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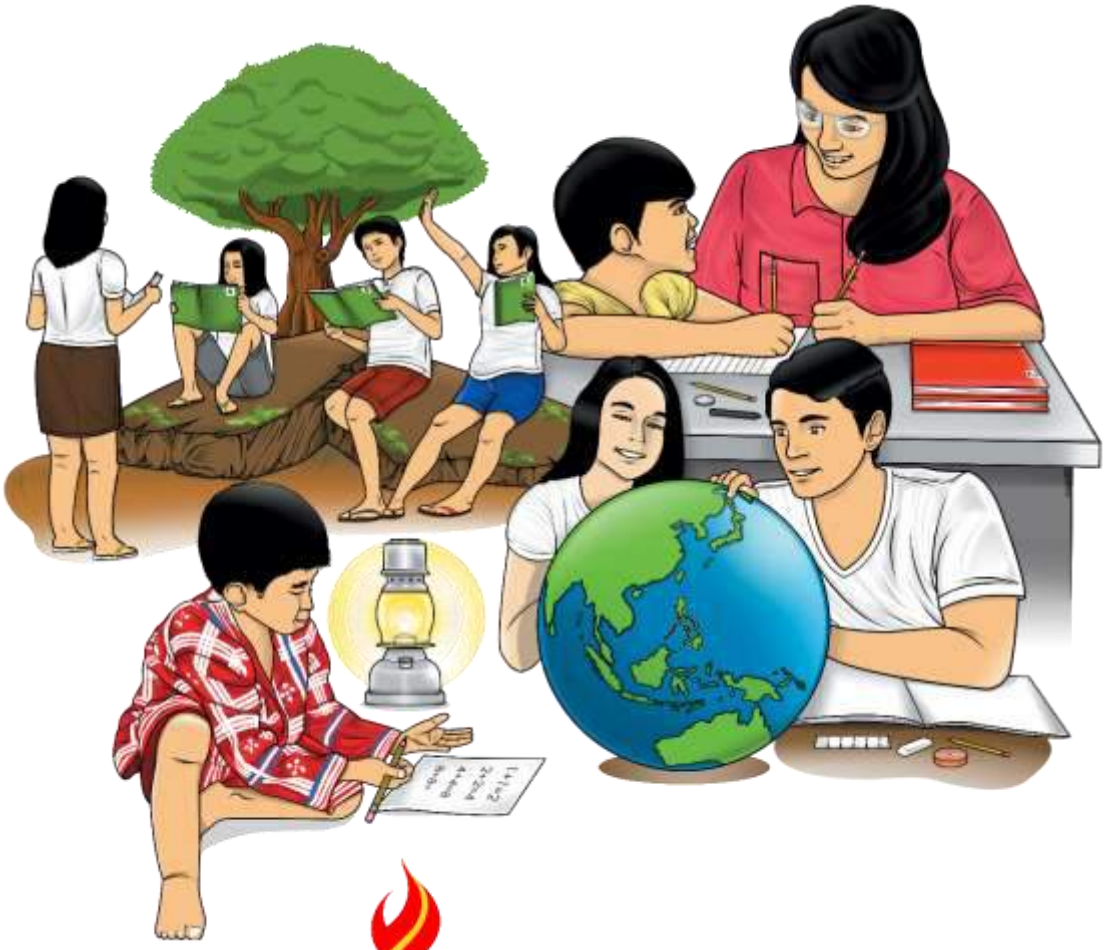
Science

Quarter 4 – Module 1:
How Rocks Turn into Soil



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5

Science

Quarter 4 – Module 1:
How Rocks Turn into Soil

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Introductory Message

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

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

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

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

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

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

Thank you.

What I Need to Know

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

This module will help you describe how rocks turn into soil.

The module is divided into two lessons, namely:

- **Lesson 1** – Mechanical Weathering
- **Lesson 2** – Chemical Weathering

After going through this module, you are expected to:

1. differentiate mechanical and chemical weathering;
2. appreciate the importance of weathering; and
3. perform how mechanical and chemical weathering occurs.

What I Know

Directions: Read and understand the sentences well. Fill in the blanks with the correct answer. Write your answers in your Science notebook.

weathering	carbonic acid
disintegration	decomposition
chemical weathering	soil
sulfuric acid	water
temperature	nitric acid
mechanical weathering	

1. _____ is the physical wearing away of rocks.
2. _____ involves a change in the composition of rocks that allows them to break down into pieces.
3. _____ is the breaking of rocks into smaller pieces.
4. Chemical weathering is also called _____.
5. The continuous change of _____ causes rocks to break.
6. Physical weathering is also called _____.
7. _____ is a valuable material where most terrestrial plants grow.
8. The common mixture combines with other element compounds in the chemical weathering process is called _____.
9. The _____ is formed by the mixture of carbon dioxide and water.
10. _____ is a strong acid that easily melts rocks and their minerals.

Lesson 1 Mechanical Weathering

The crust of the Earth is a layer that covers the entire surface of the planet and is the top component of the lithosphere. The surface of the earth is always changing. Some changes occur very slow while others take place very rapidly. These changes are brought about by many factors. Some factors are caused by natural forces such as volcanic eruptions and earthquakes, others from human activities, animal actions, or even the growth of plants.

The main cause of soil formation is weathering. Weathering is the wearing away of rocks or the breaking of rocks into fragments. It is an important process that helps shape the surface of the Earth. Weathering occurs when rocks near or on the surface of the Earth are exposed to air, water, and other living things. Rocks break up into smaller pieces and resulted in the formation of soil and different landforms. This is also the reason why we have an amazing rock formation. Weathering can be classified into two general types: mechanical or physical weathering and chemical weathering. In this lesson, we will study the processes of mechanical weathering.

What's In

Directions: Analyze the puzzle below. Find five (5) words related to mechanical weathering inside the box. Write your answers in your Science notebook.

h	e	l	a	r	g	e	t	n	i	s	i	r
y	m	i	p	c	g	o	h	a	y	e	f	o
w	e	a	t	h	e	r	i	n	g	r	h	c
y	x	s	d	e	y	k	r	g	h	o	e	k
l	h	g	o	m	e	s	o	x	d	s	e	s
i	s	e	p	i	a	d	i	t	a	i	z	a
o	d	m	e	c	h	a	n	i	c	a	l	p
s	x	i	b	a	m	i	o	k	a	n	s	z
n	a	g	n	l	r	y	e	a	p	l	g	o
a	b	r	a	s	i	o	n	y	o	n	l	n

What's New

Figure 1: Boulder (Photo Source: Spragg, 2016)

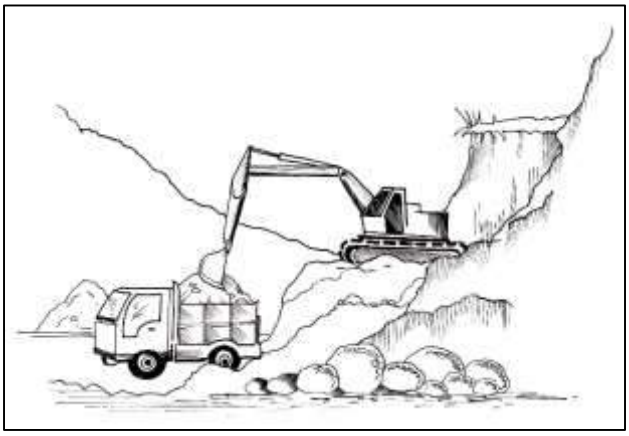
Figure 1 shows a boulder that was separated from a larger mass of rock and has been exposed to the heat of the sun during the day and has been cooled off at night time. Because of the temperature changes the boulder eventually cracked and broke up further into smaller pieces and particles.

What causes the boulder to crack? What will happen if the boulder is constantly subjected to temperature changes?

What is It

Mechanical weathering refers to the process by which rocks disintegrate into small particles due to change in temperature, human activities, and the actions of plants, animals, and frost. In this process, the physical characteristics of rocks are changed but their chemical composition remains the same. It occurs when water enters cracks and crevices of rocks and exerts more pressure, causing the rocks to break.

Rocks are made up of different types of minerals that expand and contract at various rates when exposed to temperature changes. When rocks are heated during the day, they expand. At night time, the temperature drops and cools off, causing rocks to release heat and contract. This continuous expansion and contraction of rocks affect their mineral composition that causes some rocks to crumble and fall apart. This type of mechanical weathering is called thermal expansion.



Illustrated by Ryan A. Machate

Figure 2. A mining site showing mechanical weathering caused by human activity

Many of the changes that humans have made to the environment, involves the breakdown of rocks, either directly or indirectly. When people build homes, schools, roads, bridges, and other infrastructures for any construction purposes, they usually make use of rocks for durability. Other activities like quarrying, making tunnels, landscaping, and mining as shown in Figure 2, also break rocks into pieces. This type of mechanical weathering made by humans transforms rocks into different sizes and shapes to suit their needs.

Illustrated by Reyson Joe G. Cañedp

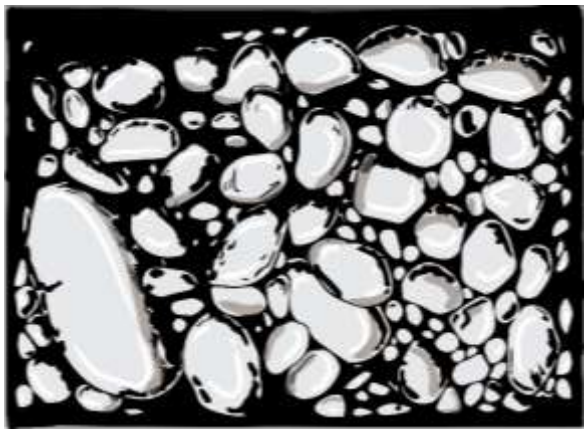
Figure 3: An example of a plant's contribution to mechanical weathering

Plants grow in different places. Some may even grow on rocky areas or rock surfaces. To get water, their roots are forced to make their way into the cracks of rocks (Figure 3). As they grow, their need for water and mineral increased. Their strong roots then, pushed their way deeper into the rocks, causing them to fall apart.

Illustrated by Reyson Joe G. Cañedo

Figure 4. Pigs use their snouts to loosen the soil

Activities of some animals may also expose rocks on the surface of the soil. Pigs loosen the soil with their snouts as shown in Figure 4. Earthworms, frogs, and termites burrow and live underground. When rocks are exposed to the different elements in the environment such as heat, cold, or water, they break into smaller pieces faster.



Illustrated by Kristina C. Aguirre

Figure 5. *Fragments abrade the bedrock or the solid rock layer beneath the stream or river*

Aside from human activities, plants, and animals, other factors that contribute to mechanical weathering include abrasion, exfoliation, temperature changes, and rain. Abrasion is a major mechanical physical weathering process. This means that rocks can break up by abrasion or by rubbing against each other. It occurs when rock fragments are being carried along by agents of erosion, such as water in streams or rivers (Figure 5).

Illustrated by Reyson Joe G. Cañedo

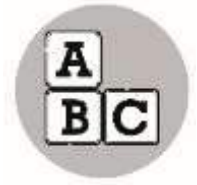
Figure 6. When the surface of rocks becomes wet, moisture penetrates pores, and crevices between mineral grains and reacts with the feldspar

Exfoliation is another significant process of mechanical weathering. This refers to the scaling off or peeling off successive shells from the surface of rocks. It occurs in coarse-grained rocks that contain the mineral feldspar (Figure 6). A chemical change will occur. Note that exfoliation is a physical process caused by a chemical change.

Illustrated by Reyson Joe G. Canedo

Figure 7. An example of parched soil which is the effect of bushfires

Rocks are subject to constant temperature change as the weather changes. This means that as the temperature rises during the day, rocks expand, and as the temperature falls at night, they contract. Only extreme temperature changes, such as those resulting from forest and bushfires as shown in Figure 7, caused rocks to crack or flake off at the surface.



What's More

Directions: Perform the activities by following each step carefully. Observe it properly and write your answers for the guide questions in your Science notebook.

Activity 1: Mechanical Weathering: Pounding

Things you need:

- 1piece of chalk
- hammer
- A piece of cloth

Reminder:

- *Do not play with the hammer and chalk*

What to Do:

1. Wear goggles.
2. Get a piece of chalk and enclose it with a piece of fabric.
3. Pound it using a hammer. (Be extra cautious in using it.)
4. Observe what happens to the piece of chalk.

Guide Questions

1. What happened to the piece of chalk when beaten with a hammer?
2. What sort of progress did the piece of chalk go through? Why?

Activity 2. Independent Practice

Things you need:

- Clean can (large size)
- A glass of water
- 6 pcs of soft rocks/stones
- A piece of cloth
- A Rubberband

What to do:

1. Put some delicate/soft stones in a clean can loaded up with water and cover it firmly.
2. Shake the can vigorously for about thirty (30) seconds.
3. Drain the water, at that point, put the substance in a compartment with a piece of fabric.
4. Remove the stones and analyze what is left.

Guide Questions

1. Where did the small grains of rocks/stones come from?
2. What might have caused it? Why?

Lesson 2 Chemical Weathering

Rocks are made up of mineral crystals, other solid masses found naturally, and even in fossils. These mineral crystals in rocks have definite chemical compositions that react readily when exposed to air and water. Chemical weathering occurs when the chemical composition of rocks changes. The minerals that make up the rock may undergo chemical changes, which may result in the weakening and breaking down of rocks.

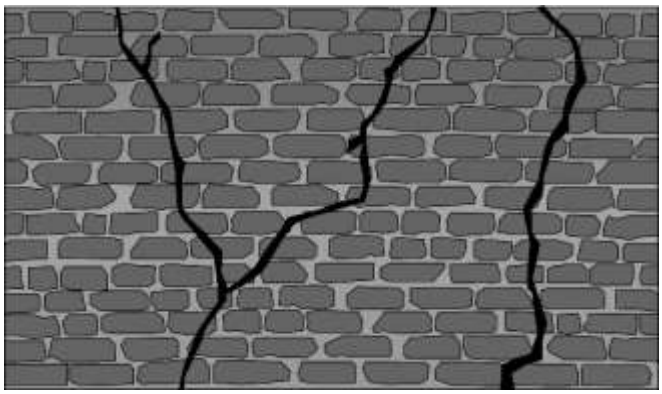
What's In

Directions: Below are jumbled letters. Arrange them accordingly to form a word related to weathering. Write your answers in your Science notebook.

1. UQARYNGRI
2. BOURWRING
3. TPASNL
4. SMILANA
5. AHUMN
6. ERATMERPUE

What's New

What do you see in Figure 8? What has caused the wall to crack? How did the wall crumble and breaks?



Illustrated by Jose Marie E. Baculi

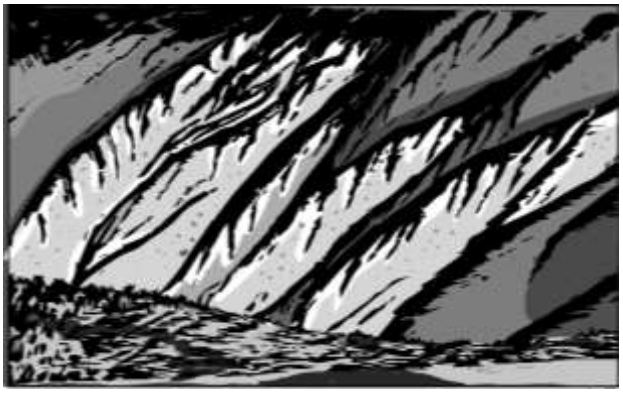
Figure 8: Cracks developed in a brick wall

What is It

Weathering is an important process that helps shape the surface of the Earth. Weathering is the breaking up of rocks into smaller pieces or particles. Weathering may break a large, solid mass of rocks into loose fragments. It includes two processes, disintegration and decomposition. The disintegration of rocks is a physical process of breaking down rocks into fragments, while the decomposition of rocks is the chemical reaction of the minerals present in rocks when exposed to air and water. In this lesson, we will study the chemical process of weathering.

Chemical weathering happens when mineral crystals in rocks react with water and air. It is the process by which new substances are formed from minerals found in rocks. This causes decomposition or changes in the chemical make-up of rocks causing them to crumble. Water is used in the process to interact with minerals found in many rocks. One type of mineral transforms into another.

