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Science

Quarter 1 – Module 2:
Changes in Materials
Due to Heat and Oxygen

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ADM

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Quarter 1 – Module 2: Changes in Materials Due to Heat and Oxygen
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Quarter 1 – Module 2:

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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.

Good luck and happy learning!

What I Need to Know

Have you ever asked yourself how materials change? How does matter change when applied with heat? When matter is heated enough, its molecules move faster with great energy. It is like watching an ice cube in your palm that becomes smaller until it melts or a boiling water that turns into a steam. If enough heat is added, solid becomes liquid and liquid changes to gas.

Do you know that oxygen forms stable chemical bonds with almost all elements to give the corresponding oxide? Oxygen is a very reactive gas. It has the ability to combine with many materials to form oxides but when it combines with nonmetal, it produces a nonmetal oxide. It is important to learn the changes that matter undergo and its effect in our environment.

This module will help you understand better how materials undergo changes due to heat and oxygen.

The module is divided into three lessons namely:

- Lesson 1: How Materials Change When Applied with Heat
- Lesson 2: Changes in Materials in the Presence or Absence of Oxygen
- Lesson 3: Changes in Materials and Its effect on the Environment

At the end of this module, you will be able to investigate changes that happen in materials under the following:

a. application of heat
b. presence or absence of oxygen
c. its effect on the environment

Note: Write all the answers of the activities in a separate sheet.

What I Know

A. Directions: Identify the changes that took place in the following activities when there is an application of heat and with the presence or absence of oxygen.

A	B
1. Boiling of water	A. breakdown of materials due to bacteria and fungus
2. Cooking rice	B. temperature changes to 100 degrees Celsius
3. Darkening of eggplant	C. color changes observed commonly among vegetables and fruits
4. Fish kill	D. water gets absorb into the grain, and heat softens the starch then alters its texture when cooked
5. Decaying garbage	E. occurs when there is lack of oxygen in the ponds or bodies of water

B. Directions: Read the questions carefully. Explain how changes in matter affect the environment. Write the letter of the best answer.

1. The following materials undergo a physical change. Which of the changes in matter has a bad effect on the environment?

   A. freezing of meat to preserve it in a long period of time
   B. using spray paint in tin cans to cover the rust
   C. cutting of the fabric to be made into clothes
   D. evaporation of rainwater

2. The following materials undergo chemical change. Which of these changes in matter has a good effect on the environment?

   A. burning of plastic
   B. composting of biodegradable wastes
   C. exposing alcohol to direct heat or fire
   D. combustion of gasoline in the car's engine

3. Cutting of trees has its advantages and uses to the people. Which of the following is a bad effect of this activity?

   A. Cutting of trees may result in house construction.
   B. Cutting of trees may result in paper production.
   C. Cutting of trees may result in furniture making.
   D. Cutting of trees may result in flooding.

4. The following activities can be done to pieces of wood, which of these can cause harm to the environment?
   A. burning pieces of wood to be made as charcoal
   B. shaping pieces of wood to be made into a chair
   C. using pieces of wood to be made as furniture
   D. forming pieces of wood as junior fence

5. Your father has celebrated his birthday yesterday; there were many empty plastic bottles of soft drinks left. What is the best way you can do with these empty plastic bottles to protect the environment?
   A. throw the empty plastic bottles into the seashore
   B. make the empty plastic bottles as flower vases
   C. dump the empty plastic bottles in the landfill
   D. burn the empty plastic bottles

Lesson 1 How Materials Change When Applied with Heat

When heat is added to substance, the molecules and atoms vibrate faster. As atoms vibrate faster, the space between atoms increases. The motion and spacing of the particles determine the states of matter of the substance. Solids, liquids, and gases expand when heat is added.

What's In

Directions: Based on the given physical and chemical properties of matter, identify which property is being described. Choose your answer from the words in the box.

Hardness	Elasticity	Conductivity	Biodegradability	Brittleness

1. Ability to break easily
2. Ability to decompose by microorganism
3. Ability to let the heat and electricity to pass through
4. Ability to be stretched and return to its original shape
5. Ability to resist pressure that may cause deformation

What's New

Directions: The following are activities done on objects where heat is applied. Draw a star ☆ if it shows physical change or a half moon ☾ if it shows chemical change.

