.
4. Force changes the movement of the soccer ball.
5. Force changes the movement of the toy car.

Assessment

1. a
2. d
3. c
4. d
5. a
6. d
7. a
8. b
9. b
10. d
11. a
12. a
13. d
14. b
15. c

Additional Activities

Possible Answers:
Importance of changing size, shape, or movement of objects:

- It is used in preparing ingredients for cooking food.
- Changing the size and shape of hardware materials is important in construction of buildings.
- Changing the movement of objects can help in driving vehicles.

References

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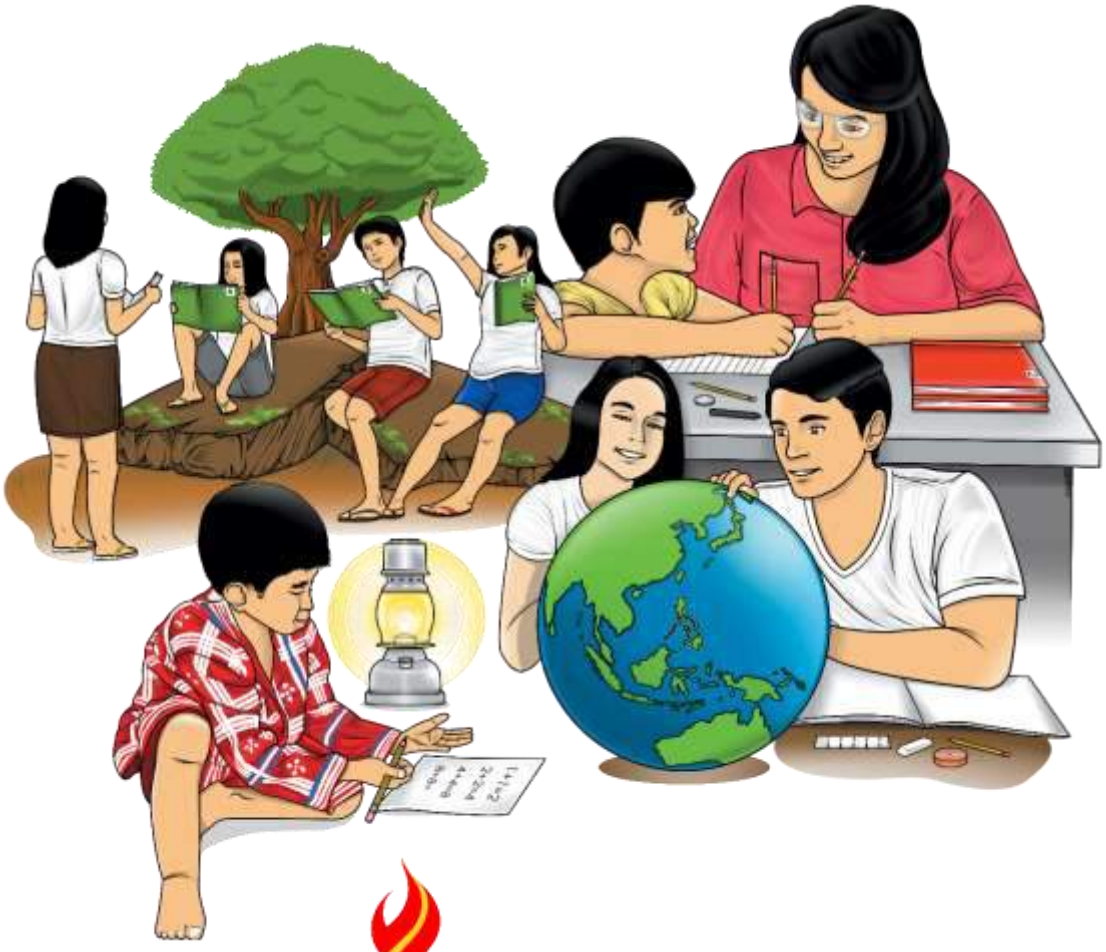
Science

Quarter 3 – Module 2:
Magnetic Force



ALTERNATIVE DELIVERY MODE
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Science

Quarter 3 – Module 2:
Magnetic Force

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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

In this module, you will familiarize of the different characteristics of magnets. But do you know that these magnets play important roles in our daily lives? Magnets have been proving its worth every day with its function by making difficult tasks easier. Magnets also play an important role in various devices we use at home. Series of activities were provided that can help you attain your learning targets. Please be guided by the instructions in each activity.

The lesson will focus on:

- Lesson 1 – Characterize magnetic force (S4FE-III d-e-3)

After going through this, you are expected to be able to:

1. determine if an object is magnetic or non-magnetic;
2. identify the types of a magnet; and
3. characterize magnetic force.

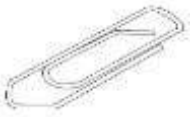
What I Know

A. Directions: Put a check mark (✔) if the object can be attracted to a magnet and a cross mark (✖) if it does not. Write your answers in your Science notebook.

1.  nickel knife

2.  gold rings

3.  wooden chair

4.  steel paper clip

5.  steel spoon

B. Directions: Write **TRUE** if the statement is correct and **FALSE** if it is not. Write your answers in your notebook.

1. Magnets attract all metals.
2. Opposite poles of magnets will repel.
3. All magnets have two north poles.
4. The same poles of magnets will attract.
5. A magnet can repel an object made of paper.
6. Most objects made up of iron are attracted to magnets.
7. Magnetic field is an area around the magnet where there is magnetic force.
8. The pulling or pushing force is strongest at the North Pole of the magnet.
9. The force of attraction of a magnet is greater at its poles than in the middle.
10. If you break a magnet into two pieces, you will have two magnets with two North poles (N-N).

Please check your answers. Did you get 11-15 correct answers? That is a good start! If not, it is okay, at least you tried it.

Lesson 1

Magnetic Force

Good day! Do you know that magnets have been known for centuries and used by many different cultures throughout this time? You do not usually see them or know they are working, but magnets power almost everything you use in your regular life. They are objects that attract certain metals. In fact, magnets are one of the fundamental forces in nature and is indeed incredibly important. Do you want to know more about magnets? This module will give you information about magnets.

Please be ready for more exciting adventure. Good luck and happy learning!

What's In

Directions: Read the following statements. Explain the effects of force base on the changes that happen in the object. Write your answer in your notebook.

1. pushing a toy car- _____
2. pounding eggshells- _____
3. folding your clothes- _____
4. kicking a soccer ball- _____
5. throwing a ball upward- _____
6. squeezing a calamansi- _____
7. cutting a piece of paper- _____
8. tearing a biscuit wrapper- _____
9. blocking a moving toy car- _____
10. rolling a marble on the floor- _____

Great! Get ready for more. This time, you will know more about magnets by performing these activities.

What's New

Note to Parent/Learning Facilitator: Guide your children in doing these activities. Remind them to be careful in handling the materials while performing the activity**.**

Directions: Perform the activities below and answer the guide questions. Write your answers in your Science notebook.

Activity 1: Hook me up!

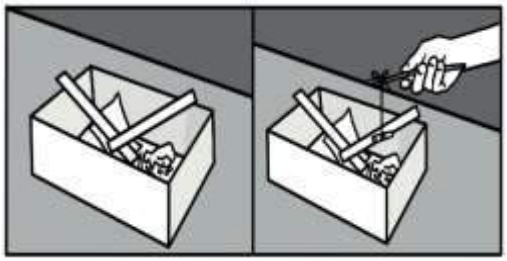
What you need:

Materials in making the fishing rod: bar magnet (alternative: ref magnets), 5-inches yarn and small stick

Materials to place inside the box: paper clip, iron nail, index card, plastic ruler, wooden ruler, copper wire, thumbtacks, pin, cellophane, aluminum foil

What to do:

1. To make a fishing rod, tie the magnet to one end of a yarn and tie the small stick on the other end of the yarn.
2. Place the materials inside a box.
3. Fish out the materials one by one using the suspended magnet tied at the end of the yarn.
4. List down the materials attracted by the magnet.
5. List down the materials which cannot be attracted by the magnet.



Guide Questions:

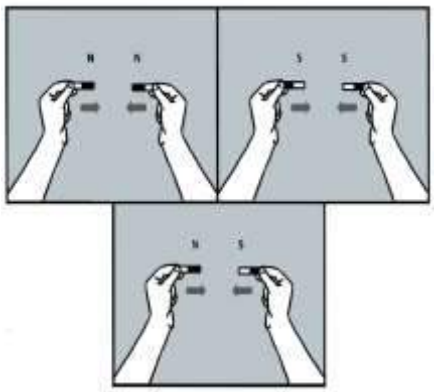
1. What material/s is/are attracted by the magnet? What are these materials made of?
2. What material/s is/are not attracted by the magnet? What are these materials made of?
3. What does this mean about the materials attracted or not attracted to magnets?

Activity 2: Attract or Repel?

What you need:

2 bar magnets, paper and pen

What to do:



1. Identify the north pole (N) and the south pole (S) at the ends of the bar magnets.
2. Place the two bar magnets on the table 5 cm away from each. Both the north poles of each magnet should be facing each other. Observe what happens as you try moving one magnet closer to the other.
3. Repeat Step 2 but with both south poles of the bar magnets facing each other. Observe what happens as you try moving one magnet closer to the other magnet.
4. Repeat Step 2 with the north pole and the south pole of the bar magnets facing each other. Observe what happens as you try moving one magnet closer to the other magnet.
5. Illustrate the direction of the movement of the magnets for Step 2, 3 and 4 using arrows.

Guide Questions:

1. What happened to the magnets when similar poles were brought closer to each other?
2. What happened to the magnets when dissimilar poles were brought closer to each other?
3. What general statement can be formulated?

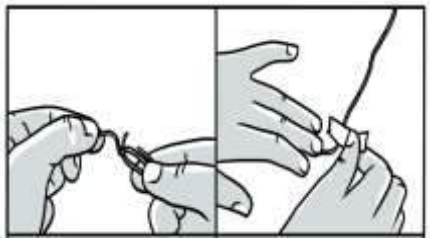
Activity 3: The Floating Paper Clip Trick

What you need:

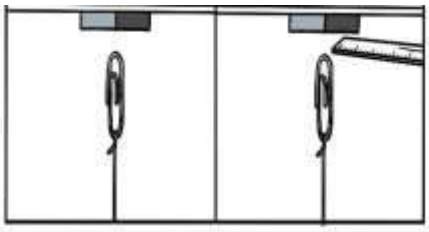
bar magnet, stand and clamp, paper clip, thread, iron nail, index card, plastic ruler, wooden ruler, coin

What to do:

1. Make your own floating paper clip by clamping a bar magnet vertically.
2. Tie a paper clip to a thread and tape the other end of the thread to the base of the stand, such that the clip is still help up by the magnet, but leaving a gap between the two.



   Please compare your set up with the picture below. Are they the similar? If they are, you may proceed performing the activity.



3. Slide on the gap between the paper clip and the magnet on the following materials one at a time: iron nail, plastic ruler, wooden ruler and index card. Observe what will happen to the paper clip each time.

Guide Questions:

1. What material/s could be slid through the gap without dropping the paper clip?
2. What material/s will definitely "cut" out the magnetic force?
3. What does it say about magnetic force?

Excellent! Now, it's time to know more about the characteristics of magnets and magnetic force.

What is It

Points to Remember:

- Magnets have an invincible magnetic field. Magnets will not attract all kinds of metals. Only objects made of **iron, cobalt** and **nickel** will be attracted to magnets.

iron

cobalt

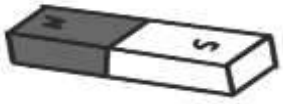
nickel

- There are several types of magnets like ring magnets, rectangular magnets, horseshoe magnets and bar magnets.

ring magnet

horseshoe magnet

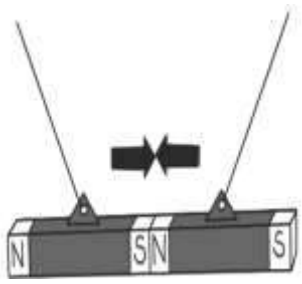
rectangular magnet



bar magnet

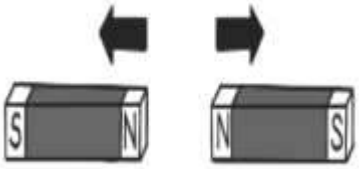
- The ends of the magnets are called poles. One pole is called north pole (N), the other is south pole (S). A magnet has always both north pole and south pole though you break it. So, when we cut a magnet into two parts, two new magnets are formed each with a north pole and a south pole (magnetic dipole).

- When the poles of the two magnets are placed near each other, they have a force that will either pull them together or push them apart. The push and pull of a magnet is called the magnetic force.



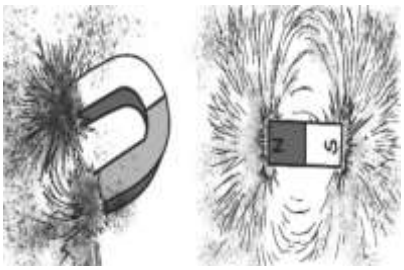
- If the poles of a magnet are the same and placed near each other, then they will be pushed away or will repel each other. Either both south poles or both north poles will result to repulsion (like poles repel).

- If the poles of a magnet are different and placed near each other, then they will be pulled together or will attract each other. Thus, a nearby south pole and a north pole will result to attraction (unlike poles attract).

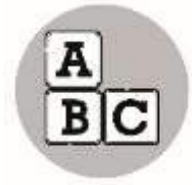


- The force of attraction of a magnet is greater at its poles than in the middle.

- The following illustrations shows the north and south poles of magnets attracting metallic objects.
- The magnetic field is the area around the magnet where the magnetic force of attraction or repulsion exists. It is strongest near the poles and its strength decreases with distance.



Good job! I hope you got all the concepts. You may now proceed to the next activities. Good luck!



What's More

Activity 1- Attracted or Not?

Directions: Identify the objects attracted by a magnet. Gather all the materials on the table, place each one of them near the end of the magnet. Observe what happens and record your observations on the table below.

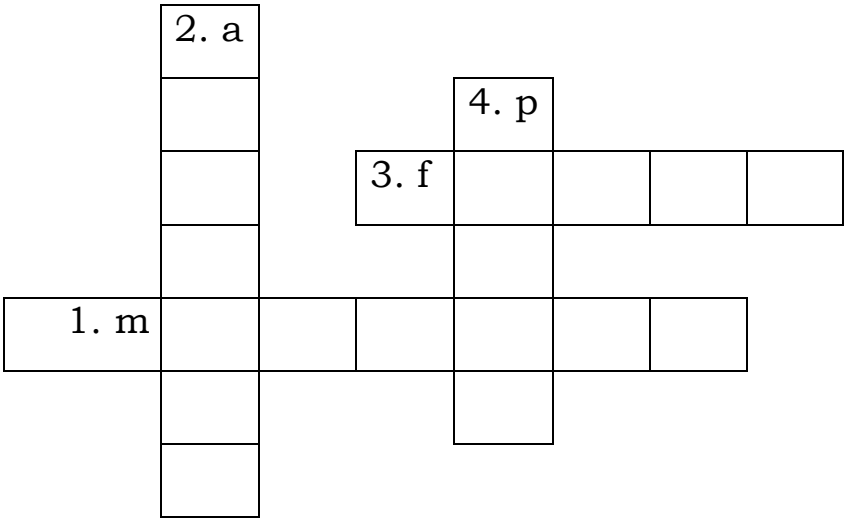
Materials:

magnet, ball pen cap, bits of paper, can opener, coins, eraser, nails, sharp pencil, paper clips, piece of cloth, plastic spoon, rubber band, plastic ruler, thumbtacks, tin can, copper wire

Objects attracted by the magnet	Objects not attracted by the magnet

Activity 2- Crossword Puzzle

Directions: Answer the puzzle in a minute. First letter was given for you to solve it. Do this in your notebook.