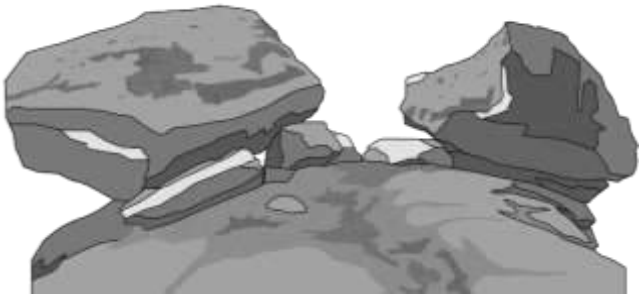
Chemical weathering refers to the breaking down of rocks into smaller pieces due to the action of some elements and compounds in the environment like oxygen, carbon dioxide, and water. The chemical composition of the rocks is changed during this process, which causes minerals to decompose and even dissolve. Water, oxygen, carbon dioxide, and acids are the most common causes of chemical weathering.



Illustrated by Kristina C. Aguirre and Reyson Joe G. Canedo

Figure 9: An example of chemical weathering. Feldspar has changed chemically forming clays which are easily eroded

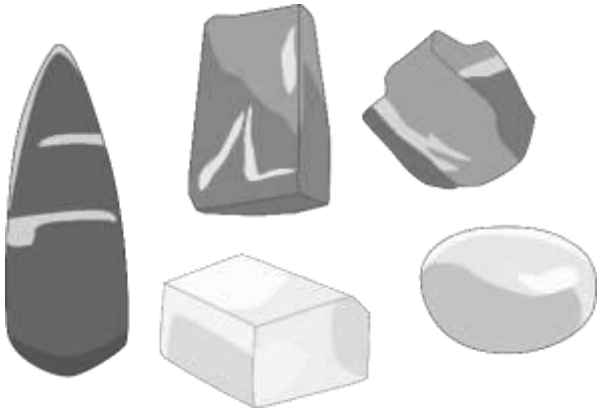
Water can dissolve many minerals. Rocks may either change in composition or fall apart. For instance, when the mineral feldspar combines with water, it changes to a clay material called kaolinite as shown in Figure 9. Water may also combine with some gases in the air to form an acid which can change the composition of the rocks with which it comes into contact.



Illustrated by Jose Marie E. Baculi

Figure 10. An example of a rusty rock on its surface

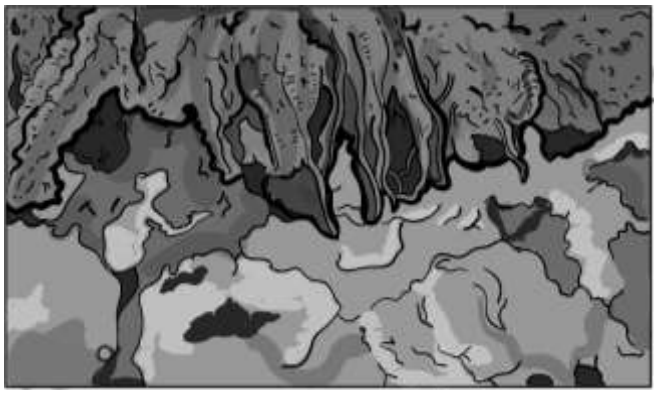
Some minerals found in rocks, especially iron compounds, readily combine with the oxygen in the air. When these rocks are exposed to air, the iron combines with oxygen. The reaction of oxygen and iron form iron oxide or rust as shown in Figure 10. This process is called oxidation. Rocks containing rust particles easily crumble into pieces.



Illustrated by Jose Marie E. Baculi

Figure 11. An example of calcite stones

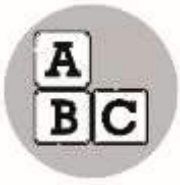
Acids may be formed when water combines with different substances in the environment. When water combines with carbon dioxide, carbonic acid is formed. Carbonic acid is a weak acid from rainwater and carbon dioxide. This acid, as it drains on the ground, dissolves some minerals present in the rocks. This acidic water is more effective than pure water in dissolving some minerals present in rocks. This acid attacks and dissolves a mineral called calcite, which, just like iron, cements rock fragments together. Rocks made up of calcite, such as limestone, sandstone, and marble can be broken down this way. Consequently, the rocks crumble into smaller fragments or fine particles known as soil.



Illustrated by Reyson Joe G. Canedo

Figure 12: An example of a carbonic acid rock

Chemical wastes such as nitrogen oxide and sulfur oxide from burning fuels or volcanic eruptions, mix with water vapor in the air. The mixture of nitrogen oxide and water produces nitric acid while the mixture of sulfur dioxide and water produces sulfuric acid. Sulfuric acid is a strong acid that easily dissolves rocks and their minerals. Acid rain occurs when these acids fall to the ground as rain. On the other hand, carbonic acid is a weak acid that can dissolve some mineral content in rocks. The removal of these minerals may weaken the rock structures, causing rocks to break into smaller pieces.



What's More

Directions: Perform the activities by following each step carefully. Observe it properly and write your answer for the guide questions in your Science notebook.

Activity 1. Chemical Weathering

You will need:

- A piece of chalk
- 1 tablespoon of vinegar
- 1 container
- 1 Goggle

What to do:

1. Get a piece of chalk.
2. Place it in a container and pour the vinegar on it.
3. Observe what happens to the piece of chalk.

Guide Questions

a. What happened to the piece of chalk when you poured the vinegar on it?
b. How did the vinegar respond to the chalk?
c. What sort of progress did the piece of chalk go through?

Activity 2: Independent Practice

Things you need:

- 15 pieces of rocks
- A paper and pen
- 3 large plastic jars or containers with covers
- Water
- Masking tape
- Vinegar

What to do:

1. Label each container with the corresponding numbers (1, 2, and 3). Put five bits of rocks in each marked container.
2. Jars 1 and 3 will be loaded up with water, while Jar 2 will be half loaded up with vinegar.
3. Shake the Jars 1 and 2 vigorously for five (5) minutes, at that point put in a safe spot or rest for five (5) minutes also.
4. For Jar 3, let the water stand for ten (10) minutes, without shaking it.
5. Observe what happened to the stones in the three containers/jars.
6. Remove the stones from the containers after 10 minutes.
7. Examine the measure of rock particles from the stones.

Guide Questions

a. How do the piles of rocks in containers 1, 2, and 3 contrast?
b. What causes the changes in the stone?

What I Have Learned

Directions: Read and understand the paragraph. Supply the missing words by filling in the blanks. Choose the correct answer from the terms given inside the box. Write your answers in your Science notebook.

mechanical weathering	chemical weathering
temperature	rocks
disintegrate	decompose

1._____ are composed of various minerals that expand and contract in response to 2._____changes. When heated during the day, rocks expand, and when the temperature drops at night, they contract. The mineral composition of rocks is affected by their continuous expansion and contraction. 3._____is the process by which rocks crumble and fall apart.

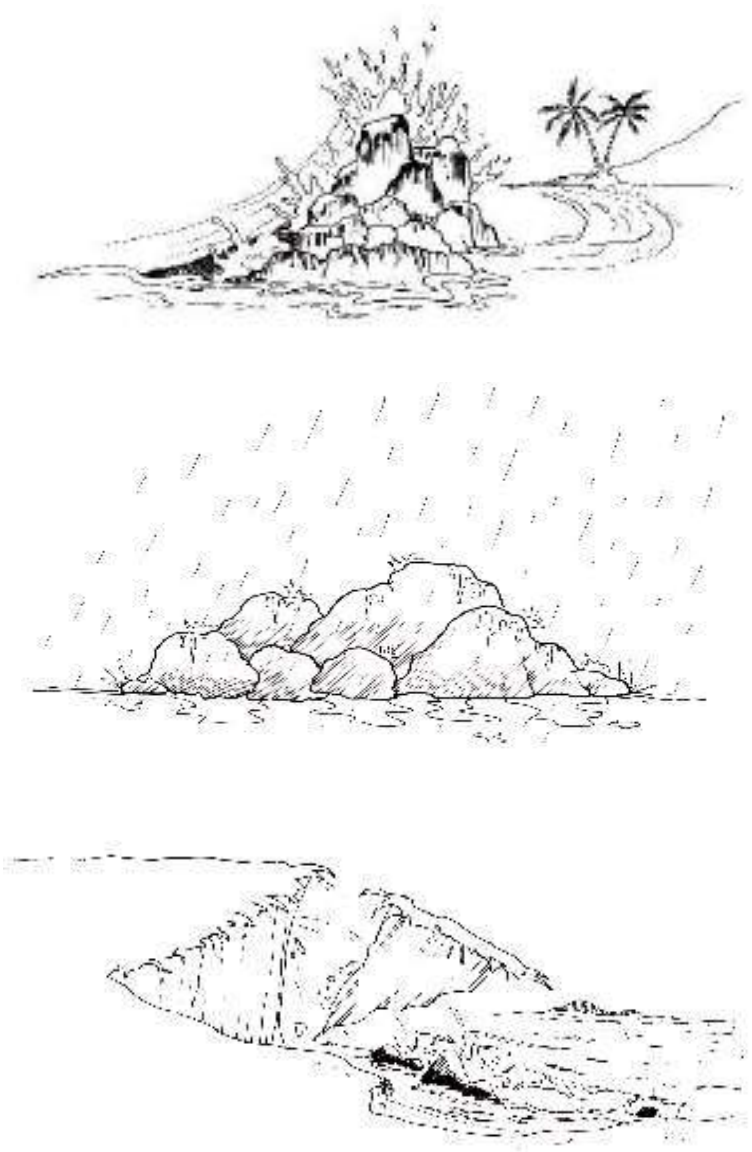
When mineral crystals in rocks react with water and air, 4._____ occurs. It is the process of forming new substances from minerals found in rocks. During this process, the chemical composition of the rocks changes, causing minerals to decompose and even dissolve. Rocks 5._____ as a result of the action of certain elements and compounds in the environment, such as oxygen, carbon dioxide, and water.

What I Can Do

A. Directions: Read and understand the sentences well. Identify the number of the statement in the sequence that describes mechanical weathering. Write your answers in your Science notebook.

1. When rocks are exposed to hot and cold temperature
2. When rocks are exposed to air.
3. Breaking of rocks due to different human activities
4. When quarrying and blasting the rocks
5. When plants grow in rocks

B. Directions: Analyze the pictures below. Then answer the following questions in your science notebook.



Illustrated by Ryan A. Machate

Based on your analysis in the illustrations above, describe how rocks turn into soil.

1. How do rocks break into pieces?
2. How does the chemical weathering process break down rocks into particles?

Assessment

A. Directions: Read and understand the sentences well. Write **True** if the statement is correct and **False** if it is not, then underline the word/phrase that made the statement false. Write your answers in your Science notebook.

1. Weathering is the process of soil formation.
2. Disintegration is also known as chemical weathering.
3. Rocks on the surface of the Earth do not change by weathering.
4. When water freezes, it expands and exerts more pressure on the rocks causing the rocks to break.
5. Disintegration is a mechanical process that breaks rocks into smaller pieces.

B. Directions: Read the statements carefully. Choose the letter of the correct answer. Place your answers in your Science notebook.

1. It is the breaking down of rocks into fragments.
   A. Erosion C. Runoff
   B. Flooding D. Weathering

2. A type of weathering that involves a change in the composition of the rock.
   A. Chemical C. Both chemical and mechanical
   B. Mechanical D. None of these

3. What do you call the process by which humans extract stones from the mountains for construction purposes?
   A. Digging C. Weathering
   B. Flattering D. Quarrying

4. What will happen to a rock when it is exposed to higher temperatures?
   A. Contracts C. Expands
   B. Evaporates D. Sinks

5. Which of the following is NOT a factor that causes chemical weathering?
   A. water C. oxygen
   B. open-field D. carbon dioxide

Additional Activities

Diamond is one of the most expensive stones in the world. It is a kind of gem or gemstone. Gemstones are precious stones that are cut, shaped, and made into jewelry. They are very attractive and most of them are very expensive too. They come in different colors and hardness. Their value depends on their luster and clarity.

Before being used as jewelry, what could be done with this gemstone to make them more beautiful and expensive? Write your answer in your Science notebook.

Answer Key

What I Know

1. mechanical weathering
2. chemical weathering
3. weathering
4. decomposition
5. temperature
6. disintegration
7. soil
8. water
9. carbonic acid
10. sulfuric acid

Lesson 1

What's In

h	e	l	a	r	g	e	t	n	i	s	i	r
y	m	i	p	c	g	o	h	a	y	e	f	o
w	e	a	t	h	e	r	i	n	g	r	h	c
y	x	s	d	e	y	k	r	g	h	o	e	k
l	h	g	o	m	e	s	o	x	d	s	e	s
i	s	e	p	i	a	d	i	t	a	i	z	a
o	d	m	e	c	h	a	n	i	c	a	l	p
s	x	i	b	a	m	i	o	k	a	n	s	z
n	a	g	n	l	r	y	e	a	p	l	g	o
a	b	r	a	s	i	o	n	y	o	n	l	n

Answers: rocks, weathering, soil, mechanical, abrasion

What I have learned

Answers:

1. Rocks
2. Temperature
3. mechanical weathering
4. chemical weathering
5. disintegrate

What I can do

A.

Answers:

- 1
- 3
- 4
- 5

What's New

The boulder cracked because of weathering process. It is caused by the constant change of temperature or maybe because of some human activities such as quarrying and digging for construction purposes. If this boulder will continue to crack it will turn into pieces which will become soil after sometimes.

What's More

Lesson 1

Activity 1

1. The piece of chalk when pounded broke into tiny pieces/particles.
2. It is a mechanical change that caused to break the chalk into pieces due to the force done by human with the use of a hammer.

Activity 2

1. The small grains of rocks come from the soft rocks which was put in the glass.
2. It was caused by the vigorous shaking of the glass. The continuous pounding or hitting to the can and with other rocks.

Lesson 2

What's In

1. QUARRYING
2. BURROWING
3. PLANTS
4. ANIMALS
5. HUMAN
6. TEMPERATURE

What I Can Do

1. As I do the analysis on the three pictures, the rocks break into pieces through the process of chemical weathering.
2. The pictures shows that the rocks breaks down into smaller one because of the waves, rivers and acid rains. Thi is because of chemical weathering. The chemical composition of the rocks is changed during this process, which causes minerals to decompose and even dissolve.

What's New

1. The wall was so much exposed to air, water and dust. Chemical content in water accelerates the breakdown of the wall and allow air and water to penetrate more deeply and caused the crumble and decay of the wall.

Assessment

1. True
2. False, Disintegration is also known as chemical weathering.
3. False, Rocks in the Earth's surface does not undergo changes by weathering.
4. True
5. True
6. d
7. a
8. d
9. c
10. b

What's More
Activity 1

A. The chalk was broken down to small pieces, or was "melted".

B. The piece of chalk when poured with a vinegar, slowly melted or "peeled".

C. It is a chemical weathering process that caused the chalk to melt. It is because of the acid contain in the vinegar solution.

Activity 2

a. The piles of rocks in Jars 1 and 2 turned into pieces or there were small grains that appeared while jar 3 there was no change.

Additional Activities

Before being used into jewelry, these stones are first cut and polished. Other treatments may also be done to enhance and show the beauty of the gemstones. They could be heated and waxed to make them more beautiful, attractive and expensive.

Activity 2

a. The changes on the rock sample was caused by shaking of the jars.and the presence of vinegar and water which reacted to the stones.