1. Heating a handful of sugar
2. Boiling of water
3. Burning of paper
4. Drying of clothes
5. Grilling pork

What is It

Heat, as discussed in your previous grade, is a form of energy. It is an energy that is transferred between objects of different temperature. Temperature is the hotness and coldness of an object and it is measured using a thermometer. Our main source of heat is the Sun. Heat can bring about a physical change in matter. Some solid materials melt when the heat is applied to them. A common example is a piece of melting ice taken out of the refrigerator. The ice absorbs heat from the surroundings, which will then melt after a few minutes. On the other hand, water evaporates when it is subjected to heat. Just like when your mother hangs your wet laundry under the sun. After several minutes or hours, the clothes become dry, which means that the water in your clothes evaporated.

Heat does not only produce a physical change in materials, sometimes heating a material causes it to undergo chemical change. The chemical changes caused by heat are irreversible. One common example of this is cooked food. The egg your mother cooked for your breakfast has undergone a chemical change. Now, can you bring the egg back into its liquid form before it was cooked? No you can't, the cooked egg cannot be changed back to its original form.

Applying heat to the material results in processes of physical and chemical changes. **Physical change** happens when only the appearance of the material changes and no new material is formed. Meanwhile, **chemical change** happens when heat is applied and the material changes its size, shape, color, and smell, and a new material is formed.

What's More

Activity 1

Directions: From the given activities below, identify which shows physical change or chemical change by writing your answers using the table below as a guide.

Frying egg	Drying of wet clothes
Boiling water	Heating of white sugar
Burning of paper	Melting of ice cream
Grilling chicken	Drying fishes under the sun
Melting chocolate	Drying wet *palay* under the sun

Physical change through the application of heat	**Chemical change through the application of heat**

Activity 2

Directions: Read the following sentences carefully. Write ***True*** if the situation shows how matter changes when applied with heat. Write ***False*** if not.

1. Melting ice cube, boiling water, and drying clothes are examples of physical changes.
2. Physical and chemical changes are results when heat is applied to matter.
3. A vanilla ice cream melts when taken out from a refrigerator for a long time.
4. Charcoal burning on the grill is an example of chemical change.
5. When heat is applied to matter or a material, nothing happens.

Activity 3

Directions: Read the following questions carefully then write the letter of the correct answer.

1. Which of the following is an example of chemical change when heat is applied?
   A. Burning of wood
   B. Drying of clothes
   C. Freezing of water
   D. Sharpening a pencil

2. Which is TRUE about chemical change?
   A. A new product is formed.
   B. Chemicals change as a result of physical change.
   C. The product can be changed to its original form.
   D. A chemical change is more important than any other process.

3. What happens when a piece of paper is burned inside a tin can?
   A. A new material is formed.
   B. There are no changes.
   C. Both physical and chemical changes happen.
   D. It turns to ashes, and after a few minutes, it returns to its original form.

4. What happens to the ice cube and butter after heat is applied?
   A. They melt, physical change happens.
   B. They melt, chemical change happens.
   C. Nothing happens to the materials.
   D. All the materials dissolve in the air.

5. What process is applied in the melting of ice cream, drying of wet clothes, and cooking of vegetables that result in physical and chemical change?
   A. Boiling
   B. Drying
   C. Freezing
   D. Heating

Lesson 2 Changes in Materials in the Presence or Absence of Oxygen

Physical changes are caused by forces like motion, temperature, and pressure. Chemical changes happen on a much smaller level. Most of these changes between molecules are unseen. Factors that affect the rate of chemical changes include temperature, concentration, inhibitors, surface area, and catalysts.

What's In

Directions: Identify which among the following activities shows Physical Change or Chemical Change when applied with heat. Write **PC** for Physical Change and **CC** for Chemical Change.

1. Melting of candle
2. Burning of wood
3. Boiling of water
4. Cooking Rice
5. Frying Egg

What's New

Let us now investigate the changes in materials in the presence or absence of oxygen.

Have you observed your mother slicing an eggplant? What was the color of the eggplant while it was being sliced? What was its color after a few minutes? Were there any changes in the color? Did it turn brown after slicing?