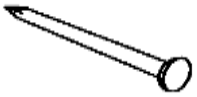
1. They attract some kind of metals.
2. It is being closer together.
3. It is a push or a pull.
4. Regions found at each end of a magnet.

Activity 3- Magnetic or Not Magnetic

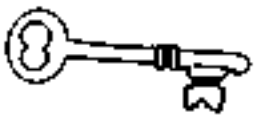
B. Directions: In your notebook write whether the following objects are **magnetic** or **non-magnetic.**

1. 

disposable plastic spoon

2. 

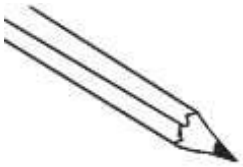
iron nail

3. 

copper key

4. 

glass

5. 

pencil

6. 

copper kettle

Great! Get ready for more. This time, you will know more about magnets by performing these activities.

What I Have Learned

Directions: Complete the following Science concepts. Write your answers in your notebook.

I learned that:

1. A _____ can pull objects from a distance. These objects are metal and are made up of either _____, _____, or _____.
2. A magnet comes in different shapes such as _____, _____, and _____.
3. A magnet always has ____ poles however you break it.
4. Two intersecting magnets will _____ when two unlike poles are brought closer together. While two like poles are brought closer the magnets will _____ each other.

Very good! Now, it's time to apply what you have learned.

What I Can Do

Directions: Read and answer the following questions. Write your answer in your notebook.

1. Cite situation/s in your daily life showing the application of magnets.

2. Which among the following can be attracted by a magnet? Why?

- an iron _____
- a piece of paper _____

3. The north pole of a bar magnet is placed near the south pole of another bar magnet. Will they attract or repel each other? Why?

Wow! You did it! It's time to test on what you have learned from this topic. Ready? Best of luck!

Assessment

Directions: Choose the letter of the correct answer. Write your answers in your notebook.

1. Which of the following cannot be attracted by magnets?
   a. cobalt b. gold c. iron d. nickel

2. Which of the following can be attracted by magnets?
   a. nickel coin
   b. copper wire
   c. gold bar
   d. aluminum pole

3. Earth is considered as a giant magnet. How is Earth's magnetic field similar to that of a magnet?
   a. It is made in Earth's core.
   b. It is shaped like a horseshoe.
   c. It has North and South poles.
   d. It is hundreds of kilometers long.

4. It is a magnet that is shaped like the letter "U."
   a. ring magnet
   b. bar magnet
   c. rectangular magnet
   d. horseshoe magnet

5. What is the area around a magnet where a magnetic force is found?
   a. North Pole
   b. magnetic field
   c. South Pole
   d. magnetic axis

6. Which of the following statement is correct?
   a. Magnets do not have force.
   b. Papers are attracted by magnets.
   c. All metals are attracted by magnets.
   d. The push and pull of magnets is called magnetic force.

7. Which of the following is NOT true about magnetic force?
   a. Like poles of two magnets repel each other.
   b. The force of attraction is greater at the middle.
   c. Opposite poles of two magnets attract each other.
   d. Magnets attract objects made up of iron, cobalt and nickel.

8. Which of the following pairs refer to magnetic poles?
   a. east and west
   b. north and south
   c. north and west
   d. east and south

9. When the same poles of two magnets whether North or South are placed to each other, they _____.
   a. do not move.
   b. pull each other.
   c. touch each other.
   d. are not attracted to each other.

10. Which of the following statements is TRUE?
   a. All magnets have two north poles.
   b. All magnets have two south poles.
   c. Magnets can attract an object made of paper.
   d. Most objects with iron are attracted to magnets.

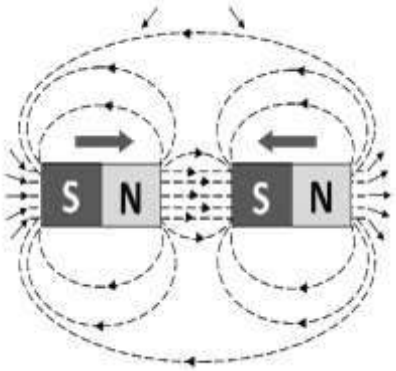
11. What substance is attracted to a magnet?
   a. iron b. lead c. silver d. water

12. What characteristics to magnetic substances have?
   a. They are always black and cold to touch.
   b. They can give a “shock” when you touch them.
   c. They can push or pull objects they are not touching.
   d. They fall faster than other objects when you drop them.

13. What happens when opposite poles of two magnets are place near each other?
    a. They do not move.
    b. They break each other.
    c. They push each other.
    d. They attract each other.

14. If you break a magnet into pieces, what will happen to the force that will be exerted by the magnet when in use?
    a. Force will be doubled.
    b. Force remains the same.
    c. Force exerted will decrease.
    d. Force of each magnet will not be affected.

15. Which statement correctly describes the picture?
    a. The two poles are attracted to each other.
    b. The iron filings formed a shape around the magnet.
    c. The iron filings show that magnetic field is strongest at both poles.
    d. The North pole of one bar magnet attracts the south pole of another bar magnet. seeking



Good job! It's time to make your learning more challenging.

Additional Activities

Directions: Answer the questions found in the flowchart. Do it in your notebook.

If you break a magnet into two pieces, what happens to its magnetic field?

↓

Prediction:

↓

Reason for prediction:

↓

Try it with the help of an older person

↓

Effects/results:

↓

Reasons:

Congratulations! You did great! Now, you may proceed to the next module. Good luck, keep learning

Answer Key

What I Know

A. 1. ✓ 2. X 3. X 4. ✓ 5. ✓

B. 1. FALSE 2. TRUE 3. FALSE 4. FALSE
5. FALSE 6. TRUE 7. TRUE 8. TRUE
9. TRUE 10. FALSE

What's In

1. The toy car will move forward.
2. The eggshells will be broken in smaller pieces, changing its size and shape.
3. The clothes will change in size and shape.
4. The ball will move along the direction of the force.
5. The ball will move upward.
6.The calamansi will change in size and shape.
7. The paper will change in size and shape.
8. The wrapper will change in size and shape.
9. The toy car will stop from moving.
10. The marble will roll on the floor.

What's New

Activity 1: Hook me up!

1. The materials attracted to magnet are paper clip, iron nail, thumbtacks, and pin. They are made up of metals like iron.
2. The materials not attracted to magnet are index card, plastic ruler, wooden ruler, copper wire, cellophane, and aluminum foil. They are made up of wood, plastic and other metals.
3. There are materials attracted to magnets like some metals and there are those that are not like plastics, wood, and other metals. Not all metals are attracted to magnets.

Activity 2: Attract or Repel?

1. The magnets did not attract each other.
2. The magnets attracted each other.
3. When the same poles of two magnets were brought closer, they repel. When unlike poles of two magnets were brought closer, they attract.

Activity 3: The Floating Paper Clip Trick

1. iron nail
2. plastic ruler, wooden ruler, and index card
3. Materials made up of iron cannot affect the magnetic force while materials made up of plastic and wood cut the magnetic force.

What's More

Activity 1- Attracted or Not?

Objects attracted by the magnet	Objects not attracted by the magnet
can opener coins nails paper clips thumbtacks tin can	ballpen cap bits of paper eraser sharp pencil piece of cloth rubber band plastic ruler copper wire

Activity 2- Crossword Puzzle

1. magnets 2. attract 3. force 4. poles

Activity 3- Magnetic or Not Magnetic

1. X 2. ✓ 3. X 4. X 5. X 6. X

What I Have Learned

1. magnet, iron, cobalt, nickel 3. two
2. ring, horseshoe, rectangular 4. attract, repel

What I Can Do

1. Pupils' answers may vary.
2. Iron can be attracted by a magnet because it is magnetic.
3. They will attract because opposite poles of magnets attract.

Assessment

1. b 2. a 3. c 4. d 5. b
6. d 7. b 8. b 9. d 10. d
11. a 12. c 13. d 14. c 15. d

Additional Activities

Prediction: Magnetic force will become weaker.
Reason for prediction: smaller size
Effects/results: The magnets have 2 poles but with weaker magnetic force.
Reasons: They attract each other. The magnets' size becomes smaller.

References

Abutay, L. Bonao D., Crucis E.,Eslabra J., Gramaje E., Guadamor M., Hernandez A., Ilagan L. Llamera F., Manawatao R., Panganiban H., Rojo J., Tosco RR., and Zape J., Science Grade 4, Learner's Material, First Edition 2015. Department of Education (2015), pp. 182-184

Abutay, L. Bonao D., Crucis E.,Eslabra J., Gramaje E., Guadamor M., Hernandez A., Ilagan L. Llamera F., Manawatao R., Panganiban H., Rojo J., Tosco RR., and Zape J., Science Grade 4, Teacher's Guide, First Edition 2015. Department of Education (2015), p. 226-228

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4

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Science

Quarter 3 – Module 3:
Light, Sound and Heat Travel

ALTERNATIVE DELIVERY MODE
ADM

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4

Science

Quarter 3 – Module 3:
Light, Sound and Heat Travel

DepED
DEPARTMENT OF EDUCATION

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

Light, sound and heat are essential part of our lives. Light allows us to see objects, shapes, and colors. Sound is the main form of communications for us humans. Without sound, we would not hear and therefore would not be able to speak. Sounds are also used by animals for communication. On the other hand, heat is needed for our activities like cooking, drying the washed clothes, and warming our bodies during cold weather.

In this module, you will be informed of how light, sound and heat travel in different media. You will be provided with activities which will help you develop the concepts you have to learn.

The lesson focuses on:

- Lesson 1- How Light Travels (S4FE-IIIf-g-4)
- Lesson 2- How Sound Travels (S4FE-IIIf-g-4)
- Lesson 3- How Heat Travels (S4FE-IIIf-g-4)

After going through this module, you are expected to be able to:

1. describe how light travels;
2. describe how sound travels in solid, liquid and gas materials; and
3. describe how heat travels in solid materials, through liquid materials and air.

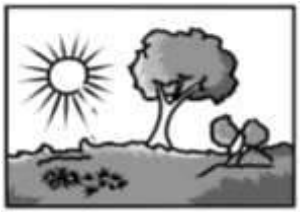
What I Know

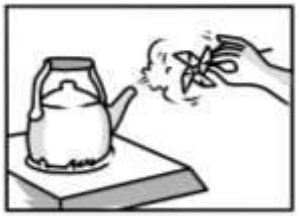
A. Directions: Write **FACT** if the statement is true and **BLUFF** if it is false in your science notebook.

1. Sound travels in waves.
2. Light needs air to travel.
3. Sound travels fastest in a vacuum.
4. Sound travels faster in liquid than gas.
5. Sound travels together with the medium.
6. Sound can travel through solids, liquids and gas.
7. Light travels in a straight line until it hits something.
8. Light is a form of energy that we can see things with our eyes.
9. When light hits a material, it begins to travel in a curve line.
10. Light travels at a speed of 300,000 kilometers per second through a vacuum.

B. Directions: Study the illustrations below on how heat travels. Identify whether heat travels through **conduction**, **convection**, or **radiation.** Write the correct answer in your science notebook.

1 

2 

3 

4 

5 

Well done! Please check your answers against the Answer Key found at the end of the module. If you got 12 to 15 correct answers, that means you're on the right track. If not, it's okay, you will have more activities that can help you learn more about this.

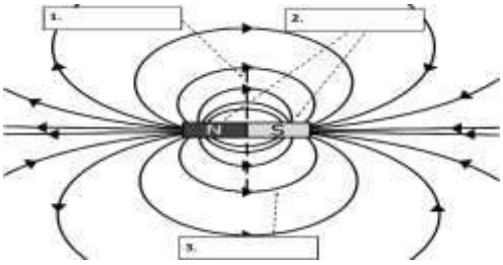
Lesson 1

"How Light Travels"

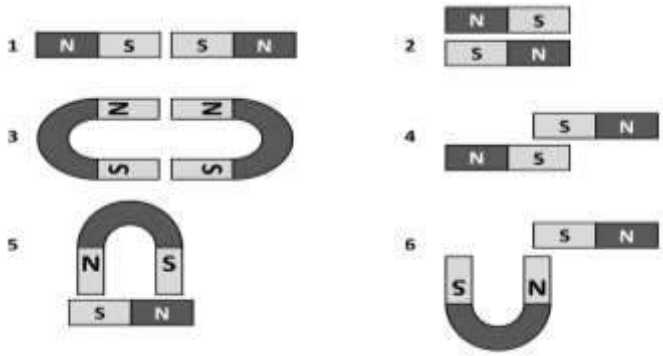
Close your eyes for a minute, and then open them afterwards. What did you see when you closed your eyes? How about when you opened them? Have you wondered how we are able to see all the things around us? It is all because of light. The world will be so dark without light. You can only see the beauty of our surroundings because of light. Light is very important for us to live. This module will try to uncover the concepts on how light travels and its properties.

What's In

A. Directions: Identify the following parts of magnetic field lines. Write your answer in your science notebook.



B. Directions: Determine whether the following pairs of magnets will **repel** or **attract** each other. Write your answer in your science notebook.



Great! You must have gotten all the correct answers. Now, it's time to discover more about the new lesson.

What's New

Note to Parent/Learning Facilitator: Guide your children in doing this activity. Remind them of the precautionary measures. Tell them to be careful in handling the materials while performing the activity**.**

To the Learner:

Directions: Perform the activity below and answer the guide questions. Write your answers in your science notebook.

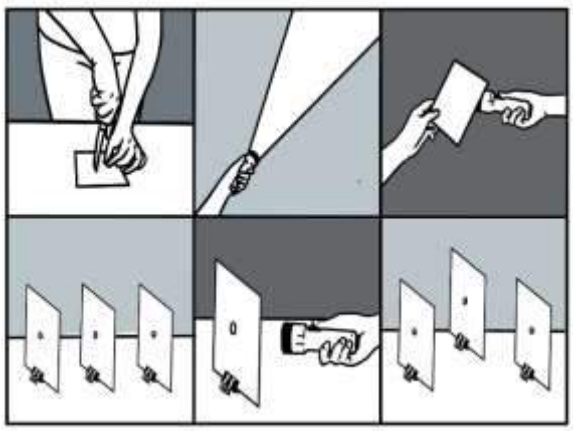
Activity 1: The Right Path

Objective: Describe how light travels.

What you need: flashlight, 3 pieces illustration boards (1/8 size), 1 piece thick cardboard, a partner (your sister or brother)

In the absence of a partner, a modeling clay could be used to create a "stand" to hold the illustration boards. In addition, this activity could be better observed when the room is dark (switch off lights, close doors, windows, curtains, etc.)

What to do:



1. Make a 2 inches hole at the center of the 3 pieces illustration boards.
2. Get a flashlight and aim it at a distant wall. Observe the path of light. Record your observation.
3. Block the path coming from the flashlight with a thick cardboard. Record your observation.
4. Hold each of the cardboard with a hole. Make sure the holes are aligned in such a way that the wall could be seen through the holes.
5. Aim the flashlight through the first hole. Observe what happens.

6. Misalign the middle cardboard your sister or brother is holding. Keep the light aimed at the cardboards. Observe what happens.

Guide Questions:

1. What happened to the light when the cardboards' holes were aligned?
2. What happened to the light when the cardboards' holes were not aligned?
3. Did the light form a straight line when you aimed it on the wall without blockage?
4. When you blocked the light with a thick cardboard, was it able to pass through the light? What was formed behind it?
5. When you aligned the cardboards with holes, was the light able to pass through? What was its path?
6. What can you say about the way light travels?

