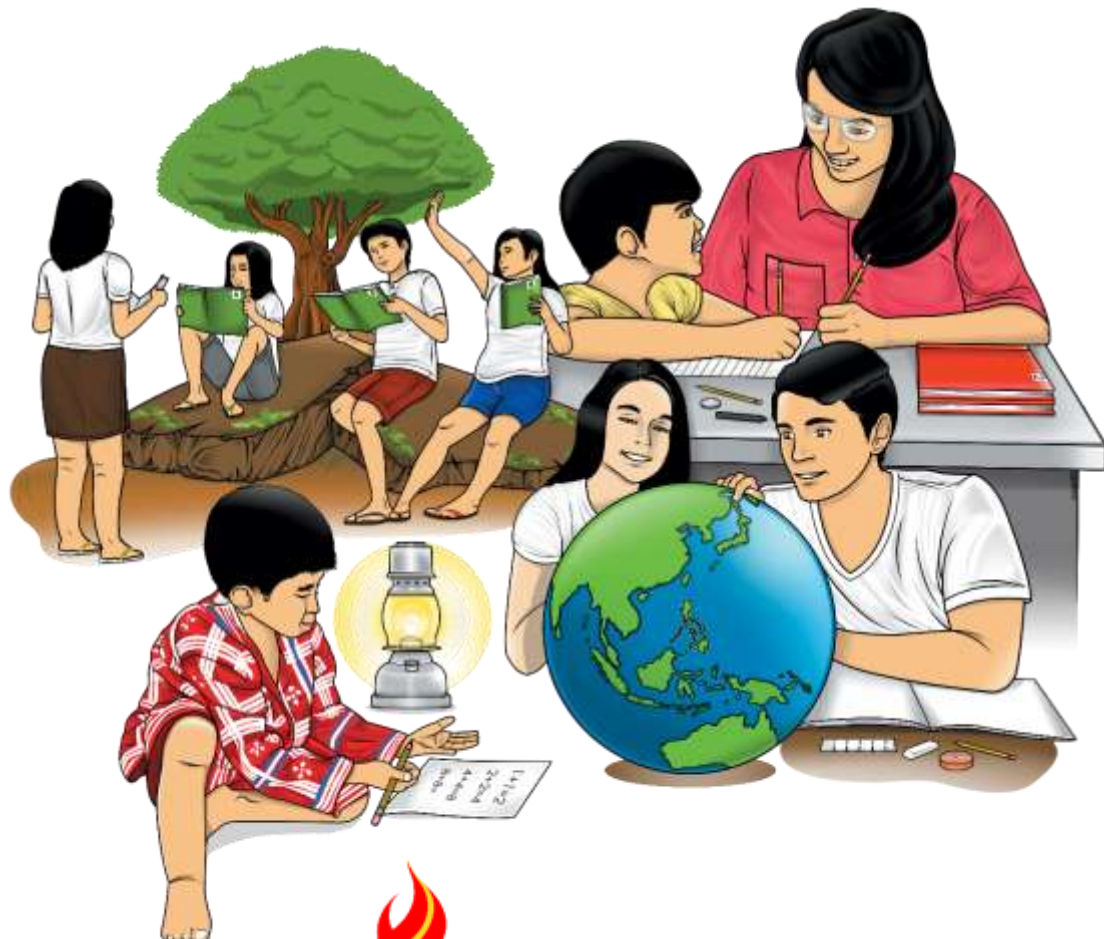


Science

Quarter 3 – Module 2:

Conductors of Heat and Electricity



Science – Grade 5

Alternative Delivery Mode

Quarter 3 – Module 2: Conductors of Heat and Electricity

First Edition, 2020

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Science

Quarter 3 – Module 2:

Conductors of Heat and Electricity

Introductory Message

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

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

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

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

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

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

Thank you.