(Verch, 2019)

What is It

The changes in the color of the inner fleshy part of the eggplant is due to its exposure to oxygen. The same phenomena could also be observed in potato, banana, guava, cassava, and other fruits and vegetables.

How do you keep the eggplant from turning brown? Place in a large bowl of water with a teaspoon of salt dissolved in it. The water should be enough for all the sliced eggplant to dip in fully. This is to prevent the oxygen present in the air to react with the chemicals present in vegetables.

Another example of a change in materials when oxygen is present is in **combustion.** It occurs when oxygen combines with another substance (as fuel) and produces fire with heat and light. Combustion is also known as burning. It is always exothermic, that is, giving off heat. In combustion, oxygen, fuel, and heat are always present.

For example, when you lit a candle, its wick burns if oxygen and wax (candle) is present and heat is produced. Other examples include the burning of wood or charcoal for cooking and burning of petrol or diesel to run your car.

If oxygen is present in a wet material with iron, such as a nail or steel bar, the formation of rust occurs. It only happens when iron, oxygen, and water react with one another. Rust occurs when iron or alloys such as steel corrode, thus **rusting** is commonly known as iron or steel corrosion.

What's More

Directions: For the given activities, read and study the situations, then answer the follow-up questions.

Activity 1 "Fire Out"

Have you seen a fire or flame? If not, observe the fire in the picture below

(Hans (pixabay.com) 2021)

- How does fire start?
- Will fire continue its flame in the absence of oxygen?
- Suppose we will cover it with a basin, what do you think will happen to the fire?
- What are the three important things needed for combustion to occur?

Activity 2 "Fish Kill"

A fishpond owner reported that there had been a fish kill in the pond. The fisheries bureau investigated the incident, only to find out that the fishpond was overly populated.

(Fish Kill, 2018)

- What could be the cause of the fish kill?
- What is needed in the overpopulated pond?

Activity 3 "Rusting"

Observe the rusted iron nails.

(Kenken n.d.)

- What causes the formation of rust in the iron nails?
- What shall we do with the iron nails to minimize or prevent it from rusting?
- What are the two factors that influence the formation of rust in the iron nails?

Lesson 3 Changes in Materials and Its Effect on the Environment

From time to time, changes in our environment occur because of natural and human factor. Such human factors include air, water, and land pollution, deforestation, emission of carbon dioxide, carbon monoxide and other harmful gases. The changes that materials undergo have important roles in our day to day activities. Not all changes that take place in materials are good. Some are harmful and even dangerous.

What's In

Directions: Identify what will happen to the objects when heat is applied. Match the materials in column A to the products in Column B.

A	B
1. fish	A. charcoal
2. wood	B. boiled egg
3. sugar	C. dried fish
4. egg	D. toasted bread
5. bread	E. syrup

What's New

Directions: The following materials undergo either physical or chemical change. Identify whether the change in the materials shows good or bad effects on the environment.

1. Old tires made into garden pots clothes

(JacekAbramowicz (pixabay.com), n.d.)

2. Burning of dry leaves

(Grichenko, n.d.)

3. Cutting century-old trees

(Mokkie, 2013)

4. Cutting fabrics or clothes

(Jrouedcunliffe, 2016)

5. Decaying unsegregated waste

(Prylarer (pixabay.com), n.d.)

What is It

Changes in materials can cause a good or a bad effect in the environment.

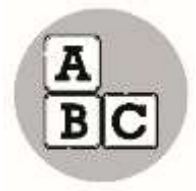
Some changes in materials are good for the environment. Composting, recycling, and the use of technology are some examples of the good effects of the changes in materials. Composting is a way of decomposing plant or animal matter into fertilizer. Recycling helps lessen garbage by reusing them like plastic, styrofoam, old tires, and paper.

Evaporation and condensation are forms of physical change in matter. Evaporation is a crucial part of the water cycle. Water from all areas on Earth will not be recycled if it will not evaporate into water vapor as clouds in the sky. Condensation is important in transforming water vapor to droplets of water stored in clouds.