Congratulations! You have done well performing all the tasks. Proceed to the next to know more information about how light travels.

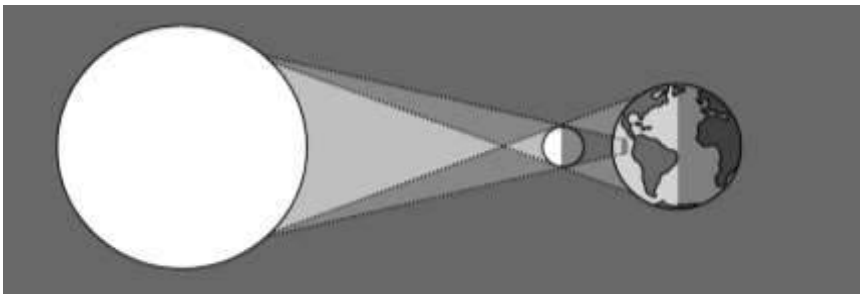
What is It

Points to Remember:

For a very long time, scientists were not sure exactly how light travels. Some say that light behaves like a wave while others claim that light behaves like a group of particles.

Then, they discovered that light travels as a wave in straight lines through empty space. Once light is produced, it will keep travelling in a straight line until it hits a material. Shadows are evidence of light traveling in straight lines. They are formed when the path of light is blocked.

During eclipse, the moon casts a shadow falling onto the Earth. Eclipse is a shadow in space. It happens when the light from the Sun is blocked by the Moon or the Earth.



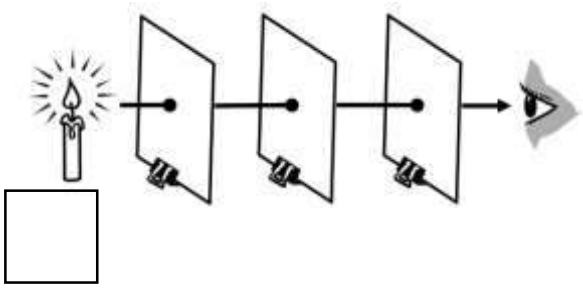
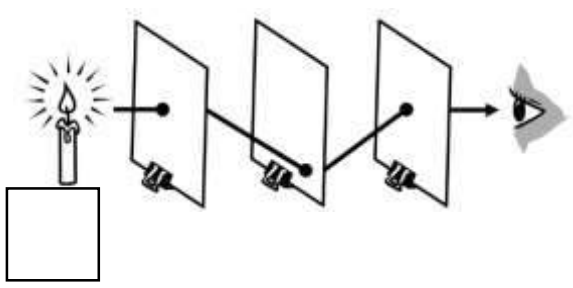
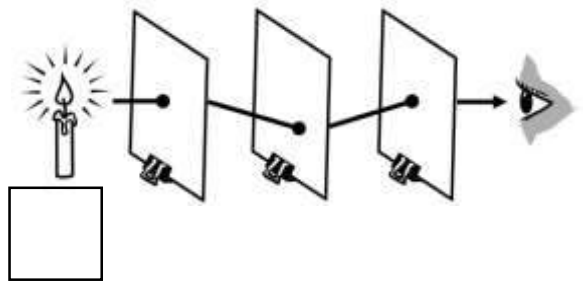
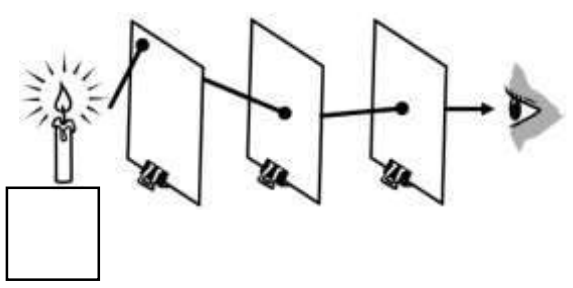
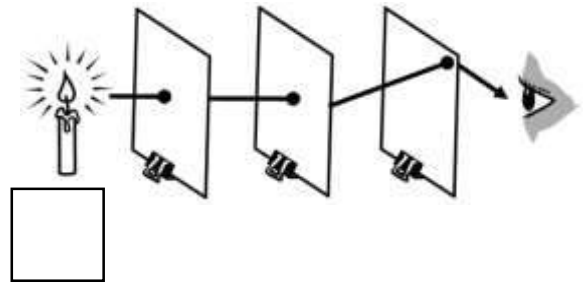
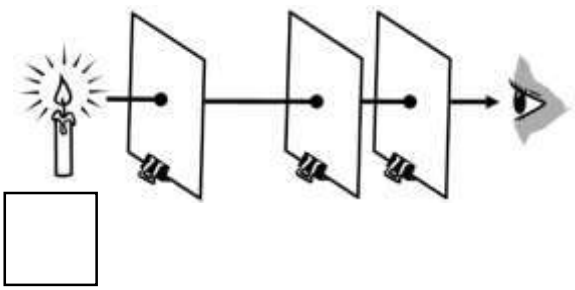
Light travels very fast at nearly 300,000 km/s in vacuum space. Light is faster than sound. Unlike sound, which needs a medium (like solid, water or air) to travel through, light does not need a medium to propagate or move through and can travel in vacuum space.

What's More

A. Directions: Write **TRUE** if the statement is correct and **FALSE** if it is not. Do it in your Science notebook.

1. Light needs a medium through which it can travel.
2. Fireworks show how light travels faster than sound.
3. Light travels faster in glass than it does in a vacuum.
4. Light travels in a straight line when it passes through a single medium.
5. Light rays could not be blocked and they could pass through all types of materials since they travel on a straight line.

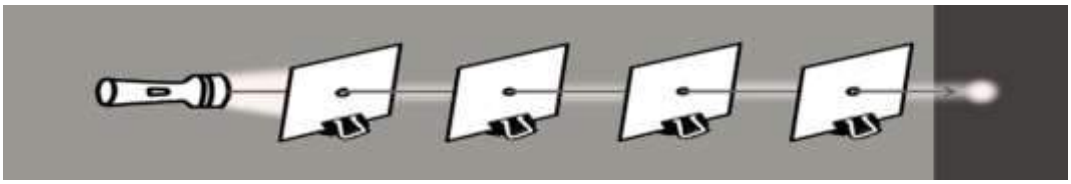
B. Directions: Observe how light travels in the pictures. Write a check mark (✓) if the flame will be seen and a cross mark (**X**) if not. Do it in your science notebook.

1. 	2. 
3. 	4. 
5. 	6. 

Great! You really learned well the lesson.

What I Have Learned

Directions: In one or two sentences, describe how light travels using the picture below. Write your answer in your science notebook.



What I Can Do

Directions: Read and answer the following questions. Write your answer in your Science notebook.

1. Why aiming laser pointer at a person's head and eyes is harmful?
2. When you take a picture, in what direction will you position yourself with reference to the source of light?

Great job! After performing the activities about how light travels, you are now ready to answer the assessment.

Assessment

A. Directions: Read and answer the following questions. Write the letter of the correct answers in your science notebook.

1. Which of the following statement is TRUE?
   a. Light does not travel.
   b. Light travels in a curve line.
   c. Light travels in a straight line.
   d. Light reflects in opaque materials.
2. Light is a form of _____ that is needed to support life on Earth.
   a. compression b. energy c. motion d. vibration
3. What evidence/s show/s that light travels in a straight line.
   a. Shadows are formed.
   b. Light passes through the holes which are aligned together.
   c. Rays of light are made of straight lines moving outwardly in all directions.
   d. All of these
4. What happens when you focus a pen light through a hole of a thick cloth?
   a. Light becomes brighter.
   b. Light changes direction.
   c. Light passes through the hole.
   d. Light is blocked or obstructed.
5. Which of these describes how light travels through an empty space?
   a. It travels in a straight line without stopping.
   b. It comes to a stop after it travels a certain distance.
   c. It changes direction often even if there are no objects.
   d. It travels straight but may change direction to avoid objects.
6. What kind of path does light take?
   a. It bounces off in all objects.
   b. It goes through in all objects.
   c. It curves around in all objects.
   d. It travels in a straight line until it hits something or goes through it.

7. Which word best describes how light moves?
   a. in circles c. slowly
   b. straight line d. faster through opaque objects
8. What do we call a material that light can travel through?
   a. air b. medium c. pathway d. water
9. We see shadow because light travels in a _____ line.
   a. curved b. rainbow c. straight d. zigzag
10. Which of the following is true?
   a. Sound travels faster than light.
   b. Light travels faster than sound.
   c. Light travels at the same speed with sound.
   d. Light and sound do not travel in any medium.

B. Directions: The following pictures of objects are considered as sources of light. Using lines, draw the path of light of each object when they are lighted. Do it in your science notebook.

1. 

2. 

3. 

4. 

5. 

Additional Activities

Directions: Cut out at least three (3) pictures of sources of light from old magazines and paste them in your Science notebook. Using lines, draw how light travels from its source.

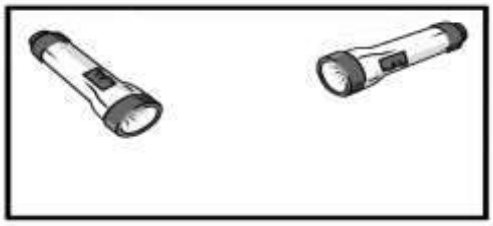
Congratulations! You are now ready for the next lesson.

Lesson 2 How Sound Travels

Sound is all around us, all the time. Sometimes we ignore, sometimes we love and enjoy listening to it. Like light, sound is also very important in our life. People can communicate because of it. Animals and the things around us produce sound that make our surroundings more lively and interesting. This module will show you how sound travels in different materials.

What's In

Directions: Draw the path of light in the following set-ups. Then, answer the questions. Do it in your science notebook.

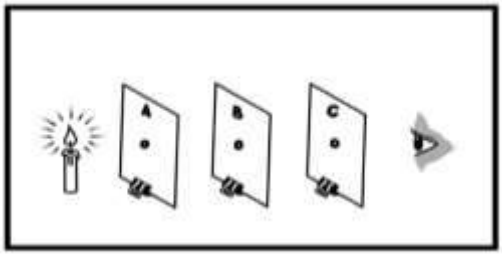
1. 

How does light travel?

_____

_____

_____

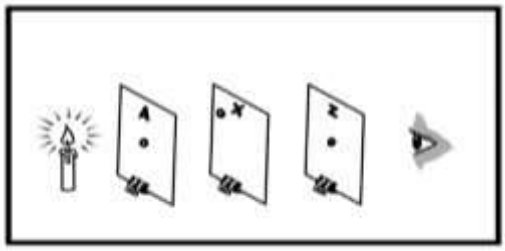
2. 

Can you see the flame of the candle in this set-up? Why?

_____

_____

_____

3. 

Can you see the flame of the candle in this set-up? Why?

_____

_____

Good job! Just like light, sound also travels in different materials. Please proceed to the succeeding activities to know more about sound.

What's New

Note to Parent/Learning Facilitator: Guide your children in doing this activity. Remind them of the precautionary measures. Tell them to be careful in handling the materials while performing the activity**.**

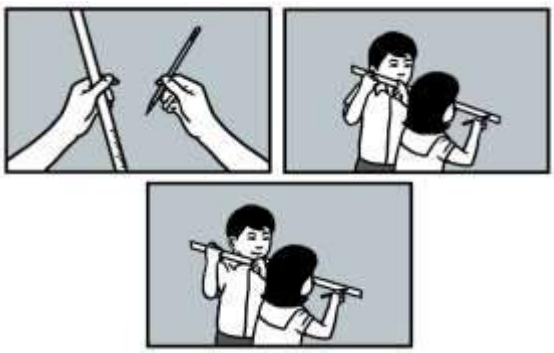
To the Learner:

Directions: Perform the activity below and answer the guide questions. Write your answers in your science notebook.

Activity 1: How Sound Travels in Different Materials

What you need: a meter stick, a pencil, a big pail or can of water, 2 stones, a partner (your brother or sister)

What to do:



1. Get a meter stick and a pencil.
2. Hold the meter stick close to your ear. Have a partner scratch the other end of the meter stick with a pencil.
    - What happens?
3. Hold the meter stick away from your ear and repeat the activity.
    - Did you hear a softer or louder sound?
    - Where does sound travel faster? In solid or in air? Why do you think so?
4. Get a big pail of water. Get 2 pieces of stones and hit them together under water inside the pail. Now, hit them together out of water.
    - Did you hear sounds when you hit the two stones together outside the pail and underwater? Why?

- Which sound was louder, in air or water? Why do you think so?

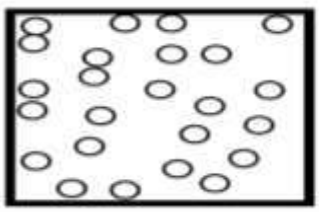
What is It

Points to Remember:

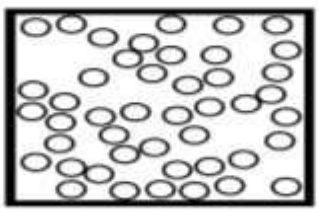
Sound is an energy produced by vibrations. When any material vibrates, it causes movement in the particles which are called sound waves. These sound waves keep going until they run out of energy.

The speed at which sound travels from one place to another depends upon the medium and how closely packed the particles are in the material. A medium is a substance that allows sound waves to travel through it. In a vacuum like the outer space, sound cannot travel so you cannot hear anything there.

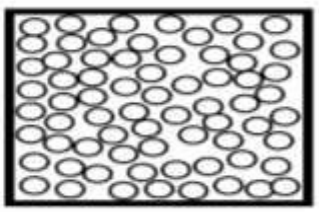
As can be shown in the diagram below, sound waves travel the slowest through gases, faster through liquids, and fastest through solids. Sound travels most quickly through solids because the molecules of a solid are closer together and, therefore, can transmit the vibrations (energy) faster. Sound travels slowest through gases because the molecules of a gas are farthest apart. Sound also travels slower than light.



Gas particles



Liquid particles



Solid particles

What's More

A. Directions: Write **TRUE** if the statement is correct and **FALSE** if it is not. Write your answers in your science notebook.

1. Sound cannot travel in a vacuum.
2. Sound travels in solids, liquids and gas.
3. Sound travels fastest through liquid materials.
4. Sound travels faster through solid materials than gas.
5. Sound is not affected by the medium through which it travels.

B. Directions: Copy and complete the sentences using the words from the box. Do it in your science notebook.

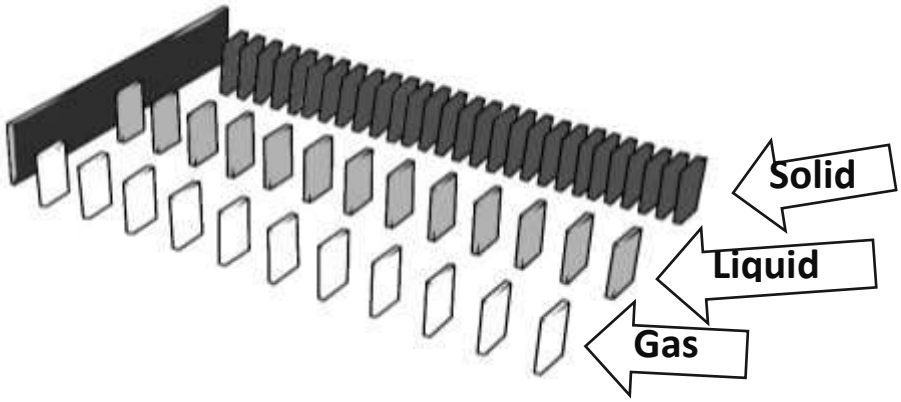
closer	speeds	liquid	gas	medium	solid

Sound can travel at different 1._____ depending on the 2._____ it is travelling through. Sound travels faster in a 3._____ than it does in a 4._____ or in a 5._____. This is because the particles in a solid are 6._____ together than they are in gas.