What I Need to Know

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

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

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

After going through this module, you are expected to:

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



What I Know

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

1. What do we call a material that allows electricity to pass through it?
 - A. conduction
 - B. conductor
 - C. insulator
 - D. metal
2. Which is an example of conductor?
 - A. book
 - B. cloth
 - C. copper wire
 - D. paper plate
3. What do we call a material that does not allow the electricity and heat to pass through it?
 - A. conductor
 - B. insulator
 - C. iron
 - D. wire
4. Which is an example of insulator?
 - A. book
 - B. copper
 - C. metal fork
 - D. silver
5. What do we call the transfer of heat in solid?
 - A. conduction
 - B. conductor
 - C. insulator
 - D. radiation
6. Why are cooking utensils made up of metal but the handles are made of plastic?
 - A. Metal is hard while plastic is soft.
 - B. Metal is expensive but plastic is cheaper.
 - C. Metal is not brittle while plastic is brittle.
 - D. Metal is a good conductor of heat while plastic is a poor conductor of heat.
7. Which of the following consists of objects that are good conductors of heat?
 - A. steel, paper towel, paper
 - B. gold, pencil, tape
 - C. iron wire, thumb tacks, steel ruler
 - D. aluminum cup, wood, cloth

8. What is the difference between a conductor and an insulator?
- A. An insulator is durable, while a conductor is not.
 - B. A conductor is durable, while an insulator is not.
 - C. An insulator allows heat to flow through it easily while a conductor does not.
 - D. A conductor allows heat to flow through it easily while an insulator does not.
9. Which of the following is a good conductor?
- A. cloth
 - B. metal
 - C. plastic
 - D. wood
10. All of the following statements are correct, EXCEPT one. Which one is it?
- A. Metals are non-ductile while non-metals are ductile.
 - B. Metals are opaque while non-metals are transparent.
 - C. Metals are lustrous while non-metals are not lustrous.
 - D. Metals are good conductors of heat and electricity while non-metals are poor conductors of heat and electricity.

Lesson

1

Conductors and Insulators

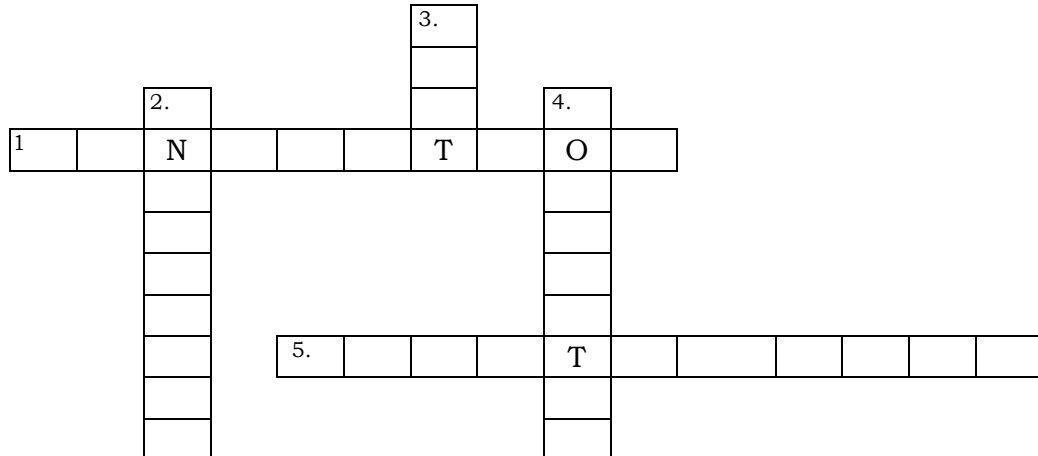
Electricity is one of the important things in our lives. Our appliances and gadgets at home requires electricity to function. Have you ever wondered how does electricity reach your homes? Have you ever asked yourself why you don't get electrically shocked when you touch an electric cord?

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



What's In

Directions: Solve the puzzle by using the clues below.



Across

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

Down

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



What's New

Heat Transfer

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

What you need:

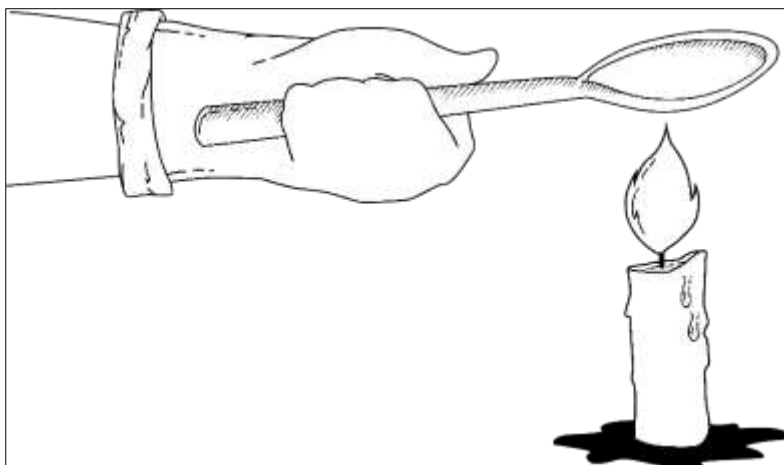
pot holder, metal spoon, match, candle

What to do:

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

Guide Questions:

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



Illustrated by Elpidio S. Palacio Jr. and Jose Marie E. Baculi
Figure 1. Heating metal spoon using a lighted candle



Notes to the Teacher

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



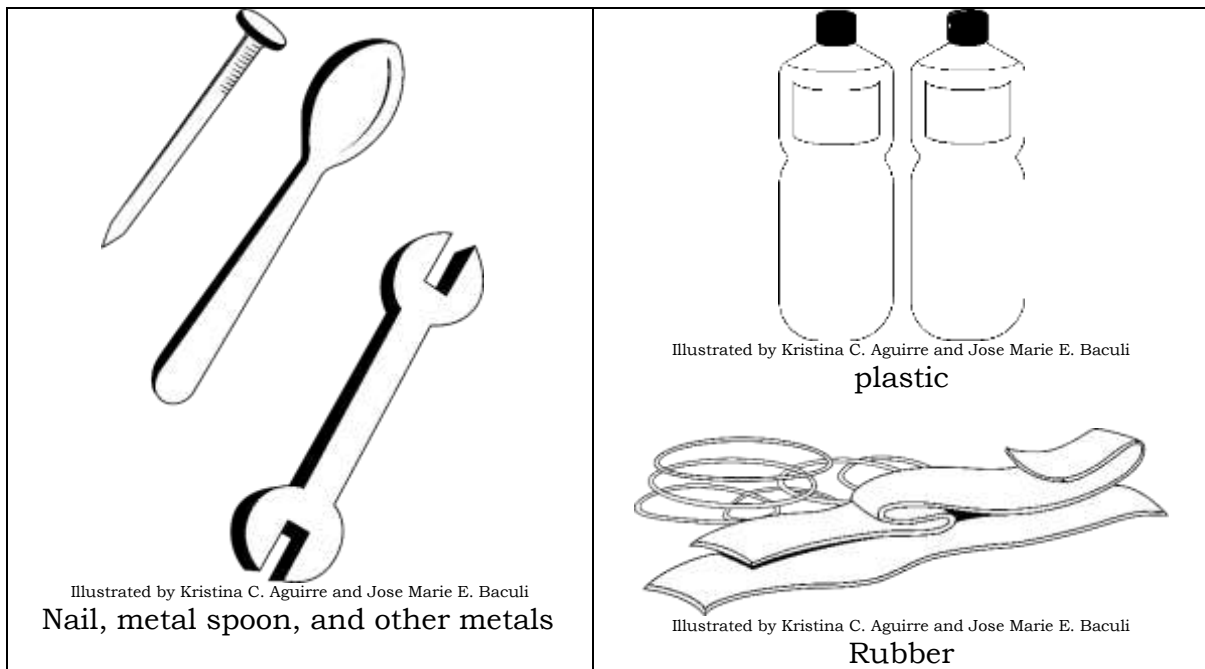
What is It

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

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

Table 1. Classification of materials as conductors and insulators

Conductors	Insulators
<ul style="list-style-type: none"> • Materials that allow heat and electricity to pass through them. • Most materials that conduct heat are metals because their electrons can flow easily. • Examples: 	<ul style="list-style-type: none"> • Materials that do not transfer electricity. • The electrons of the insulators are not free flowing for they are tightly bonded with its atom. • Examples: <div data-bbox="847 1697 1326 1899" data-label="Image"> </div> <p>Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi</p> <p>wood</p>