Some changes in matter may result in negative effects like pollution, destruction of habitat, and loss of lives. Improper disposal of garbage, harmful chemicals, and human waste can cause changes. It can pollute air, land, and water. Burning of garbage materials releases dangerous toxic chemicals, and gases that contribute to the intense greenhouse effect that may lead to global warming. Smoke from the burning of fuels can cause air pollution. Cutting down trees is also harmful to our environment. It affects the quality of air that we

breathe. It causes a rapid change in the temperature and in turn changes the weather patterns, which leads to other environmental concerns. Throwing into the river the detergents used for washing the clothes makes the river become polluted because these contain toxic substance. Polluted water kills living organisms like fish, and water plants. When land is dumped with garbage, the land becomes polluted, if this happens, the polluted land will serve as the breeding places for pests that carry germs, hence dangerous to human health.

We have to do our share in maintaining a healthy environment. We must avoid too much use of electricity and gasoline. We must also avoid burning rubber tires and plastics. Practices that will produce acid rain, increase global temperature, or deplete the ozone layer must be minimized. No matter how big or small the contribution you give, what matters most is you've made a difference for our environment.



What's More

Activity 1

Directions: Identify which bad effect to the environment results from the following changes in matter. Choose the letter of the best answer.

A. Air pollution	C. Soil Pollution
B. Deforestation	D. Water Pollution

1. illegal logging of trees
2. burning of wood
3. using plant insecticide sprays
4. dumping rusted tin cans in the sea
5. making forest areas into a residential lot

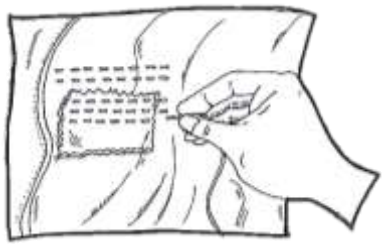
Activity 2

Directions: Write **YES** if the change in matter in each number has a good effect on the environment and **NO** if it has a bad effect.

1. Burning of dry leaves

(Bollozos, nd)

2. Stitching holes on clothes



(*Bollozos, nd*)

3. Rotting of fruits and vegetables

(*Bollozos, nd*)

4. Decomposing of garbage at the canal

(Bollozos, nd)

5. Rotting of fruits and vegetables

(Bollozos, nd)

Activity 3

Directions: The following are activities whereby materials undergo change. As a Grade Five learner, how will you change these activities in order to have a good effect on the environment?

1. You have a loaf of bread which was not eaten for two weeks already. When your mother checked the bread, she saw some molds on it. Your mother threw these breads inside the trash bin together with the other non-biodegradable waste materials.
2. At home, you have a pile of tin cans with rust. Your brother dumped these tin cans in the land at your backyard.
3. Your family went to the beach. While swimming, you and your cousins used shampoo and rinsed it in the sea.
4. Your father is fond of reading news in the newspaper. Over the years, he has collected many piles of newspaper stocked in your house. Your mother sees these newspapers as something that occupies space in the house, so she has decided to burn all these.
5. Mang Kanor has poultry. He always throws the chicken manure into the river at the back of his house.

What I Have Learned

Directions: Express your understanding of the lesson in this module by supplying the blanks in the following sentence with a word or a phrase.

I learned that (1)_____ application in matter results to either (2)_____ and (3)_____.

The presence or absence of (4) _____ has various effects on matter. Common examples are (5) _____and (6) _____.

Fire will continue its flame provided that there is continuous supply of (7) _____, (8) _____, and (9)_____. In the absence of oxygen, there will be no (10)_____that will occur.

Another example of change in the material when oxygen is present is rusting. (11) _____ is formed when iron and oxygen react with water or air moisture.

Some changes in matter may results to (12)_____ or (13)_____ effects on the environment. We have to do our share in maintaining (14)_____ environment.

We must (15)_____ too much use of electricity and gasoline. We must also avoid (16)_____ rubber tires and plastics. Lasty, we must try to minimize practices that will produce acid rain, increase global temperature, or deplete the ozone layer.