Did you get a perfect score? Good! Now, proceed to the next activity.

What I Have Learned

Directions: Using the representations of the three states of matter below, describe how sound travels through solid, liquid, and gas. Write two (2) to three (3) sentences in your science notebook.



What I Can Do

Directions: Read and answer the following questions. Do it in your notebook.

1. Why do you think that most of the musical instruments are made up of solid materials?
2. What should a motorist do upon hearing the sirens of an ambulance or a fire truck behind him?
3. Why do doctors use stethoscope when examining on their patients?

Assessment

A. Directions: Read the questions and select the letter of the correct answer. Write your answers in your science notebook.

1. When sound travels in solids, vibration is _____.
   a. fast b.irregular c.moderate d. slow
2. How does sound travel through air?
   a. very fast c. in jumping motion
   b. very slowly d. fast in random manner
3. What affects the speed of the sound as it travels?
   a. person receiving it c. the origin of the sound
   b. loudness of the sound d. the nature of the material
4. Which of the following statements about sound is correct?
   a. Sound cannot travel through solids.
   b. Sound travels faster in air than in liquid.
   c. Sound travels faster in solids than in air.
   d. Sound is not affected by the medium through which it travels.
5. You are standing 5 meters away from your teacher. Why did you immediately respond when she called your name?
   a. Sound travels in solids. c. Sound travels in air.
   b. Sound travels in liquids. d. Sound travels in a vacuum.
6. Compared to light, sound travels _____.
   a. faster
   b. slower
   c. at the same speed
   d. There is not enough information to compare the two.
7. Which of the following would be most likely to transmit sound the best?
   a. steel in cabinet c. air in your classroom
   b. water in the ocean d. water in a swimming pool
8. On which place will we not be able to hear any sound?
   a. a theatre c. in a spaceship
   b. a closed room d. in the outer space

9. Sound waves travel fastest in _____.

a. air b. liquids c. solids d. vacuum

10. In which of the following does sound travel fastest?

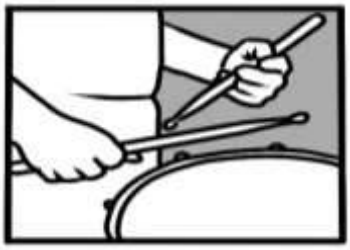
a. ice

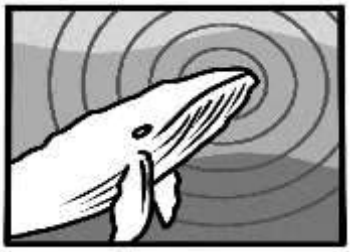
b. steam

c. water

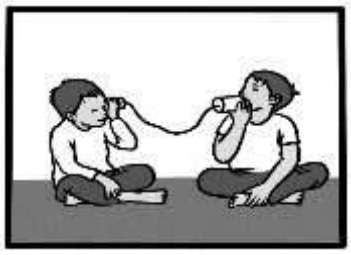
d. Sound travels at the same speed in each of the above.

B. Directions: Describe how sound travels in each picture. Write your answer on your science notebook.

1. 

2. 

3. 

4. 

5. 

Additional Activities

Directions: There are 9 words hidden in this puzzle. Find the words and make meaningful sentence/s about how sound travels in different medium.

S	O	L	I	D	S	O	U	N	D
F	A	S	T	T	R	A	V	E	L
D	O	L	I	Q	U	I	D	T	W
J	R	U	F	A	S	T	E	R	I
M	E	D	I	U	M	U	G	A	S
G	F	A	S	T	E	S	T	E	S

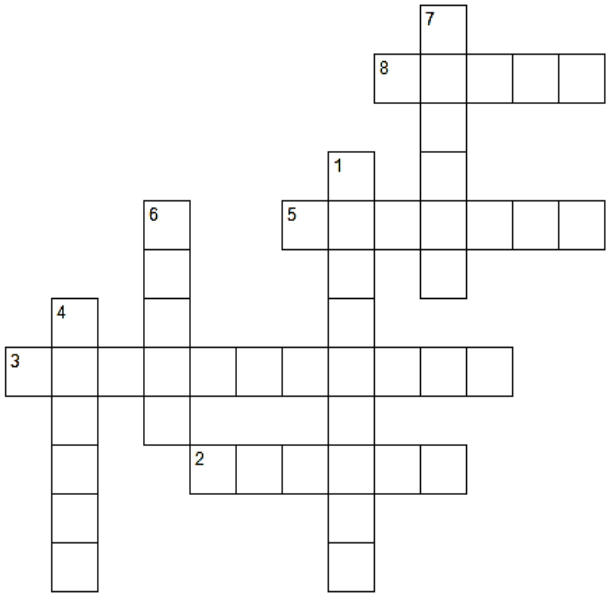
Congratulations! You are done with the two lessons! You are now ready to move on to the next! Good luck!

Lesson 3 How Heat Travels

Heat is a form of energy and it is also very important in our life like light and sound. Heat keeps us warm, cooks our food, and does a lot of other things. Heat travels through different phases of matter. It travels through a solid, liquid and gas. How does transfer of heat happen? You will find out the answer to this question as you go through this lesson.

What's In

Directions: Answer the following puzzle using the clues. Write your answers in your science notebook.



Across:
2. needed by sound in order to travel
3. movement in particles when material vibrates
5. sound travels _____
8. sound travels slowest in _____

Down:
1. up and down movement
4. sound travels fastest in _____
6. produced by vibrations
7. place where sound cannot travel

Check your answers using the key on the last page. I hope you got the correct answers. If not, it's okay, you can go back to the previous lesson.

Just like light and sound, heat also travels. Proceed to the next activities that will enable you to describe how heat travels in solid, through liquid and gas. Good luck!

What's New

A. Directions: In your notebook write two to three sentences in a given situation.

Some people say that putting a spoon in a cup of coffee would make it cool fast. Do you believe so? Why or why not?

You will be able to know if your answer is correct after you performed this activity.

Note to Parent/Learning Facilitator: Guide your children in doing this activity. Remind them of the precautionary measures. Tell them to be careful in handling the materials while performing the activity**.**

To the Learner:

B. Directions: Perform the activities below and answer the guide questions. Write your answers in your science notebook.

Activity 1: "You're Hot and You're Cold"

Objective: Describe how heat transfers in solid materials.

What you need: hot water, coffee mug, metal spoon, watch/ timer

What to do:

1. Fill the mug with hot water. Be extra careful when pouring hot water to the mug. Avoid spilling the hot water.
2. Place a metal spoon into the coffee mug.

3. Wait for about five minutes. Carefully feel the exposed end of the spoon. Slightly touch the outside surface of the mug, too. Record your observations in your Science notebook.

Guide Questions:

1. What happened to the exposed end of the spoon when you touched it after five minutes?
2. What happened to the water inside the mug after five minutes?
3. What did you notice about the outside surface of the mug when you touched it? Why?
4. What conclusion about heat transfer can you formulate or draw out from this activity?

Activity 2: Up, Down, and Spin Around

Objective: Describe how heat travels in liquid.

What you need: 2 jars, cardboard, food color (blue and red)

What to do: Dissolve the food colors in separate jars. The red jar contains warmer water and the blue jar contains colder water. Place two jars with one on top of the other. A cardboard separates the two. After that, gently remove the cardboard. Observe and record what happens.

Now, reverse the jars' positions then carefully remove the cardboard. Observe and record what happens.

Guide Questions:

1. What is the direction of the flow of warm water and cold water in the first set up?

2. What is the direction of the flow of warm water and cold water in the second set up?
3. What is the direction of heat flow in liquids?
4. If both jars are equally hot, what do you think will happen? Why?
5. If both jars are equally cold, what do you think will happen? Why?
6. What conclusion about heat transfer can you formulate or draw out from this activity?

How does the Sun dry your clothes when it's too far away from Earth? Observe what happens to your clothes when exposed to sunlight.

How about sitting near a barbecue stand where live coals are used for grilling? What did you feel?

Activity 3: How heat is transferred through radiation?

Objective: Describe how heat is transferred through empty space or vacuum.

What you need: margarine, small plastic plate, spoon, place for direct exposure to sunlight

What to do:

1. Scoop a small portion of the margarine from its container using the spoon and place it on a small plate.
2. Place the plate with margarine under the Sun and observe for five minutes. Record your observation in your notebook.

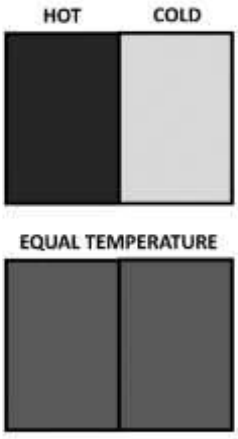
Guide Questions:

1. What happened to the margarine after exposing it to the Sun?
2. Why do you think it happened?
3. What do you think made the change on the margarine?
4. Predict what might happen to the margarine if it is continuously exposed to lamp/ Sun for a long period of time.
5. Why is it necessary that margarine or butter should be kept refrigerated?
6. Based on the activity, what can you say about heat transfer through radiation?

What is It

Points to Remember:

Heat can travel through solids by **conduction.** Conduction is the transfer of heat energy through direct contact between the heat source and another object. When this happens, heat energy moves out of the warmer object into the cooler object due to temperature difference. This heat transfer continues until both objects reach the same temperature (or thermal equilibrium).The figure at the right illustrates this.



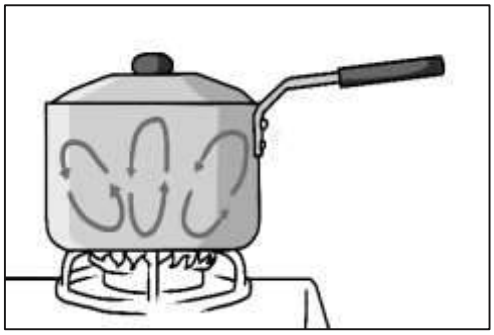
The illustration below shows conduction. The heat from the lighted candle travels to the spoon (cold object) by direct contact causing the spoon to become hot.

Another example of conduction is shown below. The heat from water travels to the ladle by direct contact.

The water and the ladle are composed of small particles called molecules. Heat energy makes the molecules in the object move faster. The fast movements of the water molecules make the cooler ladle molecules move fast, too. As the fast moving particles collide with the slow moving particles, energy is transferred. As a result, more molecules move fast. This movement of water molecules continue until heat is spread uniformly throughout the materials.

There are materials that allow heat to flow through easily. We call them **conductors**. Metals are good conductors. That's why we use them as cooking utensils because heat moves fast through the metal pan to the food. There are materials through which heat passes slowly or not at all. We call them **insulators**. Some insulators are wood, plastic and ceramic.

Heat Travels by Convection



Convection is the transfer of heat by the movement of the heated parts of a liquid or gas. Fluids include liquids and gases. Convection involves the motion of fluids in circulating currents. When water is heated in a kettle, the molecules at the bottom get heated first. The heated molecules move and rise pushing the top molecules, which are cold, to the bottom. The colder molecules sink, get heated at the bottom, and move up. Warm fluid rises and cold fluid sinks forming circulating currents. The heat moves from a higher temperature region to a lower temperature region. This movement continues until the fluid is evenly heated and you see bubbles forming.

This is also true with winds and breezes. Warm air rises, expands and cools. Cool air sinks. Convection is the reason why we have wind movements and local breezes. During daytime, air over the land is heated. It rises and expands. Cool air over the sea moves towards the land. That's why you feel a refreshing breeze by the seaside during daytime.

Heat Travels by Radiation

Heat can also be transmitted across empty space or vacuum. This is called **radiation**. Radiation does not depend on the presence of matter to transfer heat. Radiant energy travels as waves through space. Heat waves hit Earth and cause warming. The Earth's atmosphere traps the heat from the Sun.

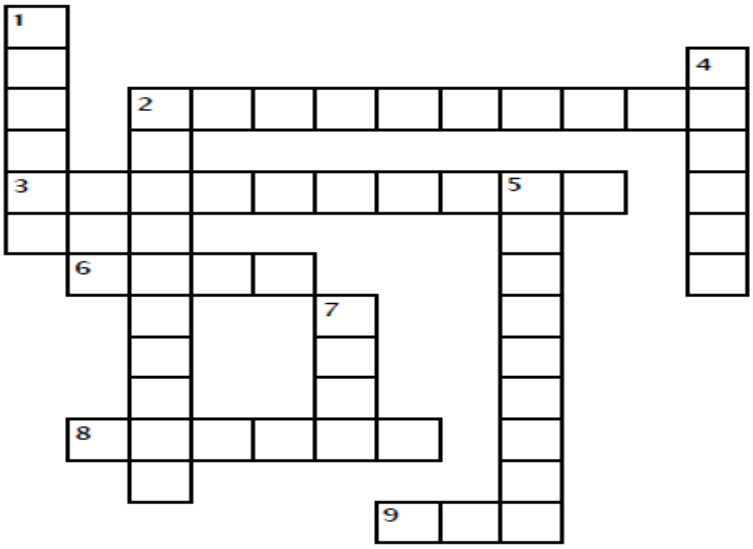
Your house gets warm when the Sun's waves or rays travel through a window and are trapped in your house. Heat waves are invisible. All warm objects radiate or give off heat waves. Some other examples of heat transfer by radiation are: the heat you feel when you are near a fire source, the heat given off by an electric heater, and the heat near a hot oven.

Amazing! I hope you got the concepts about heat transfer.

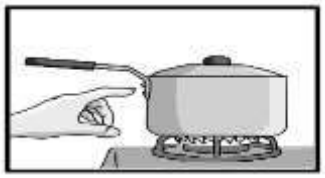
What's More

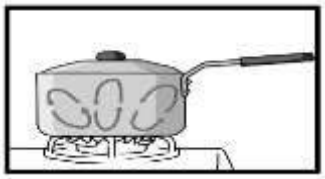
A. Directions: Guess the Word. Solve the puzzle, use the clues below. Write your answer in your science notebook.

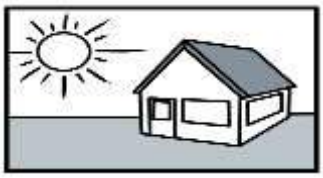
Down	Across
1 Heat can be transferred through _____ contact by the heat source and the body receiving the heat. 2 Heat transfer by the movement of heated parts of liquid or gas. 4 Heat is a form of _____. 5 Heat transfer through space 7 Heat transfer from a hot object to _____ object.	2 Heat transfer through direct contact 3 Materials that transfer heat easily 6 A form of energy that keeps us warm 8 Heat can travel through _____ in conduction. 9 The greatest source of heat energy.

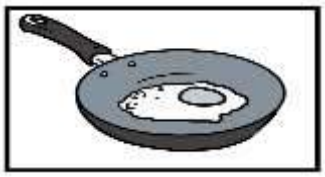


B. Directions: Identify how heat travels in each illustration whether it shows **conduction, convection** or **radiation**. Write your answer in your science notebook.

1. 

2. 

3. 

4. 

5. 