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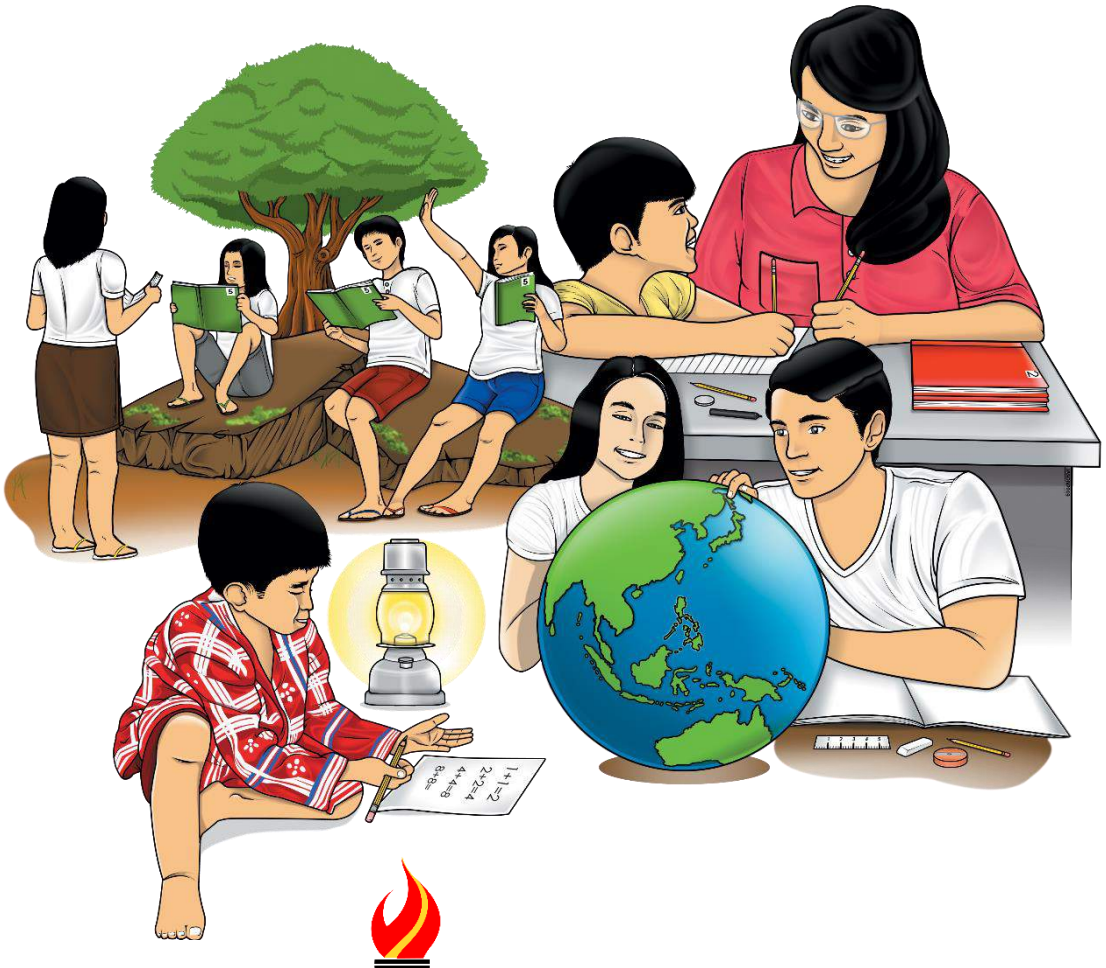
Science

Quarter 4 – Module 2:
Soil Erosion: The Process That Shape Earth's Surface



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ADM

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Alternative Delivery Mode
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First Edition, 2020

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5

Science

Quarter 4 – Module 2:
Soil Erosion: The Process That Shape Earth's Surface

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Introductory Message

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

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

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

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

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

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

Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you to understand the concepts of soil erosion as one of the processes that shape Earth's surface. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module will help you investigate the extent of soil erosion in the community and its effects on living things and the environment.

The module is composed of two lessons:

- **Lesson 1** – Factors that Affect Soil Erosion
- **Lesson 2** - Effects of Erosion on Living Things and the Environment

After going through this module, you are expected to:

1. identify the factors that affect soil erosion;
2. describe how soil erosion affects living things and the environment; and
3. cite ways to control soil erosion.

What I Know

Directions: Examine the list of words in the box. Some are the causes of soil erosion, while others are the effects. Place them in the appropriate category. Write your answers in your science notebook.

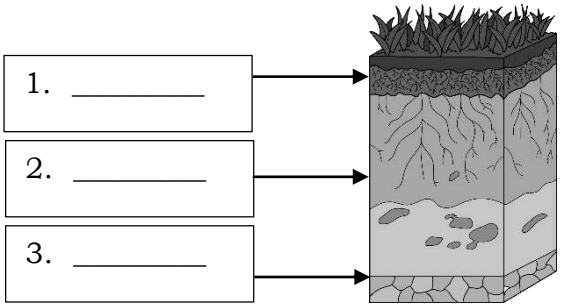
illegal logging	mining
burning of trees	uprooting of trees
overflowing of rivers	loss of topsoil
strong winds	exposed bedrocks
landslides	barren soil

Causes	**Effects**
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Lesson 1 Factors that Affect Soil Erosion

What's In

A. Directions: Below is an illustration of soil profile, the vertical structure of soil. Identify and label the three layers of the soil. Write your answers in your science notebook.



(Illustrated by Reyson Joe G. Cañedo)

B. Directions: Arrange the jumbled letters to form the correct words to describe the following statements. Write your answers in your science notebook.

1. An agent of weathering that carries light materials and soil particles by blowing them and depositing them in other places.

N	W	I	D

2. It disperses soil particles that cause topsoil loss, crop yields reductions, infrastructure damage, weed dispersal, and dam silting.

T	W	E	R	A

3. They damage the soil surface by eating vegetation and digging into wet or compacting dry soil with their hooves.

N	A	S	I	A	M	L

4. They damage the soil by doing activities such as gardening, quarrying, mining, deforestation, bad farming, and *kaingin*.

S	U	N	M	A	H

5. It is the movement of rock fragments and soil from one place to another.?

I	L	N	O	I	E	S	O	R	S	O

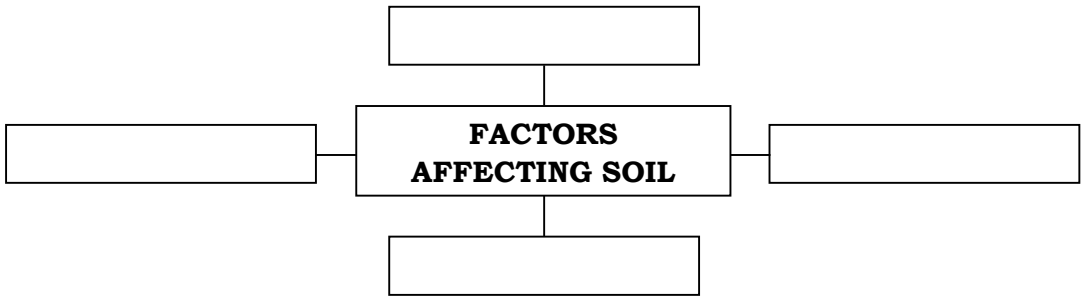
Notes to the Teacher

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

What's New

Mountains, plateaus, valleys, and plains are examples of Earth's various landforms. Some of these landforms were formed as a result of rocks breaking down and erosion. Soil erosion is a naturally occurring phenomenon that affects all landforms. Soil is a non-renewable resource that cannot be renewed after it has been eroded. Soil erosion is the irreversible change of the characteristics of the soil. In agriculture, it refers to the natural physical forces that wear away the topsoil.

Directions: Complete the concept map by filling in the physical forces or factors that affect soil erosion. Write your answers in your science notebook.



What is It

FACTORS AFFECTING SOIL EROSION

When rocks are broken down into smaller pieces, they do not remain in one place. Some rock fragments decompose and become soil. Others are moved from one place to another. **Erosion** is the transfer of rock fragments and soil from one place to another. Sediments are the materials that are transported as a result of erosion. Erosion of rock fragments contributes to soil formation and landform formation in general.

There are various agents or factors affecting soil erosion, just as there are different agents of weathering. Water, wind, animals, and humans are among them.

Water

Water carries rock and soil particles from one location to another as it flows. The rate of erosion is affected by the speed of flowing water. The erosion would be quicker and farther if the water flowed faster. The fast movement of water can cause many sediments to be carried away by the water.

Since clay, sand, and minerals are carried in the rain, the water appears muddy. It clears after a while, creating multiple layers of rock materials that represent the soil profile. Soil profile refers to the layers of the soil, namely: topsoil, subsoil, and bedrock.

Wind

When the wind blows, it carries light material and soil particles with it, transporting and depositing them somewhere else. Strong winds bring soil particles to a distant location. Wind erosion can occur anywhere, especially in areas where the soil is not sufficiently compacted. Sometimes, you may notice dust on your

cabinets, tables, and other furniture. The dust you found has been brought there by the wind. Wind has the ability to move and carry away soil particles.

Animals

Some rocks and soil particles stick to the bodies of burrowing animals as they move from one place to another, resulting in sediment transport. When animals travel around, they break down rocks with their claws and hooves, and their waste materials help in the decay of rocks that cause soil erosion.

Humans

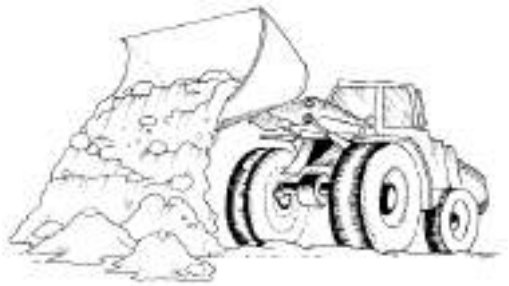
We are all aware that erosion is a natural occurrence. We cannot deny that humans play a significant role in the rate at which soil erosion occurs. Even walking contributes to soil erosion, because soil clings to our shoes, in the same way that it does to animals, and the soil is then transported from place to place.

Other human activities contribute to soil erosion, such as gardening, quarrying, mining, deforestation, bad farming, and *kaingin*.

a. Gardening causes soil erosion when digging the soil for planting. It affects the soil profile. Even walking through a garden for planting induces erosion. The soil sticks to our shoes and moves from one place to another.

(Illustrated by Ryan A. Machate)

b. Quarrying is the process of removing rocks from mountains to be used in construction. It can result in soil movement and sediment build-up downstream. Quarrying activities have the potential to damage pre-existing environments seriously. It has a negative impact on land, depletion of groundwater, loss of fertile topsoil, forest destruction, and public health.

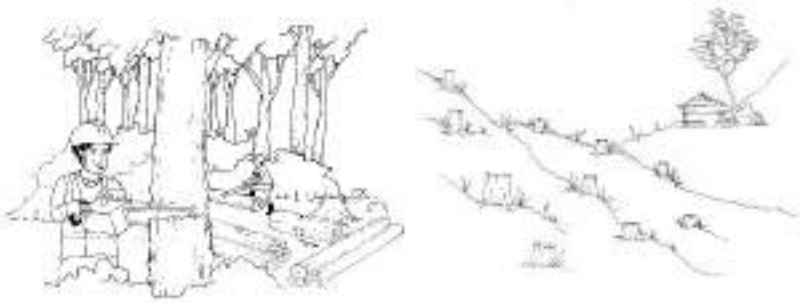


(Illustrated by Ryan A. Machate)

c. Mining is the process of removing minerals and metals from soil and rocks. Wind, water, and gravity can carry exposed soils from mining operations, tailings, and other fine materials away from mining operations, resulting in sediment loading in rivers and other bodies of water. Mining activities alter the surrounding landscape on a regular basis by exposing previously undisturbed earthen materials.

(Illustrated by Ryan A. Machate)

d. Deforestation occurs when trees are cut down without being replaced. Because there are no roots to hold or retain water from heavy rains, the soil becomes loose, making it more vulnerable to erosion.



(Illustrated by Ryan A. Machate)

e. Bad farming is referred to as excessive fertilizer and irrigation use. Farming involves plowing the field, which destroys natural vegetation and promotes the growth of new seeds or plants. If farming is not properly managed, the topsoil, which contains nutrient materials, will erode, reducing soil fertility.

(Illustrated by Ryan A. Machate)

f. ***Kaingin***, also known as slash-and-burn, is the practice of cutting down trees and burning them to clear land for cultivation, exposing the land to air and water and making the soil prone to erosion.

(Illustrated by Reyson Joe G. Cañedo)

What's More

Activity 1. Effect of Water on Soil Erosion

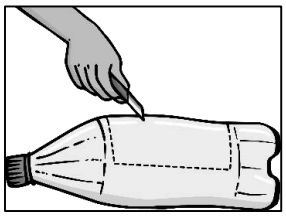
Materials Needed:

- 1 plastic soft drink bottle
- a pair of scissors or a knife
- 1 clear plastic cup/glass or container
- 2 cups of soil or more if needed
- 1 pitcher of water

What to Do:

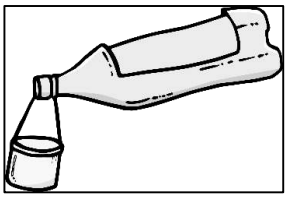
Note: *Be careful in doing the activity, especially in using sharp objects. Ask help from an elder.*

1. Use a pair of scissors or a knife to cut a large rectangle out of the side of the plastic soft drink bottle.



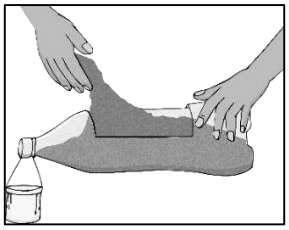
Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

2. Just below the neck of the bottle, place or hang a clear plastic cup or glass. Ensure that the plastic cup or glass is not too short – it should be capable of holding the water that will pour out from the bottle.



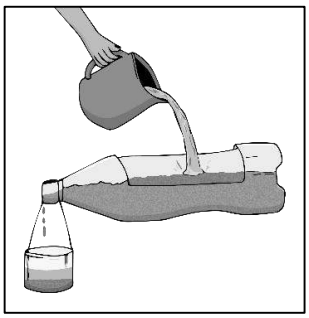
Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

3. Fill the plastic bottle with the soil up to its neck.



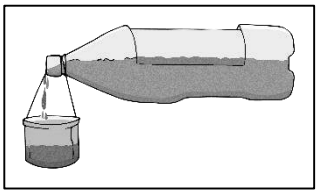
Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

4. Slowly pour water from a pitcher into the rectangular opening on the side of the bottle. Pour water on the entire surface of the soil. Observe how the water passes through the soil and how it flows out into the plastic cup or glass placed just below the small opening of the bottle.



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

5. Observe what happens to the soil as water flows out of the small opening.



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

Guide Questions 1

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

1. Were you able to do the activity correctly? How?
2. What have you observed in the activity?
3. What is your conclusion on the effect of water on soil erosion?

Activity 2. Effect of Wind on Soil Erosion

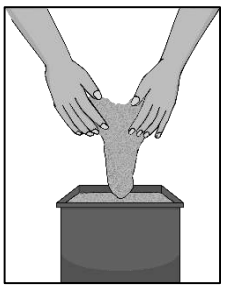
Materials Needed:

- 1 small/medium shallow box or container
- 2 cups of dry sand/soil (or more if necessary)
- 1 electric fan or hand fan

What to Do:

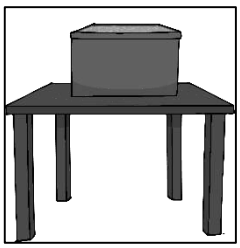
Note: *Be careful in doing the activity. Seek the assistance of an elder.*

1. Fill a shallow box or any container with dry sand or soil. Make sure to fill the box or container all the way to the brim or the topmost edge of the container.



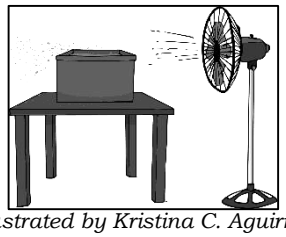
Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

2. Place the container containing the dry sand or soil on top of a table or chair. Place an electric fan in front of the set-up --- the container filled dry sand or soil.



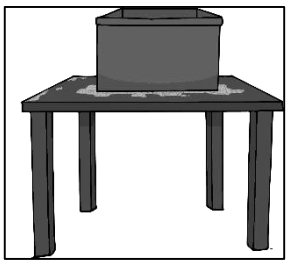
Illustrated by Kristina C. Aguirre and Jose Marie E. Baculi

3. Turn on the electric fan up to the highest fan speed possible as it faces the setup. If you do not have an electric fan, you may use an ordinary hand fan.



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

4. Observe what happened to the dry sand/soil.



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

Guide Questions 2

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

1. Were you able to do the activity correctly? How?
2. What have you observed in the activity?
3. What is your conclusion on the effect of wind on soil erosion?

Activity 3. Effect of Humans and Animals on Soil Erosion

Directions: Study the illustration below and answer the following questions. Write your answers in your science notebook.

(Illustrated by Reyson Joe G. Cañedo)

Guide Questions 3

1. What can you observe in the illustration?
2. Will the humans and animals in the illustration affect soil erosion? How?

Lesson 2 Effects of Erosion on Living Things and the Environment

What's In

Directions: Write **AGREE** if the statement is correct and **DISAGREE** if the statement is incorrect. Write your answers in your science notebook.