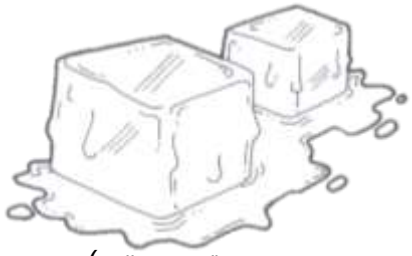
What I Can Do

A. Directions: Study the following objects. Determine the by-product or result when the material is applied with heat. Remember, some examples of heat sources are the Sun, burning fuel, electric heater, and human body. Caution: DO NOT place the actual materials below in direct heat like fire.

1. 

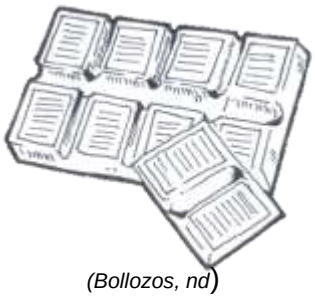
(Bollozos, nd)

rubbing alcohol

2. 

(*Bollozos, nd)*

ice cubes

3. 

(Bollozos, nd)

chocolate

B. Is rusting a problem in your home? Find out 4 ways on how you can prevent rusting of materials that are made of iron. Make a list of it using the table shown below:

Ways to Prevent Rusting

C. Directions: List down activities that you can do with the following materials to save and protect the environment.

1. left-over food
2. rusted tin cans
3. empty boxes

Assessment

A. Directions: Study the following situations and identify what is likely to happen whenthe heat is applied to the object. Choose the answer inside the parenthesis.

1. The_____(melting, melts) of butter when left out in a warm room is an example of_____(chemical change, physical change)
2. An ice cream cone_____(melting, melts) on a hot day is an example of _____. (chemical change, physical change)
3. Charcoal_____(burns, burning) on the grill is an example of _____. (chemical change, physical change)
4. Frying an egg on a_____(heated, heating) pan is an example of _____. (chemical change, physical change)

B. Directions: Choose and write the letter of the correct answer in your answer sheet.

1. The presence or absence of oxygen in the materials may result in _____.
   A. the burning of the materials
   B. the melting of the materials
   C. the change in the materials
   D. no change in the materials

2. Iron, nails, cans, and other metals with iron when exposed to moisture may develop ___.
   A. dust
   B. rust
   C. heat
   D. fuel

3. The inner part of the potatoes and apples change in color because of_____.
   A. water in it
   B. chemicals in it
   C. exposure to heat
   D. exposure to oxygen

4. The following activities cause a change in matter. Which of these has a bad effect on the environment?
   A. slicing fruits
   B. sewing clothes
   C. peeling vegetables
   D. breaking empty bottles of liquor

5. The following are effects in the environment by the changes in matter. Which of these has a good effect on the environment?
   A. air pollution
   B. composting
   C. deforestation
   D. water pollution

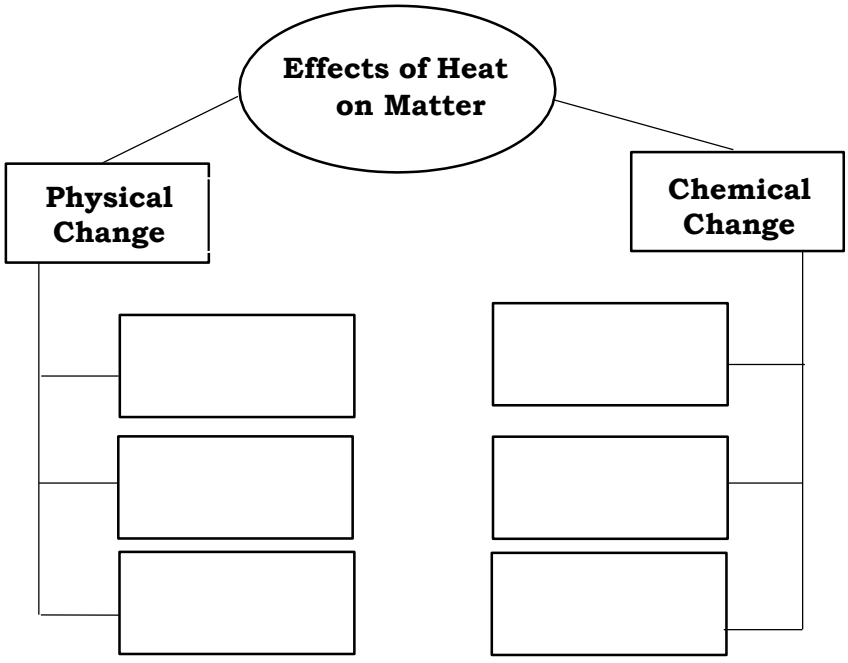
6. Many families use wood as fuel in cooking food. What is the bad effect on the environment of this activity?
   A. deforestation
   B. air pollution
   C. land pollution
   D. water pollution

Additional Activities

A. Directions: Study the activities below. Draw a happy face (🙂) if it shows good effect on the environment and a sad face (☹) if not.