C. Directions: Identify what kind of heat transfer is described in the situations below. Choose your answer from the words listed in the box. Write your answer in your science notebook.

conduction	convection	radiation

1. campfire
2. boiling water
3. heating the iron
4. warming of nail over the lighted candle
5. drying of clothes under the heat of the Sun

D. Directions: Decode the hidden word by filling the blank with the correct letters as indicated by the following numbers. Then, write a sentence describing the meaning of the words that are formed.

A	B	C	D	E	F	G	H	I	J	K	L
1	2	3	4	5	6	7	8	9	10	11	12
M	N	O	P	Q	R	S	T	U	V	W	X
13	14	15	16	17	18	19	20	21	22	23	24
Y	Z										
25	26										

1. ____ ____ ____ ____
   8 5 1 20

2. ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
   3 15 14 4 21 3 20 9 15 14

3. ____ ____ ____ ____ ____ ____ ____ ____ ____
   18 1 4 9 1 20 9 15 14

4. ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
   3 15 14 22 5 3 20 9 15 14

5. ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
   20 5 13 16 5 18 1 20 21 18 5

You are really enlightened now! Great job! Now, let's see if you can connect your learnings with real life situations.

What I Have Learned

Directions: Write **TRUE** if the statement is correct and **FALSE** if it is not. Then, change the part that makes the sentence incorrect. Do it in your science notebook.

1. Radiation is the heat transfer through space.
2. Heat transfer occurs in solid through conduction.
3. Radiation is the transfer of heat by movement of fluids.
4. Conduction is the transfer of heat through physical contact.
5. Heat moves from a lower temperature region to higher temperature region.
6. The method of heat transfer between the hot water and the metal spoon is called convection.

Way to go! This time let's see if you can apply what you learned in real-life situations. Good luck!

What I Can Do

Directions: Answer the following questions briefly in your science notebook.

1. Why do we need to use a pot holder when we are removing hot casseroles or any hot cooking wares out of the stoves?
2. When we expose half of an iron nail outside on a sunny day, then we cover the other half with cartoon, the covered half still gets heated. Why is this so?
3. When is the best time for us to dry our clothes outdoors, during sunny day or a cloudy day? Why?
4. Staying too long under sunlight may damage our skin due to the radiation. What must we do to protect our skin from being hurt or injured by the heat of the Sun?

Amazing! You reason out so well. It's time for the final test. Good luck!

Assessment

Directions: Write the letter of the correct answer in your science notebook.

1. What energy transfer is shown through direct contact of the heat source and the body receiving the heat?
   a. conduction c. heat
   b. convection d. radiation
2. Which of these activities show heat transfer by radiation?
   a. boiling egg c. refrigeration
   b. heating the wire d. lighting the room with a bulb
3. When one uses an exhaust fan, what kind of heat transfer is demonstrated?
   a. conduction c. nuclear
   b. convection d. radiation
4. Which of the illustrations show heat transfer?

   a.  b.  c.  d. 

5. Which of the following DOES NOT show transfer of heat energy?
   a. boiling water in a kettle
   b. cutting paper in small pieces
   c. lighting a room with a fluorescent lamp
   d. placing a spoon in a cup of hot coffee
6. What is the direction of flow of heat transfer?
   a. from hot to cold c. from cold to hot
   b. from bottom to top d. from side to side
7. How is heat transferred in solid materials?
   a. through radiation c. through vacuum
   b. through conduction d. through convection
8. What happens to a liquid when heated?
   a. It remains the same. c. It increases in temperature.
   b. It increases in volume. d. It increases its water level.

9. What will happen to butter and chocolate bar when they are continuously exposed to heat?
   a. They may become heavier. c. They may melt.
   b. They may decrease in volume. d. They may expand.
10. When heat is transferred through gases it is called _____.
   a. convection b. radiation c. conduction d. roasting
11. Which of the following is NOT true?
   a. Convection is the transfer of heat energy by circulating currents.
   b. Heat energy transfers from a colder body or cooler region to a hotter body or warmer region.
   c. Heat energy transfers by convection in liquids and gases.
   d. Conduction is the transfer of heat energy from molecule to molecule or atoms in an object.
12. During heating, the water at the bottom of a jar gets heated first and begins to rise. As warm water rises, cold water goes down. This shows what kind of heat transfer?
   a. conduction b. convection c. insulation d. radiation
13. You left a fork in a bowl of hot water. When you got the fork, you observed that it became hotter. What do you call the heat transfer involved in the situation?
   a. conduction b. convection c. insulation d. radiation
14. Which of the following shows convection?
   a. A spoon gets hot when left in a bowl of hot soup.
   b. A girl holding a hot spoon felt her fingers becoming warm.
   c. Larry feels his head and arms getting warm as he walks under the Sun.
   d. The hot surface of the land heats the air above it and the air becomes warm.
15. Grade IV pupils went camping. They lighted a bonfire and they felt their face and arms were getting warm. How did the heat from the fire transfer to the pupils?
   a. through radiation c. through insulation
   b. through convection d. through conduction

Additional Activities

Directions: Write a simple reflection about what you have learned in this module by completing these statements. Do it in your science notebook.

1. In this module, I discovered that_____.
2. The most exciting activity for me was_____.
3. The easiest lesson for me was _____while the hardest was _____.
4. Next time, I want to learn more about_____.
5. I will use all that I have learned by _____.

Congratulations! You did great! Now, you may proceed to the next module. Good luck, keep learning and have fun!

What I Can Do

1. Laser pointers can damage the person's eyes.

2. Towards the source of light.

Assessment

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

B. (Straight lines moving outwardly from the source of light.)

Additional Activities

Pupils' answers may vary.

LESSON 2- How Sound Travels

What's In

1. Light travels in a straight line.
2. Yes, because the light from the candle will pass through straight to the aligned holes of the cardboard.
3. No, because one cardboard is not aligned.

What's New

Activity 1: How Sound Travels in Different Materials
Answers to Guide Questions:

- I will hear a scratching sound.
- Yes
- Solid
- Yes, sound travels in water and air
- Water

What's More

A

1. TRUE 3. FALSE 5. FALSE
2. TRUE 4. TRUE

What I Know

A. 1. FACT 2. BLUFF 3. BLUFF
4. FACT 5. BLUFF 6. FACT
7. FACT 8. FACT 9. BLUFF
10. FACT

B. 1. conduction 2. radiation 3. convection
4. conduction 5. radiation

LESSON 1- How Light Travels

What's In

A. 1. magnetic axis 3. magnetic field
2. magnetic poles
B. 1. repel 2. attract 3. repel
4. repel 5. attract 6. attract

What's New

Activity 1: The Right Path
Answers to Guide Questions:
1. The light passed through.
2. The light did not pass through.
3. Yes
4. No, shadow was formed.
5. Yes, straight path.
6. Light travels in a straight line until it hits a material. When light is blocked, a shadow is formed.

What's More

A

1. FALSE 3. FALSE 5. FALSE
2. TRUE 4. TRUE

B. 1. ✓ 2. X 3. X 4. X 5. X 6. ✓

What I Have Learned

Light travels in a straight line until it hits a material. Shadows are formed when light is blocked.

Answer Key

What's New

Activity 1: You're Hot and You're Cold

Answers to Guide Questions:
1. It became hotter.
2. It became colder.
3. It became hotter because heat from the water was absorbed by the mug.
4. Heat travels in solids from hot to cold materials.

Activity 2: Up, Down, and Spin Around

Answers to Guide Questions:
1. upward, towards the cold water
2. going down, towards the cold water
3. from hot to cold region
4. There will be no movement. Temperature differences make the movement of heat from hot to cold region.
5. There will be no movement. There is no difference in temperature.
6. Heat travels in water from hot to cold region.

Activity 3: How heat is transferred through radiation?
1. It melted.
2. The sun's heat traveled in space and absorbed by the margarine.
3. The increase in temperature.
4. It will turn into liquid.
5. To maintain its low temperature and for it to remain solid
6. Heat is transferred through space.

What's More

A.

1- direct	6- heat
2- down: convection; across- conduction	7- cold
3- conductors	8- solids
4- energy	9- sun
5- radiation	

B.1. conduction 3. radiation 5. radiation
2. convection 4. conduction

C.1. radiation 3. conduction 5. radiation
2. convection 4. radiation

D.1. HEAT 3. RADIATION 5. TEMPERATURE
2. CONDUCTION 4. CONVECTION

What I Have Learned

1. TRUE 2. TRUE
3. FALSE- radiation should be changed to convection
4. TRUE
5. FALSE- high temperature to low temperature
6. FALSE, convection should be changed to conduction

Exercise 2- Fill in the blanks

1. speeds 2. medium 3. Solid
4. liquid 5. gas 6. closer

What I Have Learned

Sound travels in solid, liquid, and gas. It travels fastest in solid, faster in liquid, and slowest in gas. Sound needs a medium to travel through.

What I Can Do

1. Sound can travel easily in solids.
2. Move out of the way of the ambulance or fire truck because it could be an emergency.
3. To hear the heartbeat and sounds of the internal parts of the body

Assessment

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

B. 1. Sound travels when the boy hit the drums.
2. The sound of the whale travels in water.
3. Sound travels when the boy hits the table.
4. Sound travels from the can, then through the string until it reaches the other end of the line.
5. The sound of the barking dog is heard by the man because sound travels in air.

Additional Activities

Solids, Sound, Fast, Travel, Liquid, Faster, Fastest, Gas, Medium

Sound travels in different medium. It travels fast in gas, faster in liquid, and fastest in solids.

LESSON 3- How Heat Travels

What's In

1-vibration	5- liquids
2- medium	6- sound
3- sound waves	7- vacuum
4- solids	8- gases

What I Can Do

1. Pot holder protects us from very hot casseroles because it is a poor conductor of heat.
2. Heat travels through space and reaches the exposed part of the nail.
3. Sunny day because the sun's rays can readily travel through space and dries the clothes.
4. We should use protective materials like shades and umbrella.

Assessment

1. a	2. d	3. b	4. d	5. b
6. a	7. b	8. c	9. c	10. a
11. b	12. b	13. a	14. d	15. a

Additional Activities

Pupils' answers may vary.

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4

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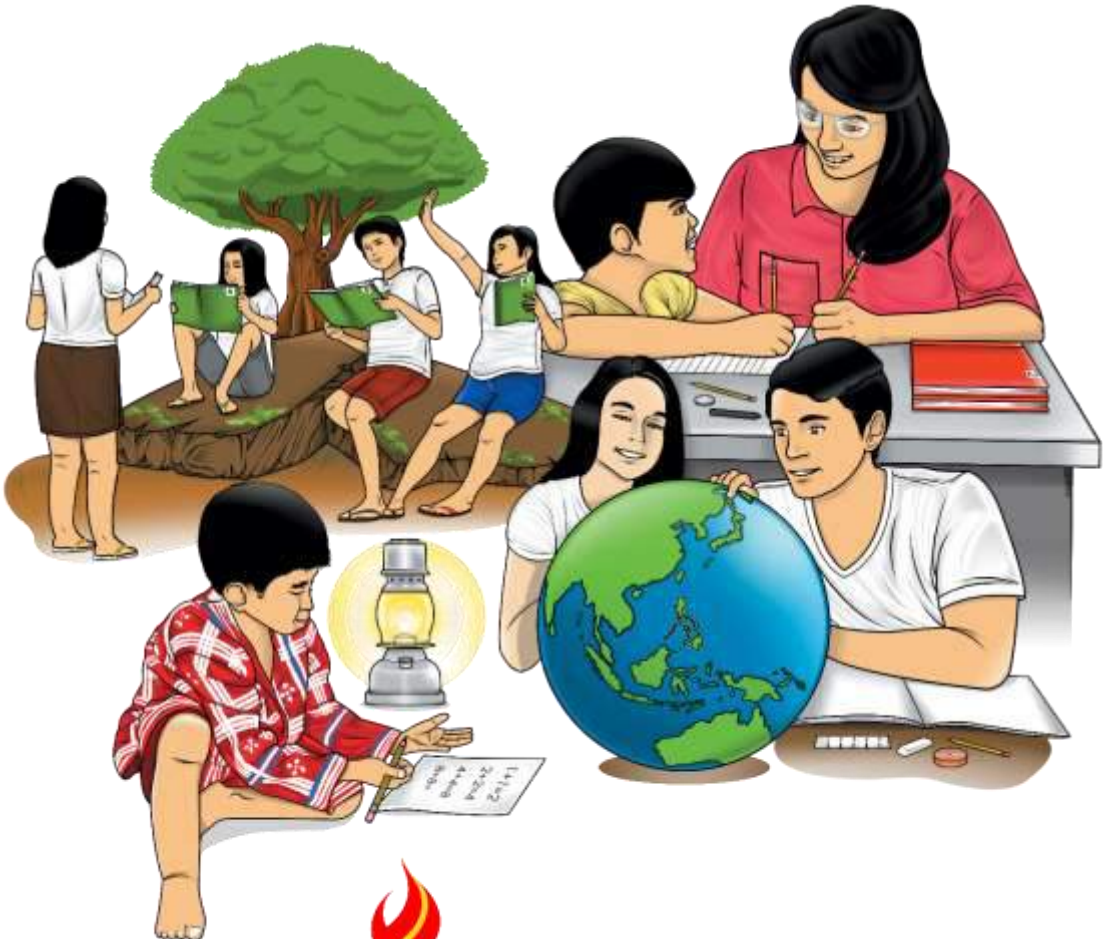
Science

Quarter 3 – Module 4:
Properties and Characteristics of Light and Sound



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ADM

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4

Science

Quarter 3 – Module 4:
Properties and Characteristics of Light and Sound

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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

In your past lesson, you have learned that light and sound are forms of energy which have different properties and characteristics. Sound and light are similar in the sense that both travel in waves. There are lots of sounds in everyday life and each sound has certain characteristics that make it unique. On the other hand, light is all around us. Without it, we will be in total darkness because light wave is generally associated with color and brightness. Just like sound, light has different properties and it is important that we know them to make our lives even better.

The lesson will focus on:

- Lesson 1- Properties of Light (S4FE-III h-5)
- Lesson 2- Properties and Characteristics of Sound (S4FE-III h-5)

After going through this module, you are expected to be able to:

1. identify transparent, translucent and opaque materials;
2. describe what happens when light hits an opaque and transparent material;
3. investigate how sound is produced;
4. describe how loud and soft sounds are produced;
5. infer that sound could be reflected in a form of echo; and
6. describe through various activities that sound can be reflected in the form of echo.

What I Know

Directions: Write "**FACT"** if the statement is true and "**BLUFF"** if it is not. Do this in your Science notebook.

1. Light and sound travel in waves.
2. The bouncing of light is called reflection.
3. Light bends as it hits an opaque material.
4. Shiny objects reflect more light than dull objects.
5. The more energy, the softer the sound produced.
6. Sound bounces back when it hits a hard material.
7. Light can be separated into 7 different bands of colors.
8. The sound that can be heard by a person has no limits.
9. The sound heard by a person is due to the vibration of an object.
10. Reflection of light can only be demonstrated by mirrors and shiny objects.
11. Sound waves are always bounced back and cannot be absorbed by objects.
12. When somebody faces a mirror, his reflection can be seen in reversed manner.
13. Loudness of sound depends on the area of the vibrating body and distance of the listener from the source of sound.
14. The stronger the source of light, the bigger the shadow and the bigger the source of light, the smaller the shadow.
15. Light can either be absorbed or reflected by the object. Absorption and reflection of light cannot happen at the same time.

Check your work and collect your stars.