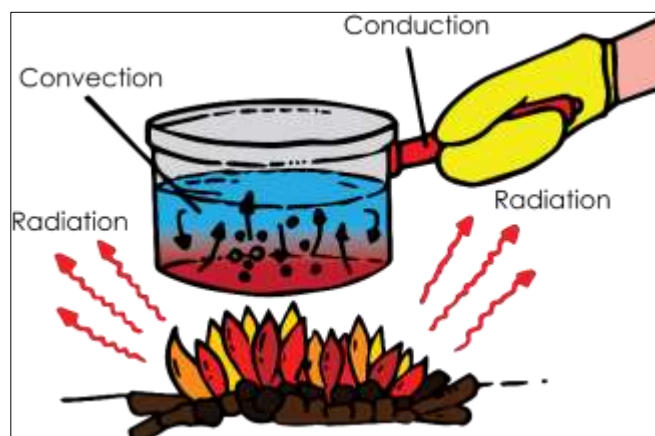


Conductivity depends on

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

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

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



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

Figure 3. Heat transfer



What's More

Activity 1. Heat flow

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

What you need:

hot water and bowl
coin
rubber band
paper

metal paper clip
toothpick
metal fork
pencil

What to do:

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

Guide Questions:

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

Activity 2

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

scissors	paper	cement	cotton	paper clip
eyeglasses	water	pencil	coins	nails
Conductors			Insulators	

Lesson

2

Properties of Good Conductors

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

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



What's In

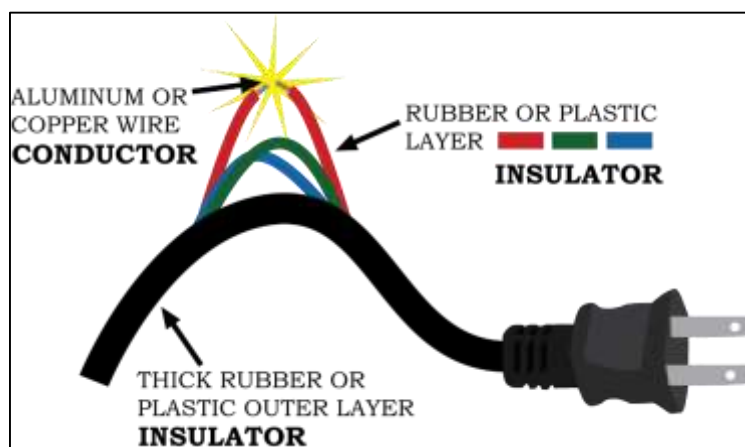
Directions: Write **C** if the material is conductor and **I** if the material is insulator.

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



What's New

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



Illustrated by Jose Marie E. Baculi

Guide Questions:

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



What is It

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

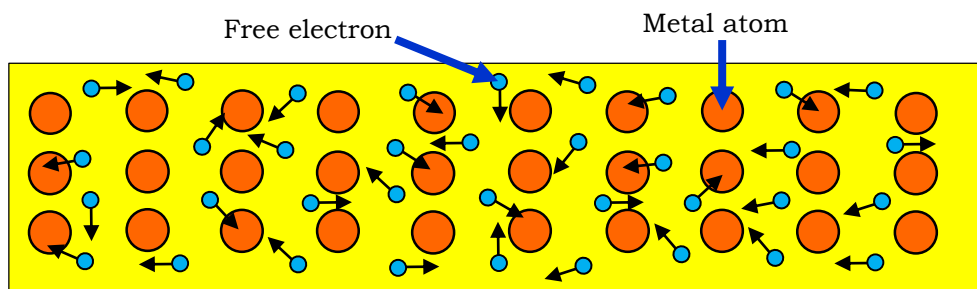
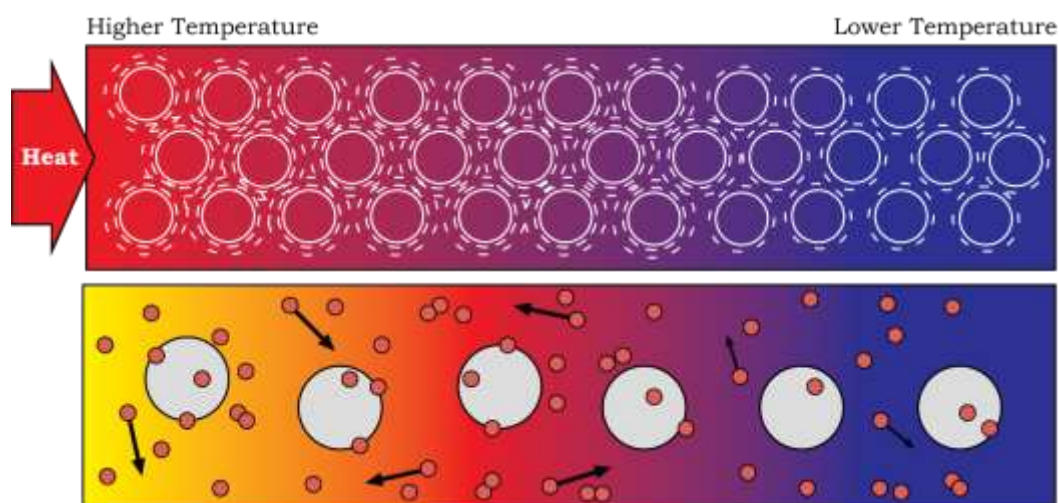