1. sewing of clothes
2. illegal cutting of trees for building houses
3. throwing of plastic toys to the canals
4. selling of old newspaper
5. burning of tires

B. Directions: Copy the following diagram and supply it with 3 examples of physical change and chemical change when heat is applied.



Answer Key

Lesson 1

What's New
Lesson 1

1.
2.
3.
4.
5.

What's In
Lesson 1

1. Brittleness
2. Biodegradability
3. Conductivity
4. Elasticity
5. Hardness

What I Know

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

Lesson 1
What's More

Activity 1 (Chemical Change) Activity 2 Activity 3

1. heating of white sugar	1. True	1. A
2. Burning of paper	2. True	2. A
3. Frying egg	3. True	3. A
4. Grilling Chicken	4. True	4. A
(Physical Change)	5. False	5. D

1. Drying of wet clothes
2. Drying fishes under the sun
3. Boiling water
4. Melting chocolate
5. drying of wet *palay* under the sun
6. melting of ice cream

Lesson 2

What's More
Lesson 2

Activity 1

1. Fire starts when a material or fuel, in the presence of oxygen, is expose to a source of heat.
2. No
3. The fire be extinguished or put off.
4. Fuel, oxygen, heat

Activity 2

1. Decrease or lack of oxygen to breath in the small or narrow area of fish pond.
2. Good supply of oxygen, larger area, controlled population

Activity 3

1. Rust is formed when the iron nails is exposed to moisture, that is to oxygen and water
2. Avoid exposure to the mixture, coat with oil or anti-rust liquid, or kept it dry.
3. oxygen and water

What's In
Lesson 2

1. PC
2. CC
3. PC
4. CC
5. CC

Lesson 2

Additional Activities

A.

1.😊 2.😐 3.☹ 4.😐 5.☹

B.

Chemical Change
1.Toasted marsmallow
2. Toasted bread
3. Burning paper

(Expected *Answers may vary)*

Physical Change
1.Boiling water
2. Drying clothes
3. Cutting paper into pieces

(Expected *Answers may vary)*

Assessment

A.
1.Melting – physical change
2.Melting – physical change
3.Burning – chemical change
4.Heated – chemical change

B.

1. C 2. B 3. D
4. D 5. B 6. B

What's More

Activity 1

1. B 1. I will tell my mother to use the bread for composting
2. A 2. I will tell my brother to recycle the tin cans
3. C 3. I will tell my cousins not to rinse their hair in the sea water.
4. D 4. I will tell my mother to sell the newspaper instead of burning it
5. B 5. I will tell Mang Kanor to use chicken manure for fertilizer.

Activity 3 (sample answers)

Activity 2

1. NO
2.YES
3. NO
4. NO
5. NO

What's New

1. good
2. bad
3. bad
4. good
5. bad

What's In

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

What I Can Do

A.

1. alcohol evaporates
2. ice cubes melt after
3. melting of chocolates

B. Answers may vary. *Example possible answer: Keep the metals dry. Apply or coat anti-rust paint on the metal surface.*

C. Answers may vary.

Example possible answer:

1) if still edible, place in the refrigerator and reheat before eating. If not, use as food for the pets. If not for food, use for composting.

2) *If still useable, paint to coat the ca and recycle.*

3) *Reuse the boxes as containers or recycle them.*

What I have Learned

1. heat
2. chemical change
3. physical change
4. oxygen
5. combustion/burning
6. rusting
7. fuel
8. oxygen
9. Heat
10. fire/flame
11. rust
12. good
13. bad
14. healthy
15. avoid
16. burning

Lesson 3

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