0-7 It's okay, you can still do better in the next activities. ★	8-11Good job! You are doing well! ★ ★ ★	12-15 Amazing! You got a great score. Keep it up! ★ ★ ★ ★ ★

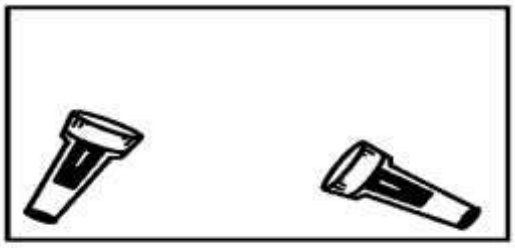
Lesson 1	“Properties of Light”

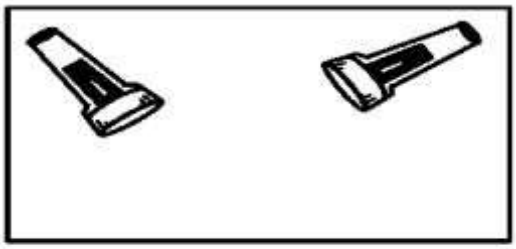
Earth has been gifted with light from the sun. It is our most important source of energy. Light warms us, enables plants to produce oxygen and allows us to find our way around all day. Without light, life is not possible. Do you know the properties and characteristics of this important energy?

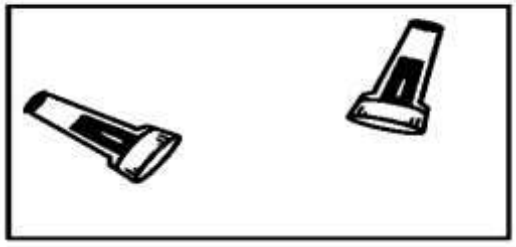
This lesson will introduce us on the different properties of light.

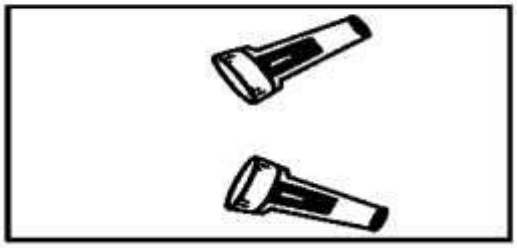
What’s In

Directions: Draw the path of light in the following pictures using lines. Then answer the questions that follow. Do this in your science notebook.

1. 

2. 

3. 

4. 

Question: Based on your drawing, describe how light travels?

_____

_____

_____

Very good! Now, you may proceed to the activities about the properties of light.

What's New

Note to Parent/Learning Facilitator: Guide your children in doing this activity. Be careful in handling the materials while performing the activity**.**

For the learner: Do the activities carefully and strictly follow the safety precautions found in each activity. Do not aim the source of light to your eyes or someone's eyes.

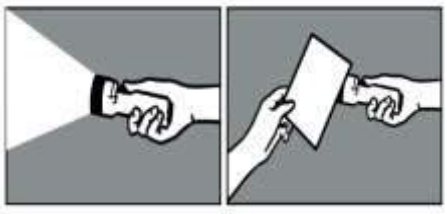
Directions: Perform the activities below and answer the guide questions. Write your answers in your science notebook.

Activity 1: To Pass or Not to Pass

What you need: flashlight, cardboard, glass slab, book, glass with water, cloth

What to do:

1. Hold the flashlight and turn it on.
2. At 10cm from the flashlight, try to block the flashlight with the following materials one at a time: cardboard, glass slab, book, glass with water, cloth.



3. Observe what happens to the beam of light each time. Write your observations in the the table below.

Materials	What happens to light?
card board	
book	
glass slab	
glass with water	
thick cloth	

Guide Questions:

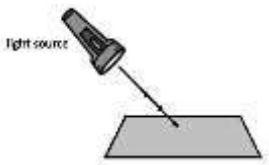
1. Which materials allowed light to pass through? How are they the same?
2. Which materials did not allow any light to pass through? How are they the same? What do you think will happen to light?
3. What happened to light as it passed through the cloth?
4. What does this say about light?

Activity 2: Bouncing Light

What you need: laser pointer or flashlight and a mirror

What to do:

1. Aim the laser pointer or flash light at an angle to the center of the mirror just like the picture below.
   Note: Do not aim the laser pointer to your eyes or somebody's eyes because it can cause harm.



2. Draw what happens to the light after it hits the mirror.

Guide Questions:

1. What happens to light after it hits the mirror?
2. What does it say about light?

Activity 3: The Broken Pencil

What you need: transparent glass, pencil, water

What to do:

1. Get a transparent glass half-filled with water.
2. Place a pencil inside the glass of water. Observe how the pencil would look like from the top and from the side of the glass.
3. Remove the pencil out of the water. Compare the pencil before and after removing the pencil outside of the glass of water.

Guide Questions:

1. What happens to the pencil when you look at it from the top of the glass?
2. What happens to the pencil when you look at it from the side of the glass?
3. What is the difference when you look at the pencil from the top and from the side of the glass?
4. Is there a difference between the way it looks inside the glass of water and outside the glass of water?
5. What does this say about light when it passes through different materials or sets of medium?

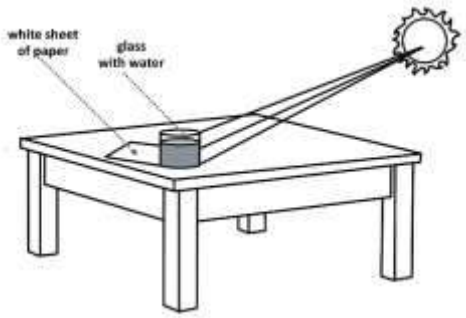
What does a rainbow tell you about light? Can you make your own rainbow? You will know more about the relationship of rainbows with light in the following activity.

Activity 4: I See Your True Colors

What you need: glass with water, bond paper, bright sunlight

What to do:

1. Set a glass of water on top of the table exposed to bright sunlight.
2. Place the white bond paper underneath the glass of water. Observe the ray of light that passes through the glass.



Guide Questions:

1. What happens to the ray of light that passes through the glass of water?
2. What are the different colors that you saw? Identify them in order. Where do you usually see such kind of colors?
3. What can you say now about light?

I hope you got similar answers. Congratulations for being such a hardworking learner. Keep it up!

What is It

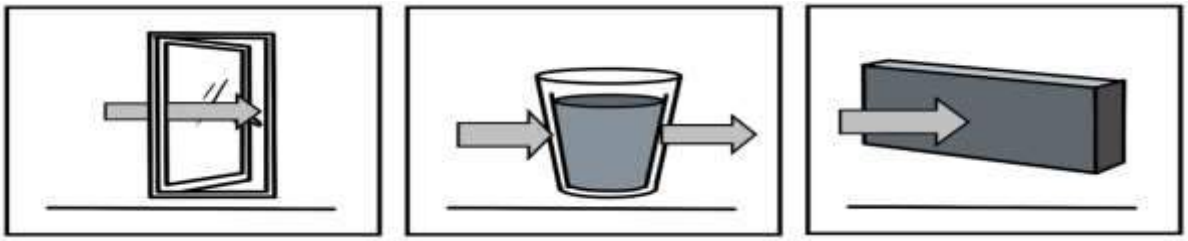
What happens to light when it hits a material?

Some materials will allow light to pass through them thus you can clearly see through that object. They are classified as **transparent materials**.

Some materials will allow some light to pass through while the remaining light will scatter. These are **translucent materials** and you can usually see fuzzy or unclear images through this kind of materials.

Some materials do not allow light to pass through them. These materials are called **opaque materials.** As they blocked any light from passing through them, you cannot see on the other side of the material.

The arrows in the following diagrams show how light behaves when it strikes different materials. More specifically, the pictures show the different behaviour of light as it strikes to different types of materials.

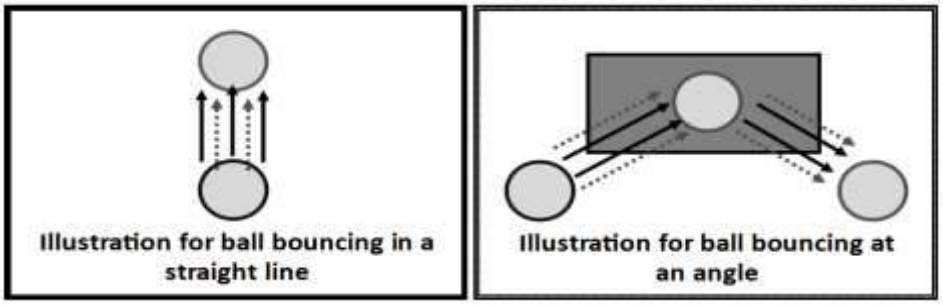


transparent window glass of water block of wood

What happens to light on the surface of the material?

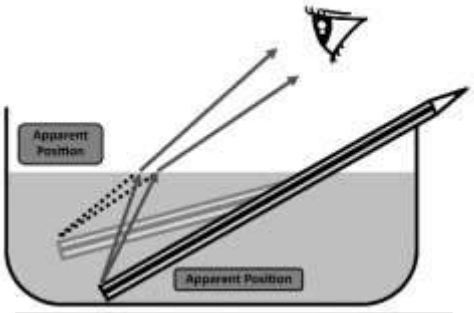
When light strikes a very smooth opaque surface, light bounces back in the same direction. The way light bounces back is very much similar to the way a ball bounces back on a hard smooth surface. When you throw a ball straight down, it will bounce straight back at you. When you throw a ball at an angle, it will bounce off at the same angle away from you. Light behaves in the same way when it hit the mirror which has a very smooth

surface. Light bounces off at the same angle that it struck the mirror. This bouncing of light is called **reflection.**



What happens to light when it passes through different materials?

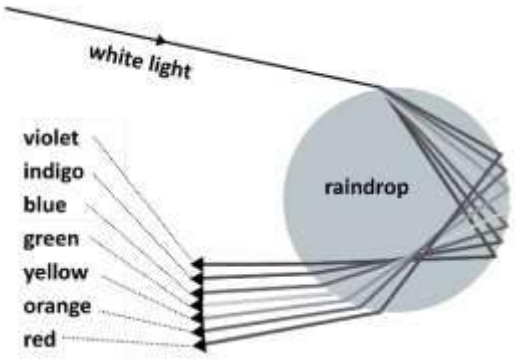
In the activity you had, the pencil appears to be broken when viewed at an angle. This appearance shows that when light passes through different transparent materials (from the air to the glass of water), it changes direction resulting in what appears to be bending of light. This change in direction is due to the light traveling slower in the water and the glass than it did in the air. This bending of light is called refraction. **Refraction** only happens when light moves from one transparent material or medium such as in air to glass and in glass to water.



Refraction of pencil in a glass of water as seen by the human eye

This visual effect is witnessed if you look at a pencil in a glass half-filled with water. As you look at the pencil from the top or on one side, the pencil appeared bent at the water surface. However, when you took it out of the glass, it was still as straight as it was before you put it into the glass with water. When part of it was placed in the glass of water, it looked bent. It even appeared as if it was cut and its lower end was bigger. But when you raised the pencil and touched, it was not bent and the lower end is on the same size as the upper part.

Rainbows are formed from the interaction of light and the rain drops. Below is a diagram of what happens to light when it strikes a droplet. During rainbow formation, two things happen to the light: refraction and reflection. Refraction happens as some of the sunlight enters the surface of the droplet. This bends light and will initially separate them into different bands of light (colors) that will be reflected at the back of the droplet. As the bands exit the raindrop, it will be further refracted into the order of colors displayed in a rainbow arc.Sir Isaac Newton assigned the 7 different color division into the following order of colors: **RED, ORANGE, YELLOW, GREEN, BLUE, INDIGO, and VIOLET (ROYGBIV).**

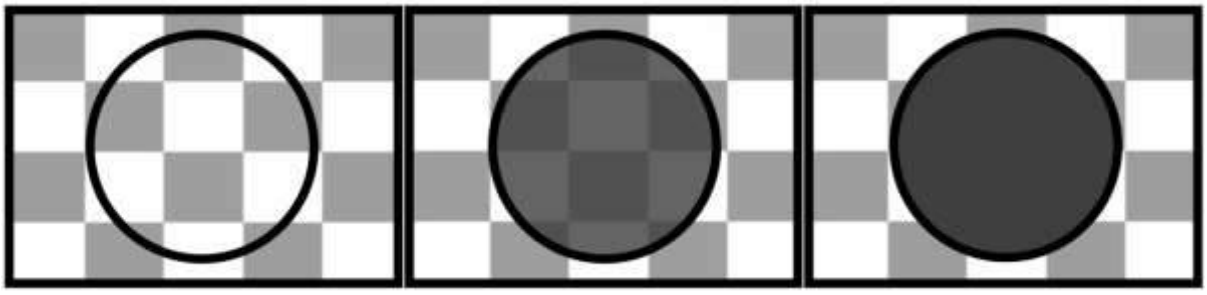


Rainbow formation through refraction and reflection of light

What's More

Activity 1: What Material Am I?

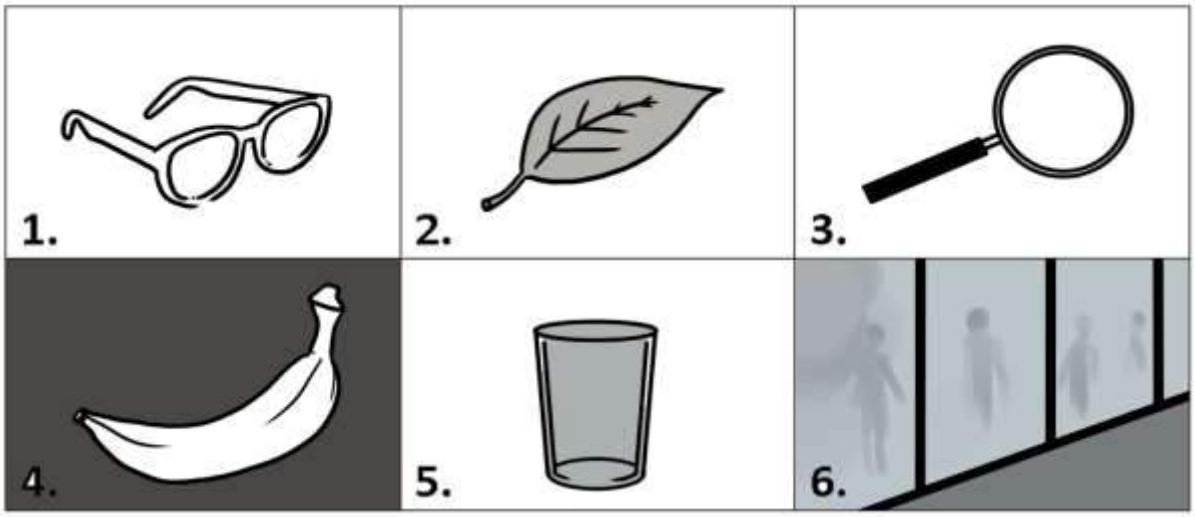
Directions: Identify which material is transparent, translucent and opaque. Write your answer in your science notebook.



1 2 3

Activity 2: Transparent, Translucent or Opaque?

Directions: Identify whether the following objects are transparent, translucent, or opaque. Write your answers in your Science notebook.



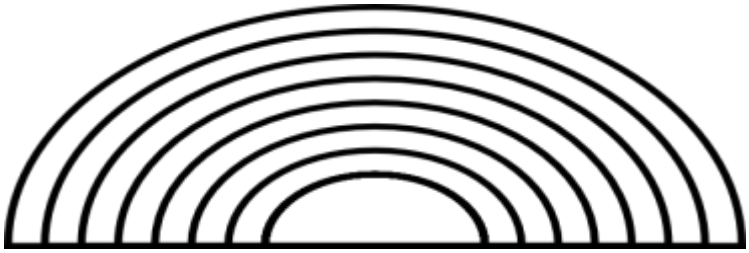
Activity 3: Reflect or Bend?