_____1. Bad farming is one of the factors of soil erosion wherein farmers use excessive fertilizers and irrigation, which damage the land.

_____2. Many vehicles passing through non-cemented roads can not cause soil erosion.

_____3. Cutting of trees causes soil to erode due to the lack of roots that hold the soil together.

_____4. Kaingin system is an agricultural practice wherein farmers clear the land by burning trees thus, exposing the soil to rain and wind.

_____5. Animals expose the soil by consuming the grass in a place, making it possible for the soil to be easily be carried by water and wind.

What's New

Every natural process on Earth, such as soil erosion, has an impact or effect on both living and nonliving things. Soil erosion not only shapes Earth's landforms but also has an impacts on the ecosystem, particularly when it occurs suddenly or abruptly.

Gardening, quarrying, mining, deforestation, bad farming, and *kaingin* are all human activities that intensify soil erosion in the environment.

Directions: Give at least three (3) effects of soil erosion on living things and the environment. Write your answers in your science notebook.

Living Things	Environment
1.	1.
2.	2.
3.	3.

What is It

EFFECTS OF SOIL EROSION

Erosion of land has been occurring for millions of years and will continue as long as there is soil and there are people, animals, wind, and water to move it. Erosion has a significant impact on plants, animals, and humans.

Landslides can occur as a result of erosion. Can you tell how dangerous landslides can be? It has the potential to kill people and harm the environment and properties. Erosion has the potential to destroy roads and bridges. It makes it impossible to pass through or travel on roads. Travel becomes difficult and challenging. Repair of roads, on the other hand, will be expensive for the government.

Erosion has an impact on the land. It has the ability to alter the shape and size of land. The effects of soil erosion on landforms are not visible in a short period of time. Some changes may take years to become noticeable. When soil is exposed as a result of deforestation or other similar activities, the shape of the landform is more likely to change.

The effect of soil erosion on landforms is also coupled with weathering and deposition. Tiny particles of rocks or the sediments formed by weathering are carried away from one place to another. It is caused by some factors of erosion such as wind and water. As the wind blows and water flows across land, they break down rocks and carry these sediments to new locations, where they are deposited. This interaction changes the land over time resulting in valleys, mountains, and hills.

Soil erosion is also a result of extensive agricultural activities. Topsoil is lost as a result of soil erosion, and rills and gullies can form. These rills and gullies have negative impact on agricultural areas because they deplete soil fertility and erode a considerable amount of soil. The majority of the nutrients of plants are from the topsoil. The organic materials produced by dead organisms are found in the topsoil.

This topsoil, however, is usually carried away by wind and water. The nutrients for plants will be carried away once the topsoil is gone.

Soil erosion reduces the ability of soil to absorb water. As a result, the soil becomes dry, coarse, and eventually unsuitable for vegetation. Sediments washed away by water can also clog irrigation systems, further reducing the plant's water supply. Plants would produce less food due to erosion, which would have an impact on both animals and humans because plants are their primary source of food and nutrients. Aside from the need for food, individuals who depend on soil cultivation for a living, such as farming, will face difficulties if they do not have rich soil.

The presence of mine tailings is yet another negative effect of erosion. Mine tailings are the mineral wastes or byproducts of the mining process. Erosion caused by water can wash mine tailings into nearby bodies of water, polluting them. Polluted seas and rivers can harm aquatic plants and animals, as well as the potable water supply of animals and humans.

WAYS TO CONTROL SOIL EROSION

Erosion is the washing away of soil. It is harmful to humans, plants, animals, and the environment in a variety of ways.

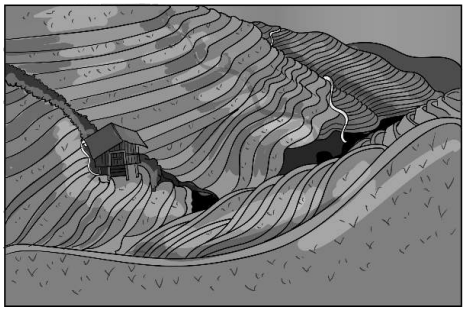
Here are some methods for preventing soil erosion.

Building dikes of stones or logs - may be used to slow down water and prevent water from flowing out. The dikes prevent soil from being washed away by rain.

(Illustrated by Reyson Joe G. Cañedo)

Contour Plowing – is a farming technique where the soil is plowed following the contour or shape of the land. It helps slow down soil erosion. It is one of the effective ways to minimize water runoff.

(

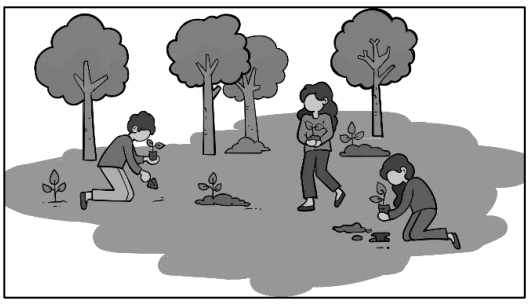


Illustrated by Reyson Joe G. Cañedo)

Crop Rotation – is a method of planting a series of different crops in the same area in sequential seasons. It maintains soil fertility and controls insects and pests.

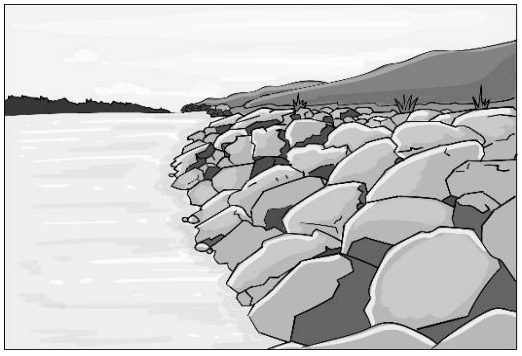
(Illustrated by Reyson Joe G. Cañedo)

Reforestation - Plants and trees help in the control of soil erosion. When rainwater falls on plants, it cannot wash away much soil. Plants roots hold the soil in place. Soil erosion can be prevented by reforestation.



(Illustrated by Reyson Joe G. Cañedo)

Riprapping - is building ripraps or chunks of stones or rocks arranged on the edge of the slope. This arrangement of stones serves as a foundation and a ridge to control soil erosion.

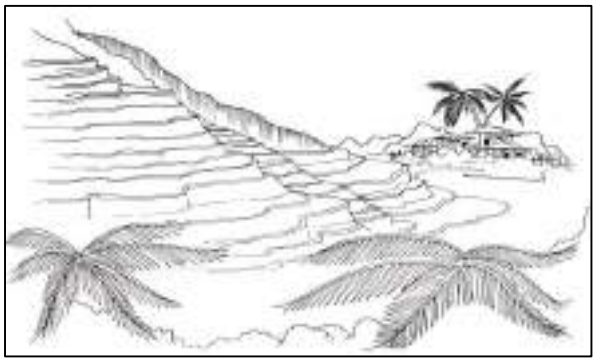


(Illustrated by Reyson Joe G. Cañedo)

Strip Cropping -is another way of conserving soil. Here, the plants are arranged in strips of alternate bands of row crops and cover crops. The cover crops hold the soil and reduce water runoff. An example is planting crops and grass alternately. Grasses prevent the soil from going downhill.

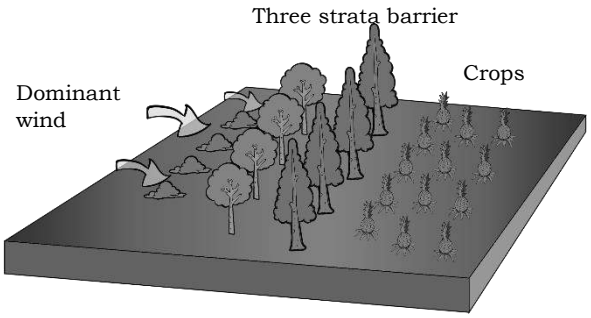
(Illustrated by Reyson Joe G. Cañedo)

Terracing - is a method that prevents soil erosion. Terraces are flat areas built on the mountainsides. Since it is flat, it prevents the soil from going down easily. These terraces are then planted with rice and other crops. The *Banaue Rice Terraces* is a famous example of the method of terracing.



(Illustrated by Ryan A. Machate)

Windbreak - Planting rows of trees or bushes is another way of preventing soil erosion. These plants act like fences or walls. They block the force of the wind. The soil will not be easily carried away by the wind.



(Illustrated by Reyson Joe G. Cañedo)

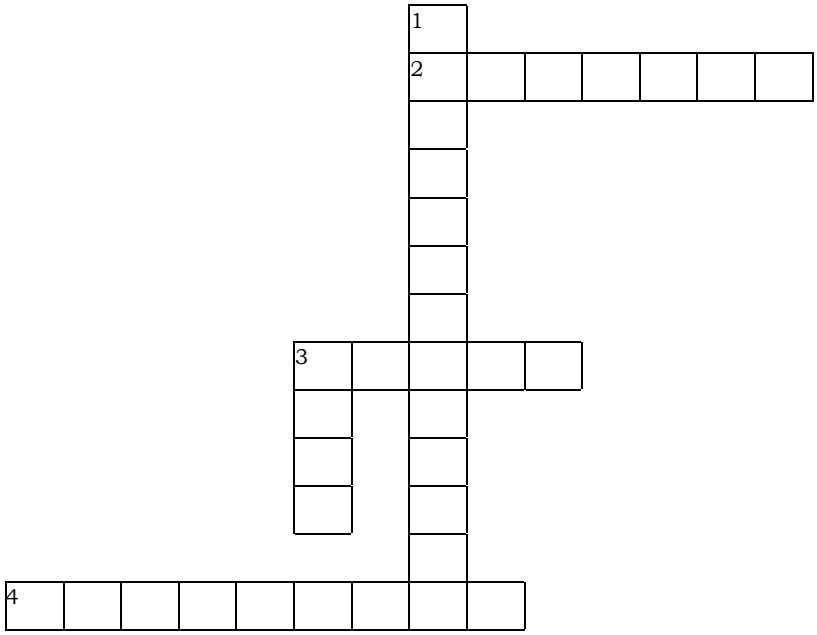
What's More

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

1. How does soil erosion cause food shortage among the people in the community?
2. How does soil erosion cause flooding in the community?
3. How does soil erosion affect the fisheries and dam reservoirs of a community?
4. How does soil erosion affect one's life?
5. What are way/s in controlling soil erosion applicable in your community?

What I Have Learned

A. Directions: Complete the crossword puzzle below by answering the following questions. Write your answers in your science notebook.



Down	Across
1. What is the term for the process of removing trees without replacing them, resulting in soil erosion? 3. What factor of soil erosion carries light material and soil particles and deposits them elsewhere?	2. What do you call the occurrence in which rock fragments and soil move from one place to another? 3. What factor of soil erosion carries rock and soil particles from one location to another as it flows? 4. What is removing rocks from mountains to be used in construction, which contributes significantly to soil erosion?

B. Directions: Fill in the blanks with vocabulary words from the discussion on the Effects of Soil Erosion. Use the words in the word box. Write your answers in your science notebook.

wind	soil erosion	landslide
humans	animals	landform

Erosion has a significant impact on plants, animals, and humans. Erosion can cause_1._____. It has the potential to harm the environment and destroy roads and bridges.

The effect of soil erosion on 2._____ is also coupled with weathering and deposition. Tiny particles of rocks or the sediments formed from the process of weathering are carried away from one place to another by agents of erosion such as wind and water. As the wind blows and water flows anywhere on land, they break down rocks and carry these sediments to other places and deposit them elsewhere. Because of soil erosion, the topsoil is lost, and rills and gullies may be created.

3._____ causes the soil to lose its ability to absorb water. Plants would produce less food as a result of erosion. This can have an impact on both 4._____ and 5._____ because plants are their primary source of food and nutrients. The presence of mine tailings is yet another negative effect of erosion.

What I Can Do

A. Directions: Read and understand the situation below. Answer the question that follows. Write your answers in your science notebook.

The manager of a quarrying firm visited your barangay and expressed his intention to conduct quarrying business in your area. He promised to make donations to the people of your barangay if he is permitted to run the business. Will you go for it as a member of the community? Why?

B. Directions: Classify the identified ways of controlling soil erosion in terms of where they should be used. Write your answers in your science notebook.

Building dikes of stones or logs	Riprapping
Contour Plowing	Strip Cropping
Crop Rotation	Terracing
Reforestation	Wind Break

Flat Lands	Slope Lands

Assessment

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

1. What factor of soil erosion is responsible for the transfer of sand from one place to another?
   a. wind
   b. water
   c. animals
   d. humans

2. Which of the following shows that animals cause soil erosion?
   a. Construction workers are building a housing project.
   b. A hen is digging the soil.
   c. The root of plants is growing.
   d. Sandstorm

3. All of these are causes of soil erosion except one.
   a. water
   b. humans
   c. sun
   d. wind

4. What human activity contributes to soil erosion that involves removing minerals and metals from soil and rocks?
   a. mining
   b. quarrying
   c. deforestation
   d. kaingin

5. What do you call the process of cutting down trees and burning them to clear land for cultivation, exposing the land to air and water, and making the soil prone to erosion?
    a. deforestation
    b. gardening
    c. kaingin
    d. bad farming

6. How can trees prevent soil erosion?
    a. The roots hold the soil firmly together.
    b. The trees block the way of running water.
    c. The roots absorb the water at once.
    d. The roots secrete acid, attacking the rocks.

7. The following are some of the processes of preventing soil erosion, except one.
    a. Crop rotation
    b. Riprapping
    c. Strip Cropping
    d. Gardening

8. In a slope land, which of the following can be used to prevent soil erosion?
    a. Building dikes of stones or logs
    b. Crop Rotation
    c. Terracing
    d. Wind Break

9. Which of the following can be used to prevent soil erosion in flatlands?
    a. Contour Plowing
    b. Riprapping
    c. Wind Break
    d. Strip Cropping

10. What is the process of using chunks of stones or rocks arranged on the edge of the slope that serves as the foundation and a ridge to control soil erosion?
    a. Riprapping
    b. Building Dikes
    c. Terracing
    d. Strip Cropping

Additional Activities

Directions: Read and understand the situations below. Answer the questions that follow. Write your answers in your science notebook.

1. It is your responsibility to sweep your back yard. As you sweep, loose soil particles are carried away. Much topsoil is lost in this manner. Which would be the most effective way of solving the problem?
2. Why would you join a “Plant A Tree” campaign in the community?

Answer Key

What I Know

Causes	Effects
1. illegal logging	1. landslides
2. burning of trees	2. barren soil
3. strong winds	3. exposed bedrocks
4. mining	4. loss of topsoil
5. uprooting of trees	5. overflowing of rivers

What's In

B.

1. WIND
2. WATER
3. ANIMALS
4. HUMANS
5. SOIL EROSION

Lesson 1

What's In

A.

What's New

What's More
Activity 3
Guide Questions 3 *(Possible Answers)*

1. What can you observe in the illustration?
   - ✓ The dog is playing, the chickens are eating, and the farmer and the carabao are walking together. The ladies are doing their chores such as sweeping and feeding the chickens.
   - ✓ Both the humans and animals are busy doing their own activities.
2. Will the humans and animals in the illustration have an impact on soil erosion? How?
   - ✓ Yes. Since the animals and humans shown in the illustration are engaged in activities that have direct effect on the soil that may result in soil erosion. The soil particles cling to the paws and feet of animals and humans, and are then carried from one place to another.

What's More
Activity 2
Guide Questions 2 *(Possible Answers)*

1. Were you able to do the activity correctly? How?
   - ✓ Yes. I followed the instructions given in the activity.
   - ✓ No. I did not follow the instructions given in the activity.
2. What have you observed in the activity?
   - ✓ I have observed that when I turned on the electric fan, the dry sand/soil particles were blown away, were scattered, and landed in some places.
   - ✓ I have not observed anything.
3. What is your conclusion on the effect of wind on soil erosion?
   - ✓ Wind greatly contributes to soil erosion. Because of the wind, light materials and soil particles are carried away and are deposited in other places.
   - ✓ Wind does not contribute to soil erosion.

