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UNIFIED SUPPLEMENTARY LEARNING MATERIALS
(USLeM)

Science 5 Week 2

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UNIFIED SUPPLEMENTARY LEARNING MATERIALS
Grades 5 SCIENCE

LESSON 1: Heat Conductors

EXPECTATIONS

This Unified Supplementary Learning Material (USLeM) is made for you to achieve this learning competency:

Discuss why some materials are good conductors of heat and electricity. (S5FE IIIc-3)

Specifically, this Lesson 1 will help you to:

1. identify materials which are good conductors of heat;
2. enumerate the characteristics of good conductors of heat; and
3. explain the effects of heat n people and objects.

PRETEST

Directions: Choose the letter of the BEST answer.

1. What property of metals allows heat to flow through them?
   A. conduction
   B. convection
   C. insulation
   D. radiation
2. Which material ALLOWS heat to pass through them easily?
   A. aluminum
   B. glass
   C. leather
   D. plastic
3. Which of the following materials DO NOT ALLOW heat to pass through them easily?
   A. copper
   B. gold
   C. rubber
   D. silver
4. Why do we need to use a pot holder to lift the pot cover and check if the *sinaing* is already cooked?
   A. to help heat flow in the pot
   B. to make the rice taste better
   C. to protect hand from being burned
   D. to measure the temperature of the pot
5. Why are pots and pans in the kitchen mostly made of metals like stainless steel or aluminum?
   A. Metals bend easily.
   B. Metals are insulators.
   C. Metals are good conductors.
   D. Metals have luster and ductility.

LOOKING BACK

Directions: Write **M** if each of the objects listed below is a metal and **N** if it is a nonmetal in the space provided before the number.

___ 1. book
___ 2. rubber band
___ 3. silver necklace
___ 4. cloth
___ 5. wood
___ 6. plastic spoon
___ 7. steel bar
___ 8. banana peel
___ 9. cooking pan
___ 10. tissue paper

BRIEF INTRODUCTION

Have you ever noticed why your cooking pots and cooking pans are mostly made of stainless steel or aluminum?

Figure 1. Pots and pans

Conduction is a process where heat can be transferred from one object to another, or from one molecule to another.

Conductors are materials that transfer thermal energy faster by allowing heat to flow freely through them. Generally, solids are better conductors than gases and liquids. This is because the particles in solids are closer, making it easier for the particles to transfer energy. Most metals are excellent conductors of heat like iron, gold, silver, brass, steel, copper, and nickel. They are used in situations wherein heat plays an important role, such as in cooking. Kitchenware such as pots and pans need to be able to transfer heat effectively from stove onto the food.

On the other hand, not all materials are good conductors of heat. Materials that are poor conductors or that do not allow heat to pass through them easily are called **insulators**. Materials that are made of plastic, silk, leather, glass, oil, and rubber are insulators. Insulators were helpful in preventing your hands from getting burned while you handle hot objects. Pot holders and handles of pots and pans are insulators.

In addition, these are the common characteristics of a good heat conductor:

1. Most conductors of heat are solid with compact molecules that are hard, ductile and malleable.
2. Good conductors are made up of atoms with free moving electrons that collide with one another, allowing transfer of heat.
3. **Thermal conductivity** is the measure of the ability of a material to allow heat to flow through them. The higher the thermal conductivity an object possesses, the better conductor it is. Metals have higher thermal conductivity than nonmetals.

ACTIVITIES

ACTIVITY 1.1 PASS ME OR NOT!

Directions: Identify whether each of the materials listed below is a conductor or insulator of heat. Explain your answer.

Material	Conductor or Insulator	Explanation
1. cloth		
2. cooking pan		
3. plastic spoon		
4. rubber band		
5. silver necklace		

ACTIVITY 1.2 GOOD OR BAD?

Objective: Identify materials as good or poor conductors of heat.

Materials: mug, hot water, wooden or plastic spoon, metal spoon, timer (cellphone or watch)

Procedure:

1. Put hot water in a mug or any available containers in your house. Be careful when handling hot water. Seek the help of your parents or any older relatives while conducting the experiment.
2. Using the handle of the wooden spoon (if not available, use plastic spoon) and metal spoon, immerse them into the water. Which of the two spoons do you think will conduct heat faster? Write your prediction in the table provided.
3. After a minute, hold the handle of each spoon carefully. Record your observations in the table provided. Also, take note of the time it took for you to feel a slight change in the temperature of the spoons.

Materials immersed in hot water	Prediction	Time it takes to feel the change in temperature
wood or plastic spoon		
metal spoon		

Questions:

1. Which of the two spoons got hotter in a shorter time? Explain your answer.
2. How is the wooden spoon (or plastic spoon) compared with the metal spoon in terms of the ability to conduct heat?