Directions: Determine whether light will **reflect** or **bend** when it hits the following materials. Write your answer in your science notebook.

1. mirror - _____
2. spoon - _____
3. straw in water - _____
4. magnifying glass - _____
5. prism - _____

Activity 4: Colors of Light

Directions: Draw a rainbow with the colors of light in correct order. Do this in your science notebook.



Check your answers. I hope you got the correct answers. If not, please remember the correct concepts this time. Alright? Now, it's time to wrap up everything that you've learned.

What I Have Learned

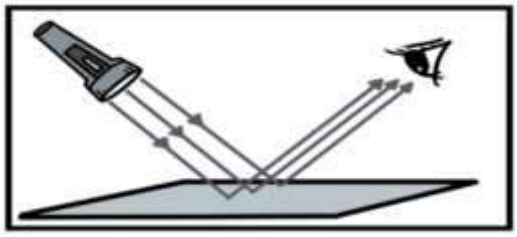
Directions: Complete the statements below. Write your answers in your Science notebook.

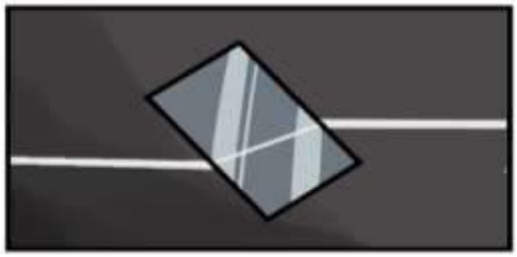
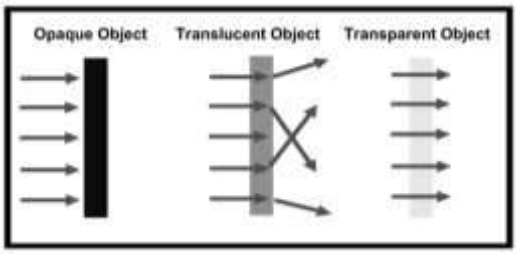
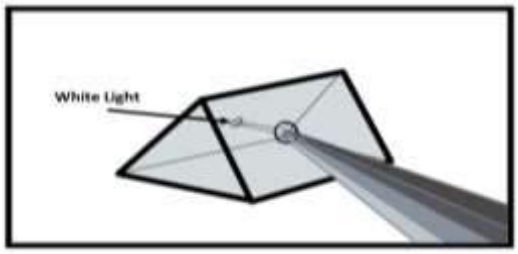
1. The bouncing of light is called _____.
2. The bending of light is called _____.
3. An object that is clear and almost all light can pass through it is called as _____.
4. An object that is cloudy and only part of the light can pass through is described as _____.
5. An object that light cannot pass through is called as _____.
6. Light is made up of _____ different colors bands.

Very good! Now, it's time to apply what you have learned.

What I Can Do

Directions: Look at the diagrams below and describe what each tells about the properties and characteristics of light.

Diagram	What does this tell about light?
1. 	

2.		
3.		
4.		

Perfect! Now, it's time for the final test!

Assessment

Directions: Read and answer the following questions. Write the letter of the correct answers in your science notebook.

1. It is the bouncing of light on the smooth surface of an object.
   a. diffusion b. reflection c. refraction d. vibration

2. What do you call the bending of light as it passes through different media?
   a. diffraction b. diffusion c. reflection d. refraction

3. What happens when light meets a thick dark-colored surface?
   a. Light is refracted.
   b. Light travels faster.
   c. Light passes through it.
   d. d. Light is blocked or obstructed.

4. What happens when you focus a pen light through a hole?
   a. Light becomes brighter.
   b. Light changes direction.
   c. Light passes through the hole.
   d. Light is blocked or obstructed.

5. Refraction is the bending of light as it passes from one _____ to another.
   a. area b. boundary c. glass d. medium

6. When light travels from air to glass its speed _____.
   a. increases c. remains the same
   b. decreases d. increases then decreases

7. What happens to light when a coin appears bigger when you look at it through a hand lens?
   a. absorbed b. reflected c. refracted d. stopped

8. What happens when light is separated into different colors through a prism?
   a. absorption b. motion c. reflection d. refraction

9. Why does a person standing waist-deep in a swimming pool appear to have short legs?
   a. Light is refracted.
   b. Light is reflected.
   c. Light is absorbed.
   d. Light is absorbed and reflected.

10. What do you call an object where light cannot pass through?
   a. invisible c. translucent
   b. opaque d. transparent

11. It is an object that is cloudy and only allows part of the light to pass through.
    a. invisible
    b. opaque
    c. translucent
    d. transparent

12. These are materials which allow light to pass through.
    a. invisible
    b. opaque
    c. translucent
    d. transparent

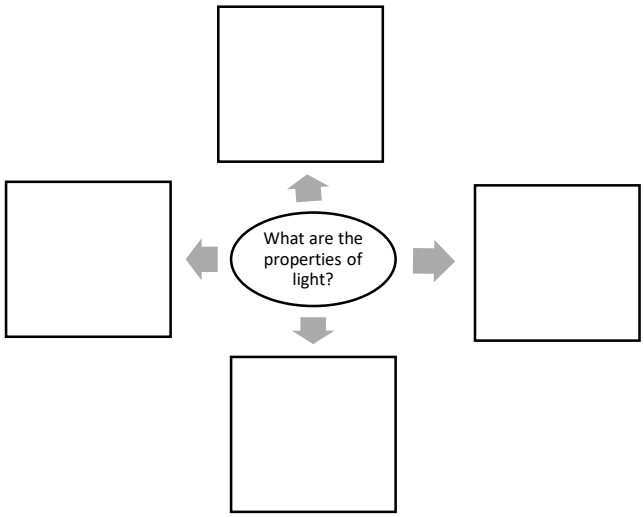
13. Which of the following is a translucent material?
    a. clear window
    b. stained glass window
    c. brick wall
    d. block of wood

14. Your grandmother has plants in her kitchen which need lots of light. What type of windows should have installed that will be best for her indoor plants?
    a. opaque windows
    b. translucent windows
    c. transparent windows
    d. no windows, just walls

15. After a rainstorm, a rainbow may appear in the sky. Which statement explains this observation?
    a. Raindrops act as prisms separating sunlight into color bands.
    b. The white clouds are actually prisms composed of different colors.
    c. The colors of the rainbow come from raindrops in the atmosphere.
    d. When the sunlight is reflected by the ground towards the clouds, it separates into different colors.

Additional Activities

Directions: Complete the semantic web below by listing the properties of light in the surrounding boxes. Do this in your science notebook.



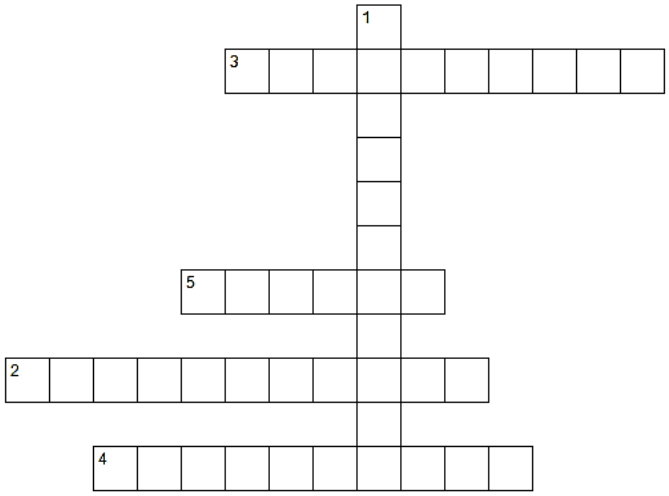
Congratulations! See? With perseverance and hard work, everything will be possible. I'm happy for you! You can now proceed to the next lesson.

Lesson 2 "Properties and Characteristics of Sound"

We use and hear sounds every day. It helps us communicate messages in many different ways, soothes the mind and also makes us relieve stress from our everyday lives. Sound also makes us aware of what is happening around us. Hence, it is important to know its properties and characteristics. This lesson will let us know how sounds are produced, its properties and characteristics.

What's In

Directions: Answer the following crossword puzzle using the given clues.



Across:

2. materials that allow light to pass through
3. happens when light moves from air to glass
4. bouncing of light
5. materials that do not allow light to pass through

Down:

1. materials that allow some light to pass through

Good job! You learned already about concepts on the lesson about properties of light. You are now ready to proceed to the activities about the properties and characteristics of sound.

What's New

Note to Parent/Learning Facilitator: Guide your children in doing this activity. Be careful in handling the materials and observe precautionary measures while performing the activity**.**

For the Learner:

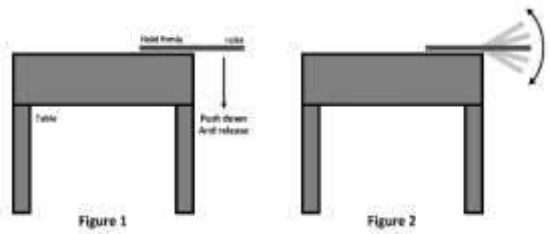
Directions: Perform the activities below and answer the guide questions. Write your answers in your science notebook.

Activity 1: How are sounds produced?

What you need: ruler, table

What to do:

1. Place the ruler over the edge of the table. Hold it firmly.
2. Push/tap it downwards, then let it go, so that the ruler moves back and forth.



Note: Ensure that you hold the ruler firmly and always protect yourself from being hit as it moves.

Guide Questions:

1. What did you exert when you push down the ruler and release it?
2. What happened to the ruler?
3. How will you describe the movement of the ruler?
4. Did you hear a sound?
5. Did the sound coming from the moving ruler suddenly stop when you held it?

6. What happened to the ruler when you released it again? Did you hear a sound?
7. How do you think sounds are produced?

When you are watching TV or listening to the radio, to what volume do you usually set your radio or TV? Why? Do you know how soft and loud sounds are made? The following activity might help you answer these questions.

Activity 2: Soft or Loud?

What to use: hands

What to do:

1. Clap your hands slowly and lightly three times. Listen to the sound.
2. Clap your hands faster and stronger three times. Listen to the sound.

Guide Questions:

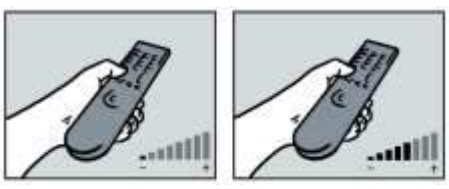
1. When you clapped your hands slowly and lightly, what kind of sound did you produce?
2. Why do you think so?
3. How about when you clapped your hands faster and stronger, what kind of sound were you able to produce?
4. What do you think is the reason?
5. What does this tell about sound?

Activity 3: Higher, Lower Volume

What to use: radio/ television set

What to do:

1. Turn on the radio/ TV set. Set it to the lowest volume. Listen to the sound.
2. Then, set the radio/TV set to the highest volume. Listen to the sound.



3. Compare the sound produced on different volume levels.
4. Go farther away from the radio/ TV set. Compare the sound when you're near and when you're far.

Note: High volume can damage your ear. Please stop setting the TV to a higher volume when the sound becomes in tolerable. Do this activity with the guidance of your guardian or an older family member.

Guide Questions:

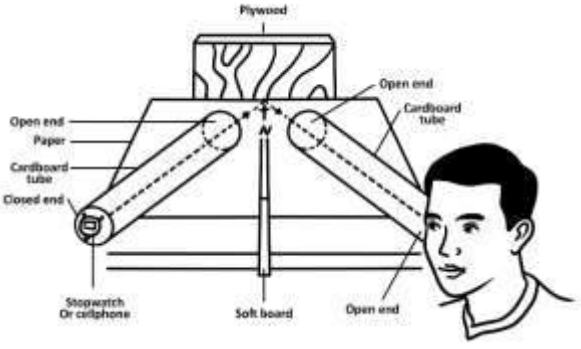
1. When you set the radio/ TV set to volume one, what can you say about the sound produced?
2. How about when we set the radio/ TV set to a high volume?
3. What can you say about the sound when you hear it near from the source (radio/ TV set)? How about when you hear it far from the source (radio/ TV set)?
4. What does this say about sound?

Activity 4: Bouncing Sound

What you need: two pieces of wood, an open space with a flat wall

What to do:

1. A stopwatch is placed inside the end part of the tube. If cellphone will be used, place itat the end of the tube. The cardboard tube will have one end open and the other end closed. Place the tube at least 45-degree angle as shown in the illustration.



2. Another cardboard tube with both ends open is adjusted at 45-degree angle so that one ear is placed close to one end of the tube to hear the loudest possible sound of the stopwatch or the cellphone. The set-up is shown in the figure.

Note: To protect your exposed ear to the tube, position itat least 5 centimeters away from the end of the tube to protect it from too much sound. Close your left ear that is not exposed to the tube to know if you will hear a sound.

3. Play a ringtone from the cellphone or turn on the stopwatch to produce sound.

Guide Questions:

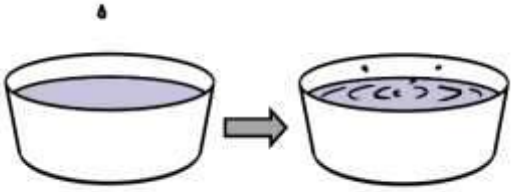
1. Did you hear the sound of the cellphone or the stopwatch?
2. What does this say about sound?

Great! I hope you enjoyed and learned from the activities.

What is It

Sound is a type of energy made by **vibrations**. When any object vibrates, it causes movement in the air particles surrounding it. These particles bump into the particles close to them, which makes them vibrate too causing them to bump into more air particles. These movements, called **sound waves**, keep going until they run out of energy.

The picture below shows a drop of water dropped into a basin filled with calm water. This will then form the rings of waves that will expand indefinitely until the water becomes calm or still again. The same is true with sound.



The sounds that you hear may vary in different ways. Some sounds may be too loud while others may be too soft. When you describe a sound, the first thing you think about is loudness. You may whisper around a sleeping baby, but might give an all-out shout when your favorite basketball player scored in a crucial end-game.

Loudness is a measure of how strong a sound seems to us. This volume of sound would depend on the strength of a vibration. If we apply greater force in an object, we produce loud sounds. If we apply lesser force in an object, we can produce soft sounds. A stronger force causes a louder volume of sound as in the case of the rumbling thunder while a lesser force makes softer sound like the soft breeze of a fine day. Other soft sounds may not be loud enough to be heard by the human ear while some loud sounds may not be pleasing to the ears.

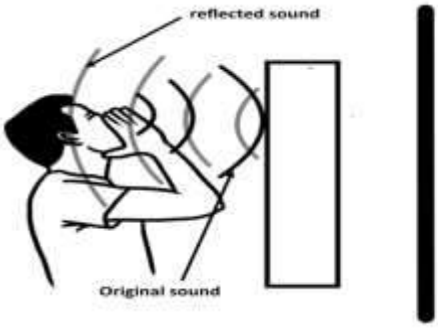
These sound waves may travel and pass these vibrations into our ears thus we 'hear' the sound. If you are near the source, the sound you usually hear seems louder and then it gradually fades or becomes softer as we move away from it. The sound does not lose some of its energy as it travel through the air. The energy just spreads out to cover a larger area.

People react to sounds in different ways. Some sound can distract us and break our concentration. When this happens, the sound becomes unwanted noise. Noise is any undesirable sound which disturbs the activities of human or animal life. Sometimes it is the repetitive nature of a certain sound and our inability to control it that makes it annoying. Car blowing its horn and the seemingly endless barking of a dog at night are good examples. We also contribute to the production of noise when we talk altogether at the same time in our classroom or at home.