What's More
Activity 1
Guide Questions 1 *(Possible Answers)*

1. Were you able to do the activity correctly? How?
   - ✓ Yes. I followed the instructions given in the activity.
   - ✓ No. I did not follow the instructions given in the activity.
2. What have you observed in the activity?
   - ✓ I have observed that as I poured water into the bottle, it turned muddy when it mixed with the soil. The soil was carried away as the water flowed out into the plastic cup or glass. The water also decreased the amount of soil in the bottle.
   - ✓ I have not observed anything.
3. What is your conclusion on the effect of water on soil erosion?
   - ✓ Water greatly contributes to soil erosion. Because of the water that passes through landforms due to rainwater, it carries rock and soil particles from one location to another.
   - ✓ Water does not contribute to soil erosion.

What's More

(Possible Answers)

1. Soil erosion makes it difficult to grow nutritious food. Soil erosion can reduce crop yields by up to 50% by reducing the nutrients available to plants as well as space for them to grow roots. Furthermore, crops that do grow are of lower quality: are smaller, and less nutritious.
2. Deforestation causes soil erosion, which can lead to flooding. Without the ability of the soil to absorb water, downstream flooding can occur, causing off-site issues.
3. Because of human activities such as mining and quarrying, soil erosion can kill fish and other life forms in the rivers or seas. Dam erosion could also result in flooding, which could lead to dam failure.
4. Soil erosion has consequences that go beyond the loss of fertile land. It has increased pollution and sedimentation in streams and rivers, clogging these waterways and causing fish and other species to die. It may also cause health problems in all living things.
5. Building dikes of stones or logs, Contour Plowing, Crop Rotation, Reforestation, Rippapping, Strip Cropping, Terracing, and Wind Break.

Lesson 2

What's New

Living Things	Environment
1. Hunger	1. Pollution
2. Low Income	2. Changes in landforms
3. Death	3. landslide

Lesson 2

What's In

Activity 3

1. AGREE
2. DISAGREE
3. AGREE
4. AGREE
5. AGREE

Additional Activities

(Possible Answer)

1. The best way to solve this problem is to only sweep the litter/trash and make sure to leave the loose soil on the ground.

2. I will join the "Plant a Tree"campaign to beautify the community and conserve soil. In that way, I can help the environment and our community to avoid soil erosion.

Assessment

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

What I Can Do

B.

Flat Lands	Slope Lands
Building dikes of stones or logs	Contour Plowing
Crop Rotation	Riprapping
Reforestation	Strip Cropping
Wind Break	Terracing

What I Have Learned

A. *Answer in number 4 & 5 may interchange.*

1. landslides
2. landforms
3. soil erosion
4. animals
5. humans

What I Can Do

A.

✓ No. Because quarrying has a negative impact on the environment and may affect our community and our

What I Have Learned

A.

			1d				
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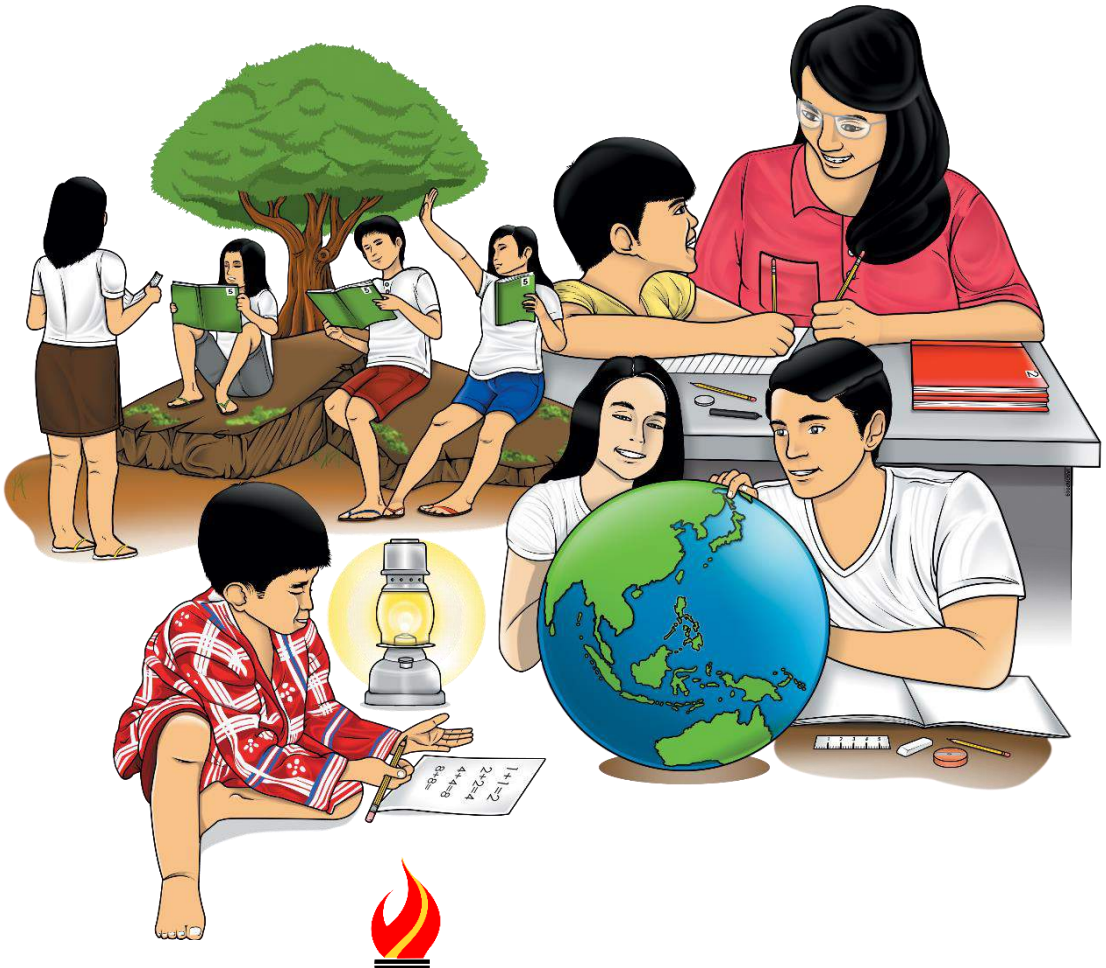
Science

Quarter 4 – Module 3:
Weather Disturbances



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ADM

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5

Science

Quarter 4 – Module 3:
Weather Disturbances

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Introductory Message

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

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

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

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

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

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

Thank you.

What I Need to Know

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

This module will help you characterize weather disturbances in the Philippines and describe their effects on daily life. It is divided into two lessons, namely:

- **Lesson 1** – Weather Disturbances
- **Lesson 2** – Effects of Weather Disturbances on Daily Life

After going through this module, you are expected to:

- describe the different weather disturbances in the Philippines; and
- describe the effects of weather disturbances on daily life.

What I Know

Directions: Analyze each question carefully and choose the letter of the **BEST** answer. Write your answers in your Science notebook.

1. It refers to the disruption of the stable condition of the atmosphere.
   A. Flash floods
   B. Landslides
   C. Storm surge
   D. Weather disturbance

2. A convection current is the ____ of the warm air and the sinking of the cold air.
   A. decreasing
   B. increasing
   C. rising
   D. sinking

3. What can we observe during a typhoon?
   A. Heavy rains and strong winds.
   B. The sun becomes visible, and the sky becomes clearer.
   C. The air is dry and cold since most of the warm air rises already.
   D. All of the above.

4. It is an intense tropical cyclone with a maximum speed exceeding 118 kph.
   A. Tropical depression
   B. Tropical disturbance
   C. Tropical storm
   D. Typhoon

5. Why do pilots and captains need to know the weather? It will help them decide _____.
   A. How much fare to ask.
   B. What color code to use.
   C. Whether to travel or not.
   D. How many passengers to carry.

6. The government agency that warns the people of an approaching typhoon.
   A. DENR
   B. DEPED
   C. PAGASA
   D. PHIVOLCS

7. Typhoon signals are raised according to _____?
    A. strength of the wind
    B. strength and speed of the wind
    C. speed of the wind
    D. none of the above

8. Why do PAGASA issue weather bulletin and warnings?
    A. To give people time to prepare.
    B. To give people to go and watch a movie.
    C. To give people time for swimming.
    D. To give people time to party.

9. The strength of the tropical cyclone depends on the _____.
    A. minimum speed of winds near the center
    B. maximum speed of wind near the center
    C. the cloudiness near the center
    D. none of the above

10. Which of the following things is NOT necessary to keep before the typhoon season?
    A. flashlight and extra batteries
    B. first aid kits and essential medicines
    C. chocolates and candies
    D. potable water and canned goods

Lesson 1 Weather Disturbances

Because we are surrounded by bodies of water, we are prone to weather disturbances. Our nearness to the Pacific Ocean, which lies on the eastern side of our country, is the most significant contributor to weather disturbances in our country. With that, our country is mostly visited by tropical cyclones.

What's In

Weather is the condition of the atmosphere for a short period. It has different factors; when these factors change and affect the condition of the atmosphere, weather disturbances may occur.

Directions: Arrange the following jumbled words to identify the factors that affect the weather. Write your answers in your science notebook.

1. PAMRTEUETER
2. DHIYUITM
3. DNWI
4. CNPTOIRIEPAIT
5. CLSUNDOIES
6. CPMSHAEORIT ESREPRUS

What's New

Weather influences human activities. Look at the illustration. Can you tell the kind of weather by just looking at the picture? Does this kind of weather condition remain all year round? Why or why not?

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

What is It

A temperature difference between the air and the surface creates a swirling mass of winds known as a **weather disturbance**. A weather disturbance is a term used to describe a change in atmospheric conditions or weather patterns. Although weather disturbances are temporary, their impact on plants, animals, livelihood, and the ecosystem is evident. Weather disturbances are common in the Philippines due to its nearness to the equator that causes wind convergence.

A **tropical cyclone** is a weather disturbance characterized by a big mass of wind and rain whirling around a center of low pressure called the **"eye"**. Tropical cyclones have different names around the world depending on where they are. In the Atlantic/Eastern Pacific Oceans, they are known as **hurricanes**, while in the Western Pacific, they are called **typhoons**. In the Indian Ocean, they are recognized as **cyclones**.

Tropical cyclones form when warm air moves over the surface of the ocean, creating a massive amount of water vapor. As it rises, the water vapor is cooled. Clouds are formed when water vapor condenses. Heat is released into the atmosphere as it does. So, this heat warms the atmosphere, causing the air to become lighter and continue to rise into the atmosphere. As the warmed air rises, it is replaced by moist air rising from below. The subsequent heat release generates strong winds, which fuel the storm.

Tropical cyclones weaken as they reach land, not because a mountain or a building blocks them, but because the loss of their source of heat, which is warm air from the ocean, reduces their wind speed.

Weather disturbances are also known as natural disasters because they can cause havoc on roads, power lines, and buildings.

PAGASA's classification of tropical cyclones based on the strength of the associated winds as of May 1, 2015 are presented in Table 1.

Table 1: Classification of Tropical Cyclones

Kinds of Cyclones	Description
Tropical Depression (TD)	- a tropical cyclone with maximum sustained winds of up to 61 kilometers per hour (kph) or less than 33 nautical miles per hour (knots) - a weak low pressure with a definite surface circulation - most common in the equatorial region or the intertropical convergence zone (ITCZ)
Tropical Storm (TS)	- a tropical cyclone with a maximum wind speed of 62 to 88 kph or 34 - 47 knots. - when a tropical depression intensifies, it becomes a tropical storm
Severe Tropical Storm (STS)	- a tropical cyclone with a maximum wind speed of 89 to 117 kph or 48 - 63 knots. - more organized and more circular
Typhoon (TY)	- a tropical cyclone with a maximum wind speed of 118 to 220 kph or 64 - 120 knots. - most of the time, accompanied by heavy rains and strong winds
Super Typhoon (STY)	- a tropical cyclone with maximum wind speed exceeding 220 kph or more than 120 knots. - the strongest tropical cyclone classification created in 2015 after the devastation of Super Typhoon Yolanda (Haiyan). - areas that are hit by this kind face a large amount of destruction

The occurrence of tropical cyclone affects the environment. Hence, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (**PAGASA**) closely observe any change in the atmosphere. The agency gives people regular updates on the weather condition. Typhoon signals to warn people of the coming typhoon through their regular weather bulletins. Wind speed is expressed in kilometers per hour (kph) and is measured using an ***anemometer***.

Table 2 shows the range of the wind speeds given for each signal number of the typhoon entering the Philippine Area of Responsibility (PAR) based PAGASA.

Table 2: Types and description of different public storm warning signal (PSWS)

PSWS	LEAD TIME (hrs)	WINDS (kph)	IMPACTS OF THE WIND
1	36	30 – 60	No damage to very light damage
2	24	61 – 120	Light to moderate damage
3	18	121 – 170	Moderate to heavy damage.
4	12	171 – 220	Heavy to very heavy damage.
5	12	More than 220	Very heavy to widespread damage.

What's More

Activity 1. Motion of Wind

Materials:

Stick

Basin with water

Talcum/baby powder

Procedure:

1. Get a basin and fill it with water.
2. Sprinkle some baby/talcum powder on the water.
3. Place a stick at the center of the basin, then move it counterclockwise.
4. Remove the stick. Observe what happens?

Guide Questions:

1. What did you observe?
2. How did the water move?
3. How did you relate this with the motion of wind in a tropical cyclone?
4. Compare the central part and the surrounding area.

Activity 2. Interpret Weather Report

Directions: Read and understand the weather report. Write your answers to the guide questions in your science notebook.

> Tropical depression *Coring* is now over Itbayat, Batanes at 10:00 a.m. today, September 12. *Coring* was estimated to have maximum winds of 50 kph near the center. It is expected to move west-northwest at 20 kph in the general direction of Aurora, Quezon.

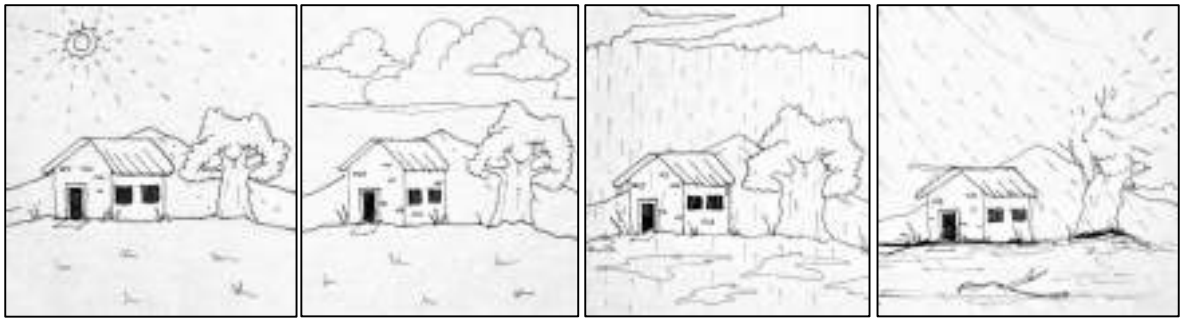
Guide Questions:

1. What weather disturbance is mentioned in the report?
2. What is the maximum wind speed of the tropical depression?
3. Do you think this is a strong weather disturbance? Why or why not?
4. Predict its effect if it reaches your place with winds of 50 kph.

Lesson 2 Effects of Weather Disturbances to Daily Life

What's In

Directions: Study the following illustrations. Do what is asked and answer the following questions. Write your answers in your science notebook.



(1) **(2)** **(3)** **(4)**

(Illustrated by Elpidio S. Palacio)

1. Identify the weather conditions presented in the illustrations by choosing your answers from the box below.

Sunny Day	Cloudy Day	Rainy Day	Stormy Day

2. In which illustration/s it is best to go hiking, camping, field trips, and going to the beach? Why?

3. In which illustration/s it is best stay at home to avoid getting cough, flu and being sick? Why?

What's New

Typhoons have disastrous effects. This unforeseen event may destroy properties, infrastructures, agricultural lands and even cause death to all living things.

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

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

1. What do you observe in the picture?
2. What do you think happened in the place?
3. What do you think will the people living in the house feel?
4. What do you think will they be able to do in that condition?

What is It

We observe weather conditions for many reasons. We do outdoor activities only if the weather is fine. Playing basketball or other outdoor sports, attending festivals and going on excursions are done during fair weather.

In school, we enjoy playing outdoors in fine weather. Field trips, hiking and camping, are also done when the weather is fine.

We also like to be forewarned about weather conditions early enough to be prepared for it. If the forecast says there will be rain showers, then we bring our

umbrellas or raincoats. We may put off making long trips because it is dangerous to travel during rainy weather.