UNIFIED SUPPLEMENTARY LEARNING MATERIALS
Grades 5 SCIENCE

REMEMBER

- **CONDUCTION** is a process where heat can be transferred from one object to another, or from one molecule to another.
- **CONDUCTORS** are materials that allow heat to flow freely through them.
- **INSULATORS** are materials that do NOT allow heat to flow freely through them.

CHECK YOUR UNDERSTANDING

Directions: Read the situations below then answer the questions that follow.

1. Your mother is cooking *sinigang* in a pot. You are asked to stir the ingredients while she tends the table. Which ladle will be better to stir the *sinigang*: wooden ladle or metal ladle? Explain your answer.

2. Your mother has cooked the *sinigang* in a pot. You are asked to transfer the pot from the fire onto a dinner table. What material can you use to hold the hot pot and avoid burning your hands? Explain your answer.

3. After putting the pot of *sinigang* in the table, you are asked again by your mother to serve the soup to your family. In which bowl will it be better to serve the *sinigang*: a soup bowl made of ceramic or a bowl made of stainless steel? Explain your answer.

POSTTEST

Directions: Choose the letter of the BEST answer.

1. What property do nonmetals have that DOES NOT allow heat to flow through them easily?
   A. conduction
   B. convection
   C. insulation
   D. radiation
2. Which material is a heat conductor?
   A. glass
   B. plastic
   C. rubber
   D. steel
3. Why are the handles of pans mostly made of rubber?
   A. They make the pan look pretty.
   B. They help heat flow in the pan.
   C. They make the food taste better.
   D. They protect hand from being burned.
4. Why are flat irons mostly made of metals like stainless steel or aluminum?
   A. Metals bend easily.
   B. Metals are insulators.
   C. Metals are good conductors.
   D. Metals have luster and ductility.
5. Which DOES NOT describe a metal as a good conductor of heat?
   A. Metals are solid and have loose molecules.
   B. Metals possess the property of thermal conductivity.
   C. Metals are made up of atoms with free moving electrons.
   D. The electrons in metals are loosely arranged and they can collide and move freely back and forth conducting heat.

LESSON 2: Electricity Conductors

EXPECTATIONS

This Unified Supplementary Learning Material (USLeM) is made for you to achieve this learning competency:

Discuss why some materials are good conductors of heat and electricity. S5FE IIIc-3

Specifically, this Lesson 2 will help you to:

1. identify materials which are good conductors of electricity;
2. enumerate the characteristics of good conductors of electricity; and
3. explain the effects of electricity on people and objects.

PRETEST

Directions: Choose the letter of the BEST answer.

1. Why are electrical wires made up of metals?
   - A. Metals do not bend.
   - B. Metals are insulators.
   - C. Metals hold much heat.
   - D. Metals are conductors.
2. Why is electrical wiring usually covered with a layer of rubber?
   - A. to make it safe
   - B. to make it look pretty
   - C. to make it strong
   - D. to help electricity flow along the wire
3. Which of the following materials ALLOW electricity to pass through?
   - A. copper
   - B. gold
   - C. silver
   - D. all the above
4. What type of material do metals belong to as they allow electricity to flow through them?
   - A. absorber
   - B. conductor
   - C. insulator
   - D. scanner
5. Why is copper commonly used as electrical wire?
   - A. Copper is hard.
   - B. Copper is expensive.
   - C. Copper has low electrical conductivity.
   - D. Copper has high electrical conductivity.

LOOKING BACK

Directions: Classify the materials listed inside the box as conductors of heat or insulators.

iron nail	plastic cover	rubber band	copper wire	steel gate
banana peel	gold ring	tap water	carton box	straw hat

CONDUCTORS	INSULATORS
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

BRIEF INTRODUCTION

Heat conductors, as discussed in Lesson 1, are materials that allow heat to move through them. This conduction process is made possible by mostly metals because the electrons in metals are loosely arranged. They can collide and move freely back and forth conducting heat. It is the same with the conduction process of electricity. The flow of electricity is based on the movement of loose electrons that move from one object to another. And, just like in heat conductors, metals are good electrical conductors.

Electrical conductors are materials that allow the flow of electricity to pass through them. Metals like copper, zinc, and iron are electrical conductors and are used as parts of electrical/ electronic devices. The most commonly used metal in making electrical wires is copper because it is inexpensive.

Electrical insulators are materials that do not allow electricity to pass through. These materials are poor conductors of electricity. Rubbers or plastic are commonly used as cover for electrical wires to prevent us from being electrocuted.