Figure 4. Movement of atoms Illustrated by Jose Marie Baculi

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



Illustrated by Jose Marie E. Baculi

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

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

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

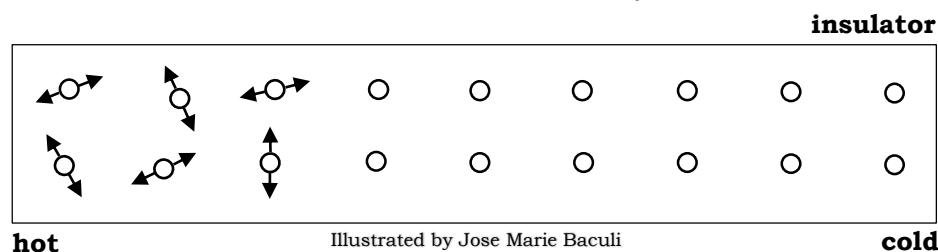


Figure 6: Movement of atoms when heated in a non-metal material

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

Good Conductors	Poor Conductors
<ul style="list-style-type: none"> gain heat quickly increase in temperature quickly lose heat quickly decrease in temperature quickly conduct heat from a hot to a cold object quickly can be hammered shinny 	<ul style="list-style-type: none"> gain heat slowly increase in temperature slowly lose heat slowly decrease in temperature slowly conduct heat from a hot to a cold object slowly brittle



What's More

Activity 1: Test for Conductors

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

What you need:

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

What to do:

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

Guide Questions:

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

Activity 2

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

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

***What I Have Learned***

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

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



What I Can Do

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



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

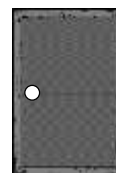
1.sweater

2. frying pan

3.bonnet / cap

4.rubber slippers

5. kettle



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

6.light bulb

7. towel

8. cooking pot

9. gloves

10. wooden door

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

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

4. Which of the following consists of objects that are good conductors of heat?
- A. steel, paper towel, paper
 - B. gold, pencil, tape
 - C. iron wire, thumb tacks, steel ruler
 - D. aluminum cup, wood, cloth
5. Which is a good conductor?
- A. Fruits
 - B. Metals
 - C. Plastics
 - D. Wood products



Assessment

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

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

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



Additional Activities

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

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



Answer Key

Activity 2:

- ## Guide Questions: (Possible answers)

Activity 1:

What's More

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

(possible answers)

What's New

What's In

Lesson 1

What I Know

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

Lesson 2

What's In

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

What's New

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

What's More

Activity 2 (Possible answer)

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

What I Can Do

- insulator
- conductor
- insulator
- insulator
- conductor
- conductor
- insulator
- conductor
- insulator
- insulator

What I Can Do

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

Assessment

A.

- False
- True
- False
- False
- True

B. (Possible answers)

- Conductors gain heat quickly.
- Conductors gain heat quickly.
- It is ductile.
- It is malleable.
- It has high melting point.

Additional Activities: (Possible answers)

A. 1. Conductors are materials that allow the heat and electricity to pass through, example: steel, copper, metal spoon.
2. Materials that do not transfer electricity. They are made up of atoms with electrons that are tightly bond. If the electrons can't move, then no electricity is produced. Examples: rubber, plastic, wood.

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

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