In case of rainy or stormy weather, we are advised to stay home and take necessary precautions. We should protect ourselves during bad weather so that we will not get sick. We should also wear clothes suited to the kind of weather condition to protect ourselves.

Ship captains and pilots must know the weather to be warned of coming storms, strong winds, thick clouds, fog, tropical depression or even typhoon that can be dangerous to travel. Farmers need to be informed of weather disturbances so that they can care for their crops. Merchants and vendors like to know the weather so that they can prepare the goods they will sell.

Good weather service is very important. In the Philippines, we have the Philippine Atmospheric, Geophysical and Astronomical Services Administration or PAGASA, that informs us of the weather conditions and gives daily weather reports.

The Philippines is located in the typhoon belt, where several typhoons pass each year. In addition to typhoons, the southwest monsoon brings heavy rains that cause floods and rough seas, especially in July, August, and September. Knowing the weather forecasts can minimize the loss of lives and properties due to weather disturbances; it can also help the industries. This is because man can prepare for the bad weather. Millions of pesos worth of properties and farm crops and people's lives are lost to flood and strong typhoons. These damages make many people suffer.

What's More

Directions: Perform the following activities properly. Answer the guide questions in your science notebook.

Activity 1. Relating Weather to Daily Life

Directions: Categorize the identified activities as to when it is best to be done, on Sunny or Rainy/Stormy Weather.

Walking in the park	Going camping
Going to the beach	Wearing raincoat
Suspending travel	Cancelling picnic
Wearing thick and warm clothes	Playing *patintero* or outdoor games

Sunny Weather	Rainy/Stormy Weather

Guide Questions:

1. Describe the community activities during sunny and stormy weather.
2. Are the activities done during sunny weather can also be done during rainy/stormy weather? Why?

Activity 2. Effect of Weather on Air and Water Transportation

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

1. What weather condition favors safe air and water transportation services?
2. Why is it not good to travel by air and water when there is tropical cyclone?
3. What actions do the air and water transportation services take when the weather is not good? Why?
4. Do air and water transportation services depend on weather conditions?

What I Have Learned

Directions: Fill in the blanks with words from the discussion on weather disturbances. Use the words in the word box to answer. Write your answers in your science notebook.

tropical cyclone	weather disturbances	water
equator	bad	good

Although weather disturbances are temporary, their impact on plants, animals, livelihood, and the ecosystem is evident. 1._____ are common in the Philippines due to the country's nearness to the 2._____, which causes wind convergence. 3._____ is one type of weather disturbance. Tropical cyclones have different names around the world depending on where they are.

In the Atlantic/Eastern Pacific Oceans, they are known as hurricanes, while in the Western Pacific, they are identified as typhoons. In the Indian Ocean, they are

recognized as cyclones. Tropical cyclones form when warm air moves over the ocean's surface, creating a massive amount of 4._____.

Tropical cyclones weaken as they reach land, not because a mountain or a building blocks them, but because the loss of their source of heat, which is warm air from the ocean, reduces their wind speed.

When the weather is 5._____, air and water transportation services are not stopped. But when there is weather disturbance, these services are temporarily suspended.

What I Can Do

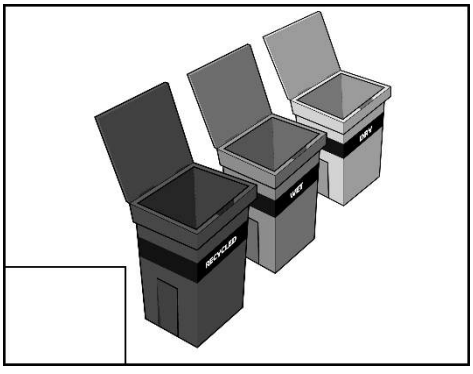
Directions: Draw a happy face ( ) if the activity would help lessen the effects of storm and a sad face ( ) if not. Write your answers in your science notebook.

1. 

Illustrated by Jose Marie E. Baculi

2. 

Illustrated by Jose Marie E. Baculi

3. 

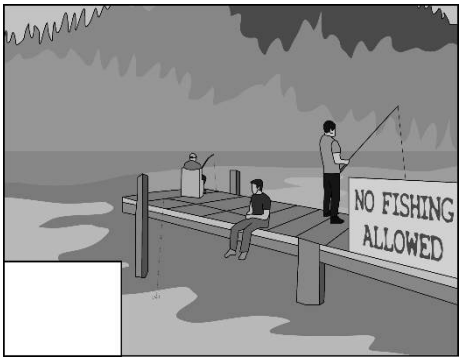
Illustrated by Reyson Joe G. Cañedo

4. 

Illustrated by Reyson Joe G. Cañedo

5. 

Illustrated by Jose Marie E. Baculi

6. 

Illustrated by Jose Marie E. Baculi

Assessment

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

1. What is a weather disturbance?
2. What is a tropical cyclone?
3. What are the classifications of a tropical cyclone? Describe each.

II. As a student, give at least three (3) activities that can be done during good and bad weather. Write your answers in your science notebook.

Good Weather	Bad Weather
1. 2. 3.	1. 2. 3.

Additional Activities

Weather in our country constantly changes from day to day or by the hour. For example, you may wake up with fair weather, but it rains towards the middle of the day. List three ways to make sure of your safety in these changing weather patterns? Write your answers in your science notebook.

Answer Key

Lesson 2 What's In

Possible Answers:

1.

(1) Sunny Day (2) Cloudy Day (3) Rainy Day (4)Stormy Day

Illustrated by Elpidio S. Palacio Jr.

2. Illustration number 1. This illustration presents a sunny day which means that the road is dry, and it is the best day to go hiking, camping and go on field trips and to the beach.
3. Illustrations number 3 and 4. These illustrations show rainy and stormy day sequentially. It is the best day to stay at home to avoid getting cough, flu and being sick.

What's More
Activity 1

Possible Answers:

1. The talcum/baby powder sinks.
2. The water moved in a counter-clockwise direction.
3. The water moved in a counter clockwise direction with an "eye" in its center.
4. The central part of the water is calm and has slight movement, while the outer bands are strong.

What's More
Activity 2

Possible Answers:

1. Tropical depression Coring
2. 50 kph
3. No, tropical depression Coring is not so strong. It has a storm warning Signal No. 1.
4. If tropical depression Coring reaches our place, it will bring intermittent rains and winds with a maximum speed of 30 to 60 kph. Water and air travel may not be safe.

What I Know

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

Lesson 1
What's In

1. TEMPERATURE
2. HUMIDITY
3. WIND
4. PRECIPITATION
5. CLOUDINESS
6. ATMOSPHERIC PRESSURE

Lesson 1
What's New

Possible Answers:

- Yes. It is a sunny weather.
- No. Because the weather is the day-to-day state of the atmosphere, and it's short-term and not permanent and may change every time.

What I Have Learned

1. weather disturbances
2. equator
3. tropical cyclone
4. water vapor
5. good

What I Can Do

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

Lesson 2
What's More
Activity 2
(Possible answers):

1. Fine weather condition favors safe air and water transportation services.
2. It is not good to travel by air and water when there is tropical cyclone because of the strong gusts of wind that may blow aircrafts and may create big waves and sink boats and ships.
3. Air and water transport services cancel all travels to lower the risk of damage to lives and properties.
4. Yes, air and water transport services depend on weather conditions to ensure safe travels.

Lesson 2
What's More
Activity 1

Sunny Weather	**Rainy/Stormy Weather**
Going camping Going to the beach Playing *patintero* or outdoor game Walking in the park	Suspending travel Wearing raincoat Wearing thick and warm clothes Cancelling picnic

Guide Questions
(Possible answers):

1. During sunny weather, outdoor activities can be done like playing outside the house, drying clothes outside, travelling and many others. When it is stormy weather, most people just stay inside the house. It is not safe to do some activities outside.
2. No, activities done during sunny weather cannot be done during a stormy weather because of strong winds and heavy rains that may cause accidents or damages.

Lesson 2
What's New
Possible Answers:

1. The picture shows floods among houses, trees, and the surrounding area.
2. The place is devastated by the typhoon.
3. People living in the houses feel scared, worried and sad.
4. They could evacuate to a safe place or climb into their roof and wait for the rescue to help them.

Additional Activities

(Possible Answers)

- Be alert. Listen to the news in the radio or TV on the weather conditions
- Have ready emergency supplies for at least 3 days with ready-to-eat foods, safe drinking water, important family documents, and first-aid kit, etc.
- Charge up electrical devices such as phones, power banks, flashlights.
- Secure your home, ex. nail loose boards and roof materials
- Avoid using the phone, except for serious emergencies.

Assessment

II. *(Possible Answers)*

Good Weather	Bad Weather
1. Sailing 2. Playing outdoor games 3. Walking in the park	1. Reading books 2. Playing indoor games 3. Watching movies

Assessment

I. (Possible Answers)

1. Weather disturbance is the change in atmospheric conditions or weather patterns.
2. A Tropical cyclone a big mass of wind and rain whirling around a center of low pressure called "eye".
3. These are the 5 kinds of cyclones and descriptions (*you may have at least one of these*)

Kinds of Cyclones	Description
Tropical Depression (TD)	- a tropical cyclone with maximum sustained winds of up to 61 kilometers per hour (kph) or less than 33 nautical miles per hour (knots) - a weak low pressure with a definite surface circulation - most common in the equatorial region or the intertropical convergence zone (ITCZ)
Tropical Storm (TS)	- a tropical cyclone with a maximum wind speed of 62 to 88 kph or 34 - 47 knots. - when a tropical depression intensifies, it becomes a tropical storm
Severe Tropical Storm (STS)	- a tropical cyclone with a maximum wind speed of 89 to 117 kph or 48 - 63 knots. - more organized and more circular
Typhoon (TY)	- a tropical cyclone with a maximum wind speed of 118 to 220 kph or 64 - 120 knots. - most of the time, accompanied by heavy rains and strong winds
Super Typhoon (STY)	- a tropical cyclone with maximum wind speed exceeding 220 kph or more than 120 knots. - the strongest tropical cyclone classification created in 2015 after the devastation of Super Typhoon Yolanda (Haiyan). - areas that are hit by this kind face a large amount of destruction

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5

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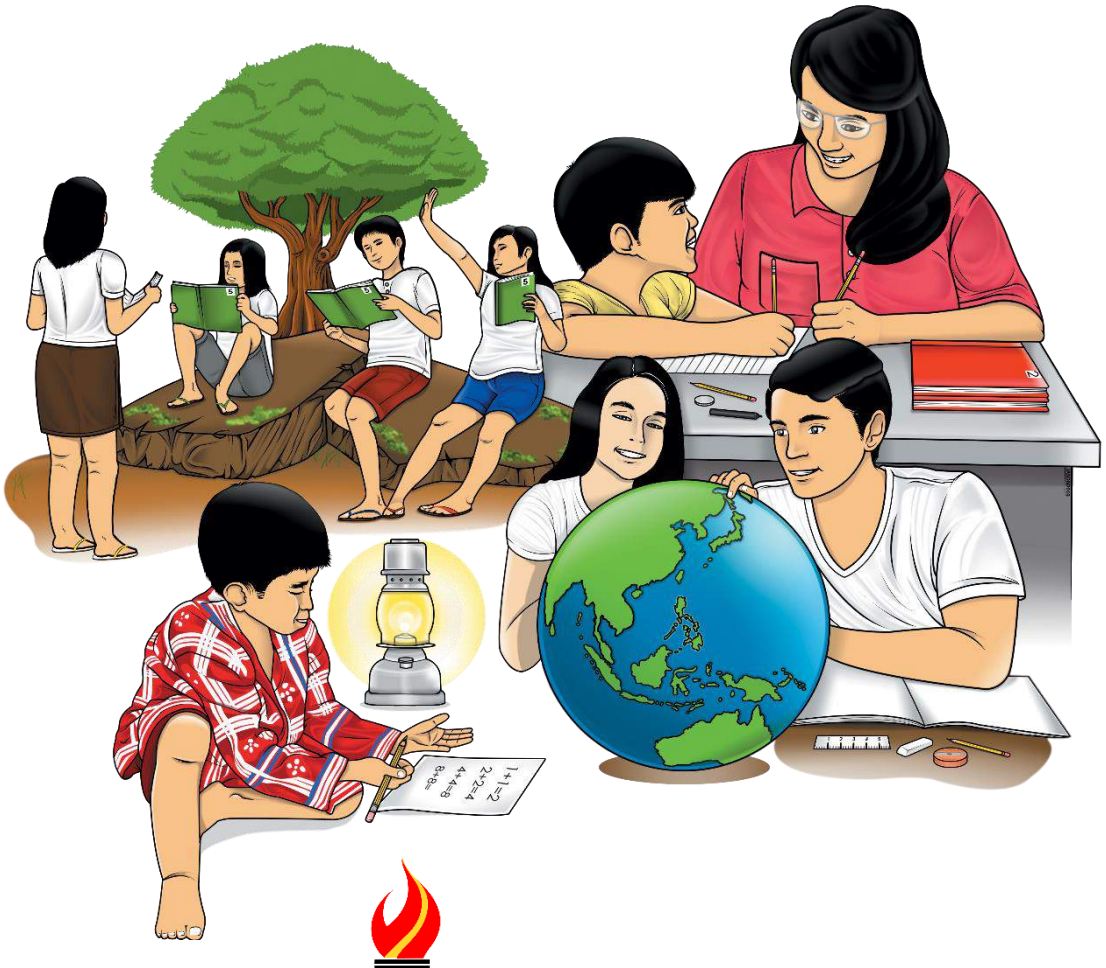
Science

Quarter 4 – Module 4:
Phases of the Moon:
Its Characteristics



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ADM

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5

Science

Quarter 4 – Module 4:
Phases of the Moon:
Its Characteristics

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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 this module you will learn about the different phases of the moon and its characteristics. This is designed and developed to provide the learning that you need to know and to give you ample opportunities to enrich your knowledge in Science that includes studying the Phases of the Moon: Its Characteristics.

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

This module will help you infer the pattern in the changes of the appearance of the moon.

The module is divided into two lessons, namely:

- **Lesson 1** – Phases of the Moon and its characteristics
- **Lesson 2** – Beliefs and practices with the phases of the moon

After going through this module, you should be able to infer the pattern in the changes of the appearance of the moon. Specifically, you shall:

1. identify the different phases of the moon and its characteristics;
2. describe the different phases of the moon; and
3. evaluate superstitious beliefs and practices associated with the different phases of the moon.

What I Know

I. Directions: Read and analyze each question carefully and identify the letter of the **BEST** answer. Write your answers in your Science notebook.

1. What causes the shape of the moon to change?
   A. The shape of the moon changes as it orbits the Earth.
   B. Some of its part break when the moon reflects light from the sun.
   C. Only the lighted part of the moon is visible when the Earth moves.
   D. All of the above

2. What do you call the change in the appearance of the moon?
   A. Illuminated moon
   B. Phases of the Moon
   C. Shapes of the Moon
   D. Structures of the Moon

3. What do you call when the moon seems to be growing?
   A. crescent
   B. gibbous
   C. waning
   D. waxing

4. The Earth is between the sun and the moon. What phase of the moon will occur when this happens?
   A. new moon
   B. first quarter
   C. full moon
   D. last quarter

5. In which phase does the moon appear dark?
   A. first quarter
   B. full moon
   C. last quarter
   D. new moon

II. Directions: Write **<u>True</u>** if the statement is correct and **<u>False</u>** if it is not.

6. All beliefs and practices about the moon have a scientific basis.
7. During the new moon, you can see the side of the moon, which is facing the Earth, is completely lit up by the sun.
8. In the waxing phase, the moon looks bigger because more parts of the moon are lit up by the sun when facing the Earth.
9. In the waning crescent phase, only a small part of the moon is visible.
10. When the moon is in a specific phase, farmers do their planting because it may bring a good harvest.

Lesson 1 Different Phases of the Moon: Its Characteristics

Do you ever catch a glimpse of the moon at night? Have you ever wondered why the presence of the moon varies over time?

The moon is not a planet but a satellite. A satellite is an opaque (objects that absorb light and produces shadow) object that orbits a planet. The only natural satellite that the Earth has is the moon. It is a huge object that circles the Earth and normally a fraction of its size.