Myth Buster! Have you ever heard that someone has been electrocuted because they handle electrical wires with wet hands? Does it mean that water is an electrical conductor? Pure water is a nonmetal; hence, it is an insulator. Electrocution takes place because oftentimes water is mixed with small metal particles especially water coming from faucets. These impurities are the reasons why we get electrocuted.

ACTIVITIES

ACTIVITY 2.1 PASS ME OR NOT!

Directions: Draw a ( ) thunder if it allows electricity to pass through and a ( ) cloud if it does not.

___ 1. book
___ 2. rubber band
___ 3. silver necklace
___ 4. cloth
___ 5. wood
___ 6. plastic spoon
___ 7. steel bar
___ 8. banana peel
___ 9. cooking pan
___ 10. tissue paper

ACTIVITY 2.2 CONDUCTOR OR INSULATOR?

Objective: Identify materials as good or poor conductors of electricity.

Materials: 1.5 V battery, 3 W light bulb with holder, 3 electrical wires, 2 metal paper clips (if not available, strip the coating of a regular paper clip), 3 to 5 materials found inside the house (example: paper, coin, nail, plastic spoon, wood)

Procedure:

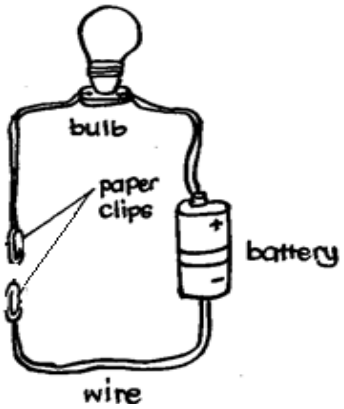

Figure 1

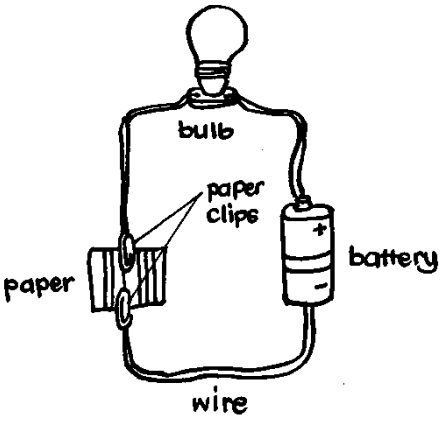

Figure 2

1. Connect the materials as illustrated in Figure 1. Note: Seek the help of your parents or guardians in performing experiments like this. Connect the two paper clips to check if the light bulb is working.
2. Separate the paper clips.
3. You will attach the materials you found inside the house in the paper clips one by one as shown in Figure 2. Note: As shown in the illustration, paper is attached to both ends of paper clips.
4. Before attaching your chosen materials, write your predictions first in the table provided. Will the bulb lights on or off?
5. Confirm your predictions if they are correct or not by attaching your materials one by one.
6. Complete the needed data in the table below:

Material	Prediction (Lights On or Off?)	Results (Lights On or Off?)	Conductor or insulator?	Was your prediction correct? Why or why not?
paper				

Questions:

1. Which materials are conductors? Insulators?
2. What makes electrical conductor different from insulator?

REMEMBER

- **CONDUCTION** is a process where electricity can be transferred from one object to another, or from one molecule to another.
- **CONDUCTORS** are materials that allow electricity to flow freely through them.
- **INSULATORS** are materials that DO NOT allow electricity to flow freely through them.

CHECK YOUR UNDERSTANDING

Think about this: We can be electrocuted which means that electricity also flows freely to a human body. Does that mean that our bodies are considered conductors? Recall the characteristics of an electrical conductor and give your reasons why you think a human body is an electrical conductor or an insulator.

POSTTEST

Directions: Choose the letter of the BEST answer.

1. Which of the following groups of materials are good conductors of electricity?
   A. copper, silver, gold, glass and zinc
   B. iron, copper, silver, gold and nickel
   C. gold, paper, leather cloth and plastic
   D. wood, paper, leather cloth and plastic
2. What metal is the most commonly used conductor in electronic wiring and electronic circuits?
   A. copper B. gold C. nickel D. silver
3. Which of the following DOES NOT describe a metal as a good conductor of electricity?
   A. Metals are solid with loose molecules.
   B. Metals possess the property of thermal conductivity.
   C. Metals are made up of atoms with free moving electrons.
   D. The electrons in metals are loosely arranged, that they can collide and move freely back and forth conducting heat and electricity.
4. Observe the picture on the right. Which material, if attached at the end of the wires, will make the bulb light up?