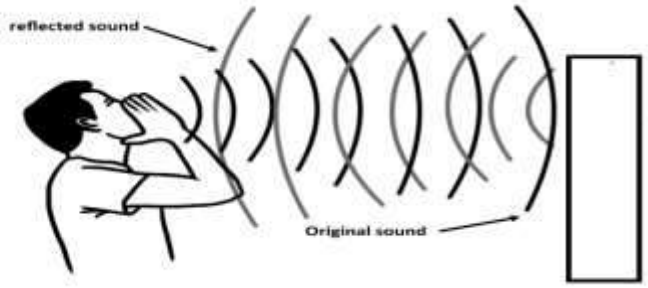
Characteristics of Sound

A sound wave travels at different speed through different media. As it travels, it often bumps into objects it encounters. When sound comes in contact with different materials like walls or carpets, it is either reflected or absorbed. If it hits a hard smooth surface, the wave reflects. The sound wave that is reflected or bounces back is called an **echo**.

An example of an echo is when you shout. Part of the sound waves you created may hit an opposing hard wall or surface. Part of the sound was reflected by the wall that is why you heard the same sound again.



Sound waves when the distance of the source of sound and the wall is less than 9 meters.



Sound waves when the distance of the source of sound and the wall is more than 10 meters.

Sometimes, we cannot hear an echo if we are too close to a big hard wall. The sound we made bounces back very fast and it mixes with the original sound thus we cannot tell which the original sound is and which

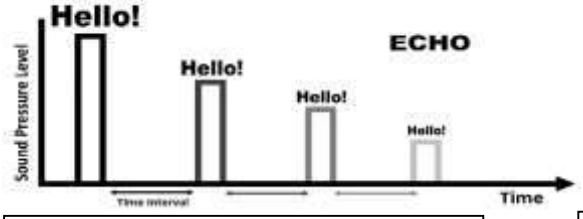


Illustration of echo sound

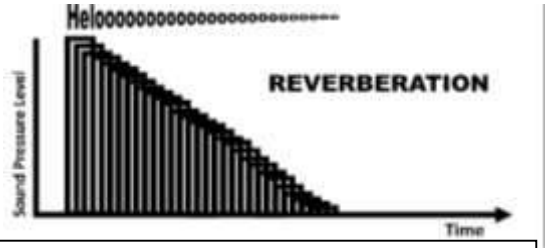


Illustration of reverberation sound

the echo is.Echo is perceived reflected sound with enough time to be distinguished from the original sound. Reverberation happens

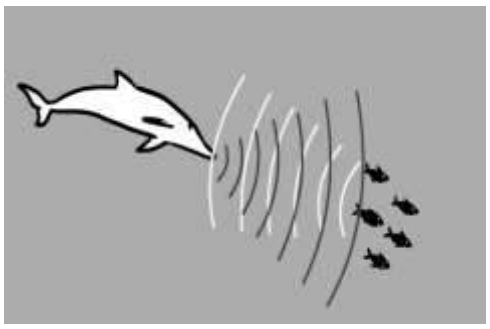
when the time interval is not enough. Reverberation is also described as series or collection of echo.

We do not always hear echoes. Here are some reasons why an echo is not produced.

1. The original sound maybe too weak.
2. The surface absorbs, rather than reflects the sound.
3. The reflecting surface is too small.

Concert halls are covered with carpet and curtains because these materials absorb the sound. So the sound that will be heard by the audience is the initial/ original sound instead of a reflected sound which is neither an echo nor a reverberation.

Ships and bats used echo in locating objects. **Echolocation** is the transmission of sound waves to locate objects. Most species of bats rely on echolocation to help them find their food.



Meanwhile, whales use echoes to move and find their way through the sometimes murky depths of the deep ocean. They send out high-pitched sounds (clicks) which bounces off an object and returned to the whale. The whale can then determine how far the object is. Other than distance, they can also determine such things as texture, shape and size of the object. This helps them in deciding on where the prey and the different objects around the ocean may be.

Echoes have proven to be of wide practical use by applying this concept to many of our navigational equipment such as locating landmarks and for surveillance.

What's More

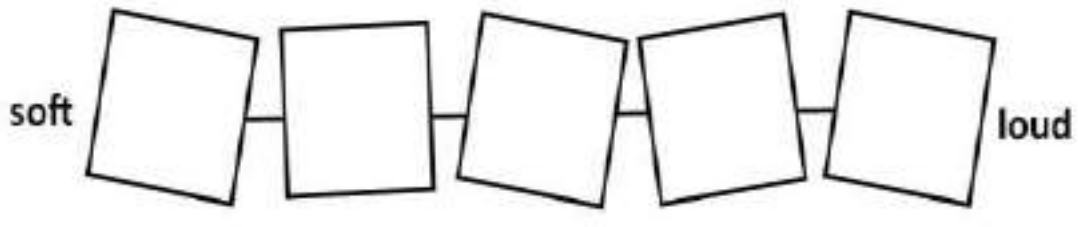
Activity 1: True or False

Directions: Write **"T"** if the statement is **TRUE** and **"F"** if the statement is **FALSE**. Write your answer in your science notebook.

1. The medium travels with the sound.
2. Repeated echo is known as reverberations.
3. Ships and bats used echo in locating objects.
4. Sound waves carry different amounts of energy.
5. The stronger the vibrations of an object, the louder the sound.
6. Hitting an object harder or softer changes its volume/ loudness.
7. Echolocation is the transmission of sound waves to locate objects.
8. The bouncing back of sound when it strikes a barrier is known as echo.
9. Noise is any desirable sound which helps the activities of human or animal life.
10. In order for sound from a speaker to reach a listener, air near the speaker must move to the listener.

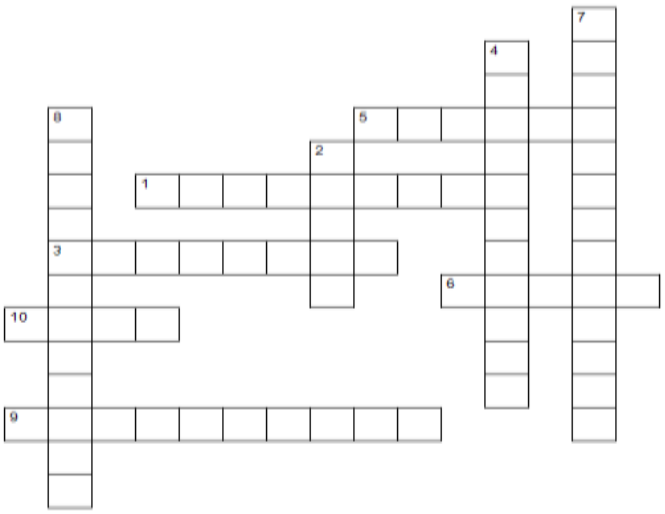
Activity 2: Soft to Loud

Directions: Draw objects that produce soft to loud sounds in order. Do this in your science notebook.



What I Have Learned

Directions: Answer the crossword puzzle below. Do this in your Science notebook.



Across:

1. Sound may be reflected or _____.
3. Measure of how strong a sound is
5. It depends on the strength of vibration.
6. Navies used it to locate sunken ships
9. Sound is a type of energy made by _____
10. Reflection of sound

Down:

2. Undesirable sound
4. Movement of sound
7. Reflection with no enough time interval
8. Used to locate things

Great work! I hope you learned the lesson by this time. Now, it's time to apply your learnings in real life scenarios.

What I Can Do

Directions: Read and answer the following questions. Write your answer in your science notebook.

1. When you are watching TV or listening to the radio, to what volume do you usually set your radio or TV? Why?
2. What might be the reason why the walls of movie houses are designed to be rough?
3. Wild animals have different adaptations or characteristics to help them survive. Why do some animals use echolocation to help in survival?

Assessment

Directions: Read and answer the following questions. Write the letter of the correct answers in your science notebook.

1. Which of the following produce sound?
   a. soft objects
   b. radio stations
   c. vibrating objects
   d. objects under pressure
2. Which of the following would be useful in locating a sunken ship at the bottom of the ocean?
   a. laser
   b. sonar
   c. spectroscope
   d. telescope
3. The loudness and softness of sound is called _____.
   a. amplitude b. echo c. pitch d. volume
4. An echo is an example of sound being _____.
   a. absorbed
   b. broken
   c. reflected
   d. transmitted
5. The quality of being high or low is a sound's _____.
   a. amplitude b. frequency c. loudness d. pitch

6. It is a measure of how strong a sound seems to us.
   a. frequency b. loudness c. noise d. Pitch

7. Which of the following is NOT true about sound?
   a. It is a form of energy.
   b. It is something you see.
   c. It is any vibration in space and time.
   d. It is a type of wave that takes the form of vibrations traveling through air or another material.
8. What happens to sound as you get farther and farther from its source?
   a. becomes louder
   b. becomes softer
   c. becomes flatter then louder
   d. the same as when it was first created

9. Which of the following will make the loudest sound?
   a. dropping a pin
   b. dropping a ballpen
   c. dropping a paper clip
   d. dropping a big box on the floor
10. Which of the following is TRUE about the relationship of force applied to an object and the sound produced?
   a. The greater force applied to an object, the louder the sound produced.
   b. The weaker the force applied to an object, the louder the sound produced.
   c. The greater force applied to an object, the softer the sound produced.
   d. Force has no effect on the loudness or softness of sound.
11. The use of echo to measure distance is known as _____.
   a. echolocation
   b. echo destination
   c. echo dictation
   d. echo displacement
12. It is perceived as a reflected sound with enough time to be distinguished from the original sound.
   a. echo
   b. reverberation
   c. vibration
   d. volume
13. Which of the following is NOT a reason why we do not always hear echoes?
   a. The surface is soft.
   b. The reflecting surface is too small.
   c. The original sound maybe too weak.
   d. The surface absorbs, rather than reflects the sound.
14. Which of the following is NOT related to the loudness of sound?
   a. frequency of the sound
   b. energy of a vibrating object
   c. condition of the air the sound waves travel through
   d. distance between the observer and the sound source

15. Echo has different uses. Which of the following is NOT a situation when echo is used?
    a. to find large shoals of fish
    b. to measure the depth of the sea
    c. to locate a sunken shipwreck or cargo
    d. to know the composition of materials found in the surroundings

Additional Activities

Directions: Search the 10 words that are related to the lesson about the properties and characteristics of sound hidden in this puzzle. Then, write a sentence or a phrase stating what you learned about each word based on the lesson. Write your answer in your science notebook.

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

Words found in the puzzle	What do you know about the word?
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
10. _____	_____

Very good! It's another achievement for you, Kid! I hope to see you soon in your next modules. Keep learning and have fun in your next journey, young scientist! Good luck!

Answer Key

What I Know

1. FACT	2. FACT	3. FACT
4. FACT	5. BLUFF	6. FACT
7. FACT	8. BLUFF	9. FACT
10. BLUFF	11. BLUFF	12. FACT
13. FACT	14. FACT	15. BLUFF

LESSON 1- Properties of Light

What's In

Path of light must be drawn using straight lines from the source.
-Light travels in a straight line.

What's New

Activity 1: To pass or not to pass

Materials	What happens to light?
card board	Did not pass through
Book	Did not pass through
glass slab	Passed through
glass with water	Passed through
Cloth	Some light passed through

Answers to Guide Questions:
1. glass slab, glass with water, cloth- they are transparent materials
2. card board, book- they are non-transparent materials
3. Some light passed through it.
4. Light can pass through transparent materials. Light cannot pass through solid and non-transparent materials. Some light can also pass through certain materials like cloth.

Activity 2: Bouncing Light
Answers to Guide Questions:
1. It bounces/reflects back.
2. Light bounces/reflects back when it hits a mirror.

Activity 3: The Broken Pencil
Answers to Guide Questions:
1. The part of the pencil in the water looks bigger.
2. Looking on top of the glass, the pencil appears bigger, on the side, it appears broken.
3. Yes
4. Light bends when it is seen through different medium.

Activity 4: I See Your True Colors
Answers to Guide Questions:
1. It separates into different colors.
2. red, orange, yellow, green, blue, indigo, violet/ rainbow
3. Light is made up of 7 different colors

What's More

Activity 1: What Material Am I?
1. transparent 2. translucent 3. Opaque

Activity 2: Transparent, Translucent or Opaque?

1. transparent	2. opaque	3. transparent
4. opaque	4. translucent	6. translucent

Activity 3: Reflect or Bend?
1. reflect 2. reflect 3. bend
4. bend 5. bend

Activity 4: Colors of Light
Arrangement of colors: Red, Orange, Yellow, Green, Blue, Indigo, Violet

What I Have Learned

1. reflection	2. refraction	3. transparent
4. translucent	5. opaque	6. 7

What I Can Do
1. Light can be reflected when it hits a material.
2. Light bends when it travels through different media.
3. Opaque objects do not allow light to pass through; translucent allows some light to pass through; and transparent allows all light to pass through.
4. Light is made up of 7 different colors.

Assessment

1. b	2. d	3. d	4. c	5. d
6. b	7. c	8. d	9. a	10. b
11. c	12. d	13. b	14. c	15. a

Additional Activities
Light can be reflected.

Light can be refracted.

Light can pass through transparent materials; Light cannot pass through opaque materials; and Some light can pass through translucent materials.

Light is made up of 7 different colors, ROYGBIV.

LESSON 2- Properties and Characteristics of Sound

What's In

1. translucent 4. reflection
2. transparent 5. opaque
3. refraction

What's New

Activity 1: How are sounds produced?
Answers to Guide Questions:
1. Force
2. It vibrated/ moved.
3. up and down
4. Yes
5. Yes
6. It vibrated/moved up and down and produced sound again.
7. Sounds are produced when force is applied and there is vibration in an object.

Activity 2: Soft or Loud?
Answers to Guide Questions:
1. soft sound
2. lesser force was exerted
3. loud sound
4. stronger force was exerted
5. When stronger force is exerted, loud sound is produced. When lesser force is exerted, soft sound is produced.

Activity 3: Higher, Lower
Answers to Guide Questions:
1. soft sound
2. loud sound
3. loud, soft
4. Volume is a measure of how soft or loud a sound is. Volume or loudness or softness of a sound depends on how far or near the receiver of the sound is from its source.

Activity 4: Bouncing Sound
Answers to Guide Questions:
1. yes
2. Sound bounces when it hits a hard material.

What's More

Exercise 1: True or False

1. F	2. F	3. T	4. T	5. T
6. T	7. T	8. T	9. F	10. F

Exercise 2: Soft to Loud
Pupils' answers may vary.

What I Have Learned

1. refracted	2. noise
3. loudness	4. sound waves
5. volume	6. sonar
7. reverberation	8. echolocation

What I Can Do
1. Just enough to be heard because too loud sound is already a noise which may affect the activities of the members of my family.
2. To avoid too much echo and to have better sound quality
3. They use it to locate food and give them a sense of direction.

Assessment

1. c	2. b	3. d	4. c	5. d
6. b	7. b	8. b	9. d	10. a
11. a	12. a	13. a	14. a	15. d

Additional Activities
1. LOUDNESS- How loud or soft a sound seems to the listener
2. REFLECT- bounce back
3. NOISE- unpleasant sound
4. VIBRATION- Sounds are made by vibrations.
5. WAVES- Sound travel in waves.
6. SONAR- Sonar uses sound to locate things underwater or map the seafloor.
7. SHIPS- Ships use sonar to search the ocean.
8. ECHO- reflection of sound
9. VOLUME- measure of loudness or softness of sound
10. BATS- They use echolocation to find food and to determine their distance.

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