The moon does not have its light source. It receives all of its light from the sun. The location of the moon varies in relation to the observer on Earth as it rotates and revolves around the Earth. As a result, the shape of the moon changes over time. It is because the moon passes across the Earth, the illuminated part of the moon shifts. The apparent variation in the shape of the moon is referred to as ***phases*** of the moon.

What's In

Directions: Analyze the picture below. Record your answers to the questions based on your observation of the picture. Write your answers in your science notebook.

Illustrated by Reyson Joe G. Cañedo

Answer the following questions:

1. Based on the picture above, how often do you see this moon phase in a month?
2. Where does its light come from?
3. Is the moon always a circle in shape? What other shapes of the moon do you see at night?
4. Why do you think the moon changes its shapes?

What's New

Directions: Here are some facts about the moon. On your Science notebook, draw a smiley face (☺) if you already know the fact, and a wow face (😮) if this is new to you. Place your answers in your science notebook.

The sun may be the closest star to the Earth, but it is certainly not our closest neighbor in space. Here are some facts about the moon:

1. It is the natural satellite of the Earth. A satellite is an object in space that revolves around another object.
2. Our closest neighbor in space is the moon, a rocky ball about one-fourth size of the Earth.
3. It is the sixth-largest moon in the solar system.
4. The moon is one of the heavenly bodies reached by man. The first person to step on the Moon on July 21, 1969, was Neil Armstrong, an American astronaut.
5. Like Earth, the moon does not have the light of its own. The moon can be seen in the sky because it reflects lights from the sun.
6. The moon is the second brightest object in the sky next to the sun. Its name is Luna.
7. It is about 406,676 kilometers away from the Earth with a diameter of 3,476 kilometers, approximately ¼ of the Earth's diameter, it is almost as large as Mercury.
8. It has no air and water.
9. It revolves around the Earth.
10. It makes one complete revolution every 27 days and 7 hours, and 43 minutes.

What is It

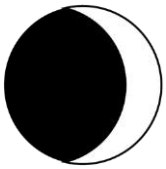
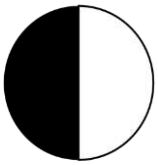
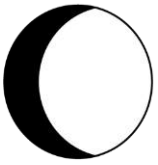
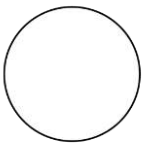
A **moon** is a massive, heavy rock ball that orbits a planet. The Earth has only one moon, while Mars has two, and Jupiter has a whopping 67! The moon doesn't have its own light source. It absorbs the light of the sun and reflects it to us.

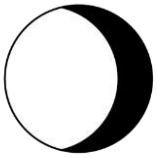
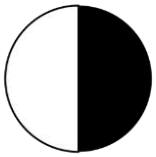
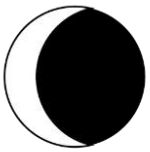
The Earth and the moon are 384,400 kilometers apart. The Earth revolves around the moon. It completes one full revolution every 27 days, 7 hours, and 43 minutes. It orbits the Earth at a distance of 406,676 kilometers and has a diameter of 3,476 kilometers, or around 14% of the Earth's diameter. It is almost as large as Mercury.

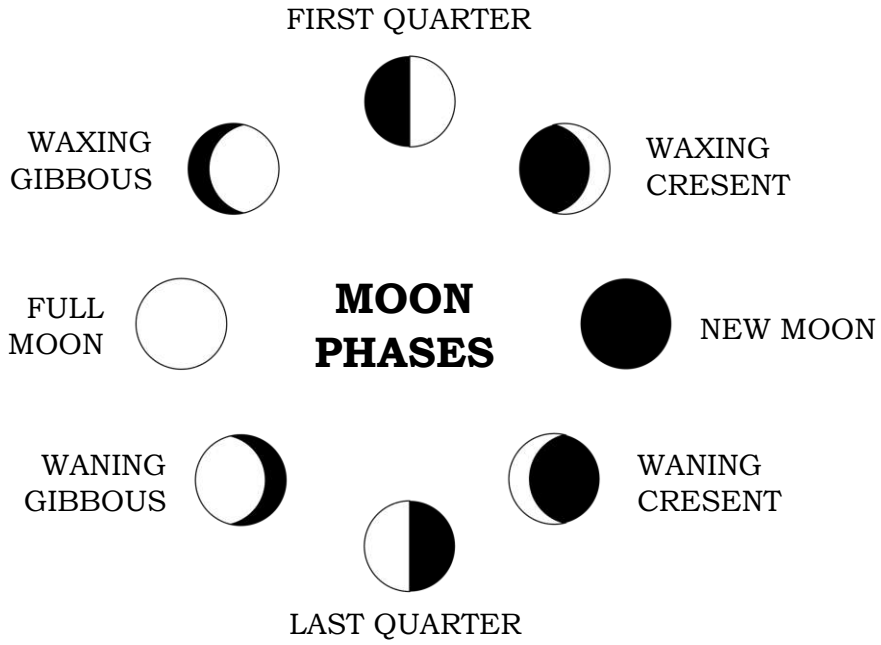
When it orbits around the Earth, the moon rotates from west to east. The shape of the moon appears to change as it rotates and orbits around the Earth. The various "shapes" of the moon are referred to as *phases*.

The shape of the moon that is illuminated and visible to the observer is known as the *phases of the moon*. New Moon, Waxing Crescent, First Quarter, Waxing Gibbous, Full Moon, Waning Gibbous, Last Quarter and Waning Crescent are the eight lunar phases.

The various phases of the moon, as well as their characteristics and illustrations, are shown below. *(All illustrations in this section are made by Mr. Reyson Joe G. Cañedo)*

Name of Phases of the Moon	**Characteristics**	**Illustration**
New Moon	In this phase, we cannot see the moon between the sun and the Earth. The sun shines on the side of the moon, which is away from the Earth.	
Waxing crescent	In this phase, we could see a tiny edge of the moonlight one or two days after a new moon. The moon appears to be growing, and it is in the midst of a waxing phase, wherein the moon started to take on a semicircular shape.	
First quarter moon	In this phase, we can see half of the moon's illuminated side about a week after the new moon.	
Waxing gibbous	In this phase, more than half of the moon is visible in the sky.	
Full Moon	In this phase, we can see the full lighted side of the moon a week after the first quarter moon when the Earth is between the moon and the sun throughout	

Name of Phases of the Moon	Characteristics	Illustration
	this phase. The full moon appears in the sky as a perfect circle.	
Waning gibbous	In this phase, it occurs when the lighted part of the moon becomes smaller.	
Last quarter moon	In this phase, the half lighted part of the moon can be seen again on the third week of the month. The moon soon disappears. Only then can it be replaced by another new moon.	
Waning crescent	In this phase, most of the moon is visible in the sky but decreasing every night time.	



What's More

Directions: Perform the following activities properly. Write your answers to the guide questions in your science notebook. ***(All illustrations in this section are made by Mr. Reyson Joe G. Cañedo)***

Activity 1. Describing the Characteristics of the Different Phases of the Moon

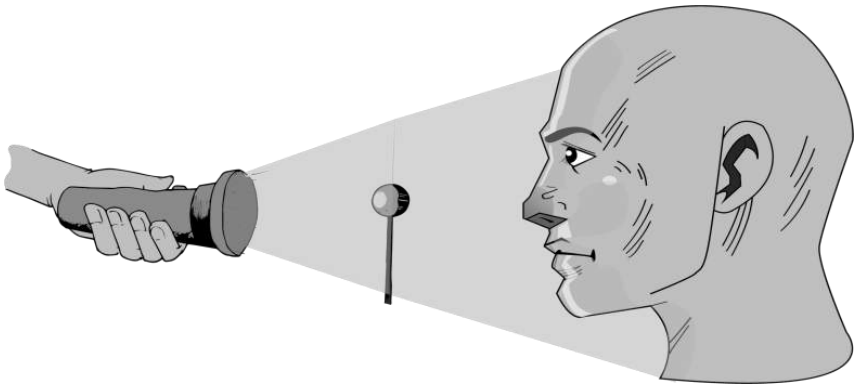
You Will Need:

- Human head (represents the Earth)
- Flashlight (represents the sun)
- Small ball (represents the moon)

Reminder: *Make sure NOT to focus the light directly towards the eyes*

What to Do:

1. Prepare the materials needed.
2. Turn off the lights in the room. Make sure that the room is dark enough to allow the flashlight's light to shine brightly.
   Note: It works best if you prepare a very dark set up.
3. Get the small ball (Moon) and let it orbit around the head (Earth).
4. Turn on the flashlight. Be sure to focus its light on the head.
5. Hold the small ball in between the head and the flashlight.
6. Turn the small ball slowly around the head. DO NOT MOVE THE FLASHLIGHT.
7. Observe what portion of the small ball reflects the light.
   (Note: human head represents the Earth, the small ball represents the moon, and the flashlight represents the sun)



Guide Questions:

1. On a piece of paper, draw the lighted portion of the small ball in different positions.
2. Did the small ball change its shape as it turned around the human head? Why?
3. What portion of the small ball reflects the light? Did the ball change its shape? Why?

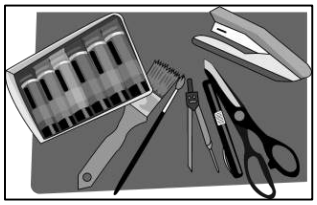
Activity 2. Moon Phases Slider

You Will Need:

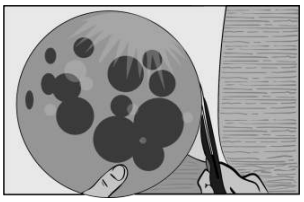
- Colored paper (blue, black)
- Bond paper
- Glue
- Scissor
- Staple
- Pencil
- Crayons

What to do:

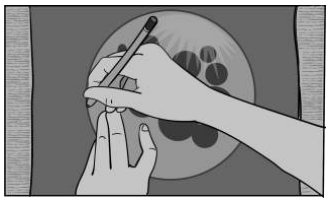
1. First, prepare the materials needed.



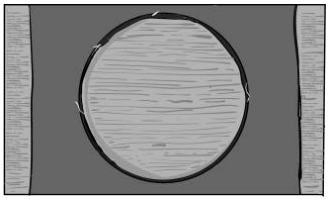
2. Draw a large circle (represent the moon) in a bond paper and cut it out.



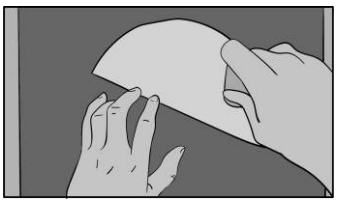
3. Using a pencil, trace the outline of your moon onto the center of a piece of rectangular-shaped blue colored paper.



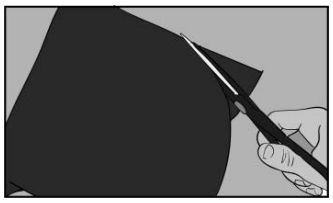
4. Now that you have the circle drawn onto the blue colored paper cut it out. (Be extra careful in using sharp objects).



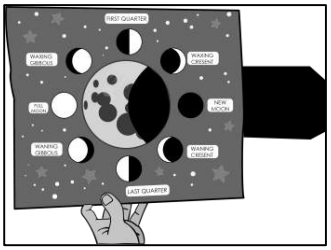
5. Glue your picture of the moon onto the center of bond paper. (You may put additional designs such as stars).



6. Take a large piece of black colored paper and cut it to the same width as your picture of the Moon. Trim the corners so that they are curved to form a half-circle. This long black piece of colored paper will act as the slider.



7. Lastly, take both pieces of colored paper and staple them together at the bottom and top. (making sure not to staple the sides, they should be left open). Move the slider back and forth to cast a shadow over the moon.



Guide Questions:

1. Did you enjoy the activity?
2. Using your improvised/finished moon phases slider, have you seen on it the different phases of the moon?
3. What are the different phases of the moon?

Lesson 2 Moon-Related Beliefs and Practices

Since they have such a significant influence on the lives of the people, the different phases of the moon are frequently associated with superstitious practices.

What's In

Directions: Let us look at your current understanding of the following topics by answering the questions below. Place your answers in your science notebook.

1. Have you ever heard of moon superstitions?
2. Do you believe in superstitions? Why?
3. Can you tell a story or stories about superstitions related to the moon?
4. Do you believe these stories about the moon? Why or why not?

What's New

Directions: List down at least three (3) superstitious beliefs that are associated with the moon. You may ask your parents or grandparents regarding moon-related superstitious beliefs. Write your answers in your science notebook.

What is It

Did you know that the moon is often associated with superstitious beliefs that influence our everyday lives? Why is this so? Superstitions are beliefs and traditions that existed before our ancestors. It has been passed on from generation to generation till modern times. People used to believe that the moon had a significant effect on their lives. The moon is used as a guide for them. It provides weather signals as well as information as to when to plant, harvest and catch fishes. Some of these beliefs and traditions are still practiced by some people nowadays.

The following are some of the moon-related superstitious beliefs:

1. The moon influences our weather. When the Sun, Moon, and Earth are aligned, and the moon is closest to the Earth, you could expect lower temperatures. It's due to the Moon and the Sun's combined gravitational force. The moon has an impact on the atmosphere in the same way that it affects our oceans. The moon's gravitational pull causes the Earth and its waters to bulge during the full or new moon, and the same thing happens with the atmosphere.

2. The moon affects the occurrence of high and low tides. Tides are the rise and fall of sea level caused by the combined effect of the moon and sun's gravitational forces, as well as the Earth's rotation. There are two different types of tides. The moon is responsible for the ***low*** and ***high*** tides. High tides produce water bulges. Our fishermen believed that the increased number of fish they could catch is attributed to the moon.

3. Our farmers' ancestors believed that planting when the moon was in those phases was beneficial and would yield a good harvest. It is because they affect the rate of plant growth. According to them, from the new moon to the full moon, the soil moisture is at a higher level. Since it could help plant growth and production, many farmers prefer to sow their crop seeds at this time.

4. For a long time, people believed that the phases of the moon were related to the menstrual cycle in some way. The lunar cycle is about the same length as a woman's average menstrual cycle, which inspired this concept.

5. The full moon influences animal behavior. They howled at the moon and even in the dark sky, just like wolves. The presence of the moon influences certain animals, but it is the light that affects them, not the moon. They are more active and more likely to be out when there is more light.

What's More

Activity 1. Guided Practice

Directions: Explain the superstitious beliefs cited below. The rubrics below could serve as your scoring guide. Write your explanation in your science notebook.

1. It is favorable to plant seed between the new moon and the full moon.
2. The moon is responsible for the occurrence of high tide.

Rubrics for Activity 1

Criteria	5 points	3 points	1 point
Accuracy	The concept is very evident.	The concept is evident.	The concept is not so evident.
Delivery	Completeness of ideas explain is presented.	Some ideas are not presented/delivered.	The idea presented is not coherent with the explanation's made.

Activity 2. Independent Practice

Directions: Write a short paragraph about a belief that is related to the moon. The rubrics below could serve as your scoring guide. Place your output in your science notebook.

Rubrics for the Activity 2

Criteria	5 points	3 points	1 point
Accuracy	All given concepts are correct.	Most of the given concepts are correct.	Most of the given concepts are not correct.
Organization	Completeness of ideas explain is presented.	Some ideas are not presented/delivered.	The idea presented is not coherent with the explanation's made.

What I Have Learned

A. Directions: Read each statement carefully. Fill in the blank spaces with the missing terms or identify what is/are asked. Choose the correct answer inside the box below. Write your answers in your science notebook.

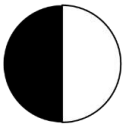
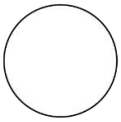
Phases	Moon	Superstitious	Bulge
High Tides	High and Low	Good Harvest	

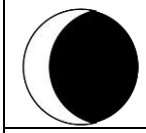
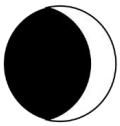
1. There are different _____ of moon.
2. _____ are beliefs based on opinions, observations, and experiences but have no scientific explanation.
3. The _____ are often associated with superstitious beliefs and practices.
4. Many farmers believe that planting when the moon is in specific phases may bring _____.
5. There are two types of tides. The _____ and _____ tides.
6. _____produce these water bulges.
7. When the phase of the moon is full Moon or new Moon, it causes a _____ in an ocean.

B. Directions: Give at least three (3) superstitious beliefs and practices associated with the moon. Write your answers in your science notebook.

What I Can Do

A. Directions: Give the name of the different Phases of the Moon. Number 1 is done for you. Place your answers in your science notebook.

 1. <u>New Moon</u>	 5. _____
 2._____	 6._____

 3._____	 7._____
 4._____	 8._____

B. Directions: Give at least two (2) beliefs and/or practices related to the moon that you are most likely to believe. Write your answer in your science notebook.

Assessment

I. **Directions:** Match the descriptions in Column A with the Phases of the Moon in Column B. Write the letter of the correct match on your science notebook.

Column A	**Column B**
1. A phase of the moon between the last quarter and the new moon.	A. First Quarter
2. The quarter phase of the moon is between the new moon and full moon.	B. Full Moon
3. The quarter phase of the moon is between the full moon and the new moon.	C. Last Quarter
4. A phase when the moon is not visible.	D. New Moon
5. A phase where you see the whole lighted side of the moon.	E. Waning Gibbous
	F. Waning Crescent

II. **Directions:** Write **T** if the statement is true and **F** if the statement is false. Write your answers in your science notebook.

6. Superstitions are beliefs having scientific explanation.
7. Moon can produce its light.
8. Ancient people believe that the moon has a direct influence on their lives.
9. The moon affects the moisture content of the soil.
10. During ancient times the moon served as a guide when to plant and to harvest.

Additional Activities

Directions: Observe the Moon for a week. Draw and describe its shape every night and place your output in your science notebook like the table below.

DAY	DRAW THE SHAPE OF THE MOON	DESCRIPTION

Answer Key

Lesson 2 What's New

POSSIBLE ANSWER

1. During the ancient times, people believed that during full moon mythical creatures like aswang, encanto, kapre, tikbalang and tiyanak mostly appear.
2. Fishermen believe that the moon also affect the number of fishes they could catch.
3. Couples should marry during full moon because more blessing will be given to them.

LESSON 2
What's In

Answers may vary from learner's point of view.

1. Yes or No
2. Yes. I believe in superstitions.
   No. I don't believe in superstitions.
3. The moon controls fertility.
4. Yes. Because the elderly share stories about their experiences about the moon.
   No. Because I don't believe in superstitions.

Lesson 1 What's More Activity 2

1. Answers may vary from the lerner's point of view.
2. Yes I see different phases of the moon.
3. The different phases of the moon are new moon, waxing crescent, first quarter,waxing gibbous, full moon, waning gibbous, last quarter, and waning crescent.

What I Know

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

Lesson 1

What's New

Answers may vary from learner's point of view.

LESSON 1
What's In

1. Every night
2. We can see the moon up above the sky during night time.
3. No, it changes its shape. Sometimes it is half lighted and sometimes it is crescent and gibbous.
4. It changes its shape because of the different amount of light it reflects from the sun as it revolves around the Earth.

Lesson 1 What's More Activity 1

1. Answers may vary from students mental ability.

Illustrated by Reyson Joe G. Cañedo

2. Yes, because as the light moves around the human head, it changes its shapes.
3. Yes, it is at the left side of the small ball that reflects the light. It changes the shape because as the lights move around the head, it creates another shape on the small ball.

What I Can Do

A.

1. New Moon
2. Full Moon
3. Waning Crescent
4. Waxing Crescent
5. First Quarter
6. Last Quarter
7. Waning Gibbous
8. Waxing Gibbous

B. *Possible answers:*

1. Planting when the moon was in those phases was beneficial and would yield a good harvest.
2. The moon influences animal behavior.

Assessment

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

What I have Learned

A.

1. Phases
2. Superstitions
3. Moon
4. Good Harvest
5. High and low
6. High Tides
7. Bulge

B. Possible Answer

- It is good to plant and may bring good harvest when the moon is in specific phases.
- Wolves howled during full moon and when the sky is dark.
- Fishermen believes that the moon affect the increased number of fishes they could catch

Lesson 2 What's More Activity 1

(Possible answers)

1. This belief tells us that a farmer has to plant their crops when moon is in its specific phases like full moon etc. and believes that this may bring good harvest.
2. Through the gravitational forces exist between the moon and earth to hold each other in their respective positions that affect Earth's tides. When one side of the Earth is close to the moon, the other side will be pulled towards moon causing to bulge which cause the ocean to rise and the other side experiences low water.

Additional Activities

(Possible Answer)

AUGUST	DESCRIPTION
 Illustrated by Reyson Joe G. Cañedo	The other side of the moon is a little bit lighted and it started to increase its size.
 Illustrated by Reyson Joe G. Cañedo	The moon started to increases its size and waiting to be a full moon.
 Illustrated by Reyson Joe G. Cañedo	The moon is a little bit round. It starts to be a full moon.
 Illustrated by Reyson Joe G. Cañedo	The moon is whole lighted side of the moon. The full moon appears as an entire circle in the sky.
 Illustrated by Reyson Joe G. Cañedo	The full moon starts to disappear by decreasing its size.
 Illustrated by Reyson Joe G. Cañedo	After the full moon it started to decreases its size until it becomes a gibbous moon.
 Illustrated by Reyson Joe G. Cañedo	The moon decreases in size and now becomes a gibbous moon.

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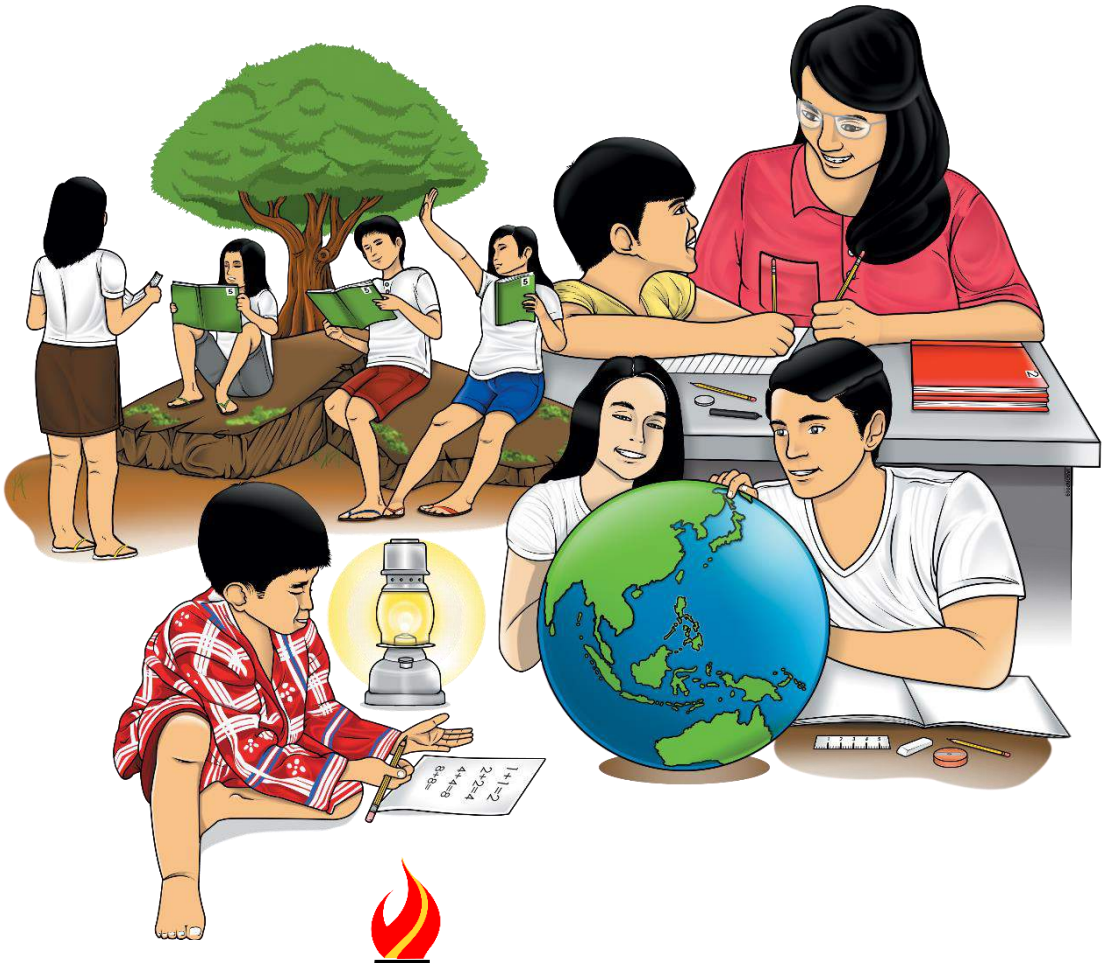
Science

Quarter 4 – Module 5:
The Stars and Constellations



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5

Science

Quarter 4 – Module 5:
The Stars and Constellations

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Introductory Message

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

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

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

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

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

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

Thank you.

What I Need to Know

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

This module will help you identify star patterns that can be seen at particular times of the year.

The module is divided into two lessons, namely:

- **Lesson 1** – The Stars
- **Lesson 2** - The Constellation

After going through this module, you are expected to:

1. classify stars according to their size, brightness, color and temperature;
2. describe the different patterns formed by groups of stars; and
3. explain the stages of the life cycle of the stars.

What I Know

Directions: Read and understand the statements carefully. Fill in the blanks by choosing the letter of the correct answers. Write your answers in your science notebook.

1. A constellation is a group of visible _____ that form a pattern when viewed from Earth.
   A. lights B. patterns C. planets D. stars

2. The color of the stars with the highest temperature is _____.
   A. blue B. orange C. red D. yellow

3. Which of the following constellation is most visible during October?
   A. Cancer B. Libra C. Orion D. Pegasus

4. The life cycle of a star is determined by its_____.
   A. gas B. matter C. mass D. weight

5. Which gas is the fuel for stars in producing their light?
   A. Carbon C. Hydrogen
   B. Helium D. Oxygen

6. It is difficult to see the stars and determine their size with our naked eyes because _____.
   A. They are very far from Earth.
   B. It is surrounded by many planets.
   C. Their location cannot be determined.
   D. Stars are very bright and have a hot temperature.

7. Which is a huge group of stars that are fairly close to each other in space?
   A. Galaxy B. Model C. Planet D. Universe

8. During each _____, different groups of constellations are noticeable.
   A. Christmas season C. Summer
   B. Season of the Year D. Winter

9. As the Earth rotates on its axis, the constellations and stars in them appear to _____.
   A. disappear around each other C. move around each other
   B. move across the sky D. stand still in the sky

10. Which is the most recognizable constellation of all?
    A. Big Dipper B. Leo C. Little Dipper D. Pegasus

Lesson 1

The Stars

Look at the night sky. What do you see? When we look at the night sky, many of us are amazed at the beauty of the tiny lights we see hanging in the dark. If the sky is clear, you will see hundreds of stars. Almost all of the stars you can see are part of the large system of stars called the ***Milky Way galaxy***.

During ancient times, people used the stars as their point of reference when travelling. It is because there are stars that appear to be fixed in position throughout the year. At present, stars play an important role in the field of astronomy. They are used as guides in determining the distance of planets and the locations of heavenly bodies.

What's In

Directions: Read and understand the sentences well. Draw a happy face (☺) if the statement is correct and draw a sad face (☹) if the statement is not correct. Write your answers in your science notebook.

1. The real color of the Sun is yellow.
2. The Sun is the nearest star to Earth.
3. The Sun is travelling at 520 km per second.
4. The Sun is the star at the center of the Solar System.
5. The Sun is a globe of hot gas, composed mainly of hydrogen, which is so large that 1,300,000 Earths would fit inside it.

What's New

Have you tried observing the sky during night time? What do you see? What do you call these little lights in the sky during the night?

As you gaze the sky tonight, make a portrait out of your observation of the night sky and compose a one stanza song about your portrait. You may portray it on the space provided below.

What is It

Stars are huge celestial bodies made of gases and can produce light and heat through nuclear fusion inside their cores. Stars are the building blocks of galaxies, of which there are billions in the universe. It is impossible to know how many stars exist, but astronomers estimate that in our Milky Way galaxy alone, there are about 300 billion.

Stars are so far away that distances between them are measured in light-years. A ***light-year*** is the distance traveled by light in one year. A light-year is equal to 9.5 trillion kilometers. The Sun is the closest star to us.

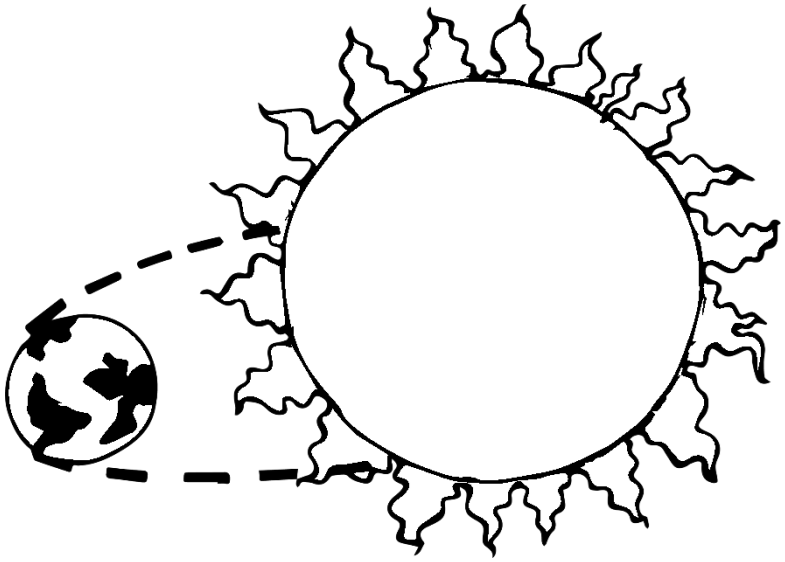


Figure 1: Comparison of the size of the Sun, the biggest star, from the Earth
(Illustrated by Ryan A. Machate and Jose Marie E. Baculi)

The closest known star outside of our solar system is Alpha Centauri which is over four light-years away. Many stars that you see in the sky as mere points of light are millions of light-years away.

Stars may be blue, white, yellow, orange, or red. Stars differ in color because of their different temperatures. Like the flame, stars with high temperatures are blue or bluish-white. On the other hand, Red stars have lower temperatures. Yellow and orange stars have medium temperatures.

Stars have different sizes. They are measured in diameters. A ***diameter*** is a straight line that cuts a circle passing through the center point. The smallest known star has a diameter of about 20 kilometers. The Canis Major, one of the largest known stars, has a diameter of 1,975,000,000 kilometers. This is more than 100 times than the size of our Sun. Some stars are so large, yet the naked eye cannot see them because they are too far away.

The table below lists the names of some stars, their colors, and their surface temperatures.

Table 1: Name, Color, and Temperature of Common Stars

Star	Color	Temperature (˚C)
Rigel	Bluish-white	12,000
Sirius	White to blue-white	10,500
Sun	Yellow	5,500
Arctus	Orange	4,200
Antares	Red	3,000

Magnitude, in astronomy, measures the **brightness** of a **star** or other celestial body. The brighter the object, the lower the number assigned as

a **magnitude.** The magnitude of a star refers to how bright it looks to our eyes. The magnitude of a star is determined by its size, temperature, and distance from Earth.

There are two types of star magnitude, the apparent brightness or apparent magnitude and absolute brightness or absolute magnitude. The *apparent brightness or apparent magnitude* of stars is the brightness of stars that varies with their distance from the observer. Some stars with apparent magnitudes are the Sun = -26.7, Moon = -12.6, Venus = -4.4, Sirius = -1.4, Vega = 0.00, faintest naked eye star = +6.5, brightest quasar = +12.8, faintest object = +30 to +31.

No matter how near or far a star is from the observer, it has its own real or absolute brightness. *Absolute magnitude* is also known as a star's luminosity. Its luminosity measures the total amount of light energy emitted by a star. It is measured in watts or joules per second. Some visible stars have such low absolute magnitudes that they would appear bright enough to outshine the planets and cast shadows if they were 10 parsecs away from Earth. Rigel (7.0), Deneb (7.2), Naos (6.0), and Betelgeuse (5.6) are a few examples.

Stars are born, and as a result, they have a life cycle. Stars form in nebulae, which are clouds of gas and dust. Nuclear reactions in the center (or core) of stars generate enough energy to keep them shining brightly for many years. This is known as the **main sequence**. The exact lifetime of a star is highly dependent on its size. Large, massive stars burn their fuel much faster than smaller stars, and they may only live for a few hundred thousand years. Smaller stars, on the other hand, will last for billions of years because their fuel burns much more slowly.