   A. cloth
   B. glass
   C. metal spoon
   D. paper
5. An experiment was conducted with the following materials and yields the following data:

Materials	Heat Conductor (Yes or No?)	Electricity conductor (Yes or No?)
Metal spoon	Yes	Yes
Iron nail	Yes	Yes
Rubber eraser	No	No

Which of the following is/ are TRUE from the data gathered in the experiment?
I. Materials that are good conductors of heat are also good conductors of electricity.
II. Materials that are poor conductors of heat are also poor conductors of electricity.
III. Materials that are poor conductors of heat can be good conductors of electricity.

A. I B. I and II C. I and III D.II and III

REFERENCES

Sarte, Evelyn T., and et. al. 2016. ***Science Beyond Borders 5***. Edited by Lilia M. Rabago. Manila: Vicarish Publication and Trading Inc. pp. 134-139

UNIFIED SUPPLEMENTARY LEARNING MATERIALS
Grades 5 SCIENCE

ANSWER KEY

POSTTEST

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

Questions:

1. Conductor: coin, nail
   Insulator: paper, plastic spoon, wood
2. Conductors have the ability to allow electricity to flow through them, hence making the bulb light up in the experiment. They are mostly metals. On the other hand, insulators are the opposite, they do not allow electricity to pass through them, hence making the bulb not light up. They are made mostly nonmetals.

CHECK YOUR UNDERSTANDING

Human body is considered an electrical conductor because some of its parts are made or mixed with metals like blood, which is rich in iron - a metal.

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

POSTTEST

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

LESSON 2: Electricity Conductors

PRETEST

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

LOOKING BACK

CONDUCTORS	INSULATORS
1. iron nail	1. banana peel
2.gold ring	2. plastic cover
3. copper wire	3. rubber band
4. tap water	4. carton box
5. steel gate	5. straw hat

ACTIVITY 2. 1 PASS ME OR NOT!

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

ACTIVITY 2.2 CONDUCTOR OR INSULATOR?

Material	Prediction (Lights On or Off?)	Results (Lights On or Off?)	Conductor or Insulator?	Was your prediction correct? Why or why not?
paper	*Answer may vary*	off	insulator	*Answer may vary*
coin	*Answer may vary*	on	conductor	*Answer may vary*
nail	*Answer may vary*	on	conductor	*Answer may vary*
plastic spoon	*Answer may vary*	off	insulator	*Answer may vary*
wood	*Answer may vary*	off	insulator	*Answer may vary*

Questions:

1. Conductor: coin, nail
   Insulator: paper, plastic spoon, wood
2. Conductors have the ability to allow electricity to flow through them, hence making the bulb light up in the experiment. They are mostly metals. On the other hand, insulators are the opposite, they do not allow electricity to pass through them, hence making the bulb not light up. They are made mostly nonmetals.

CHECK YOUR UNDERSTANDING

Human body is considered an electrical conductor because some of its parts are made or mixed with metals like blood, which is rich in iron - a metal.

POSTTEST

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

LESSON 1: Heat Conductors

PRETEST

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

LOOKING BACK

1. N		6. N
2. N		7. M
3. M		8. N
4. N		9. M
5. N		10. N

ACTIVITY 1. 1 PASS ME OR NOT!

Material	Conductor or Insulator	Explanation
1. cloth	Insulator	It is a nonmetal
2. cooking pan	Conductor	It is a metal
3. plastic spoon	Insulator	It is a nonmetal
4. rubber band	Insulator	It is a nonmetal
5. silver necklace	Conductor	It is a metal

ACTIVITY 1. 2 GOOD OR BAD?

Materials immersed in hot water	Prediction	Time it takes to feel the change in temperature
wood or plastic spoon	*Answers may vary but similar to: slower*	*Value may vary but must be slower than metal spoon or no change in temperature at all*
metal spoon	*Answers may vary but similar to: faster*	*Value may vary but must be faster than wood or plastic spoon*

Questions:

1. Metal spoon, it got hotter faster because it is made of metal therefore it is a good conductor of heat.
2. Wooden spoon, a nonmetal, has lower thermal conductivity than the metal spoon hence making it a poor conductor of heat.

CHECK YOUR UNDERSTANDING

1. It is best to stir the *sinigang* using the wooden ladle because wood is a poor conductor of heat, hence preventing my hands from being burned as I stir the ingredients.
2. I will use pot holders made up of cloth or rubber because they are insulators which helps my hand from not being burned while transferring the pot to the table.
3. I will serve the soup using a bowl made of ceramic and not of stainless steel. Stainless steel bowl is made of metal which is a good conductor of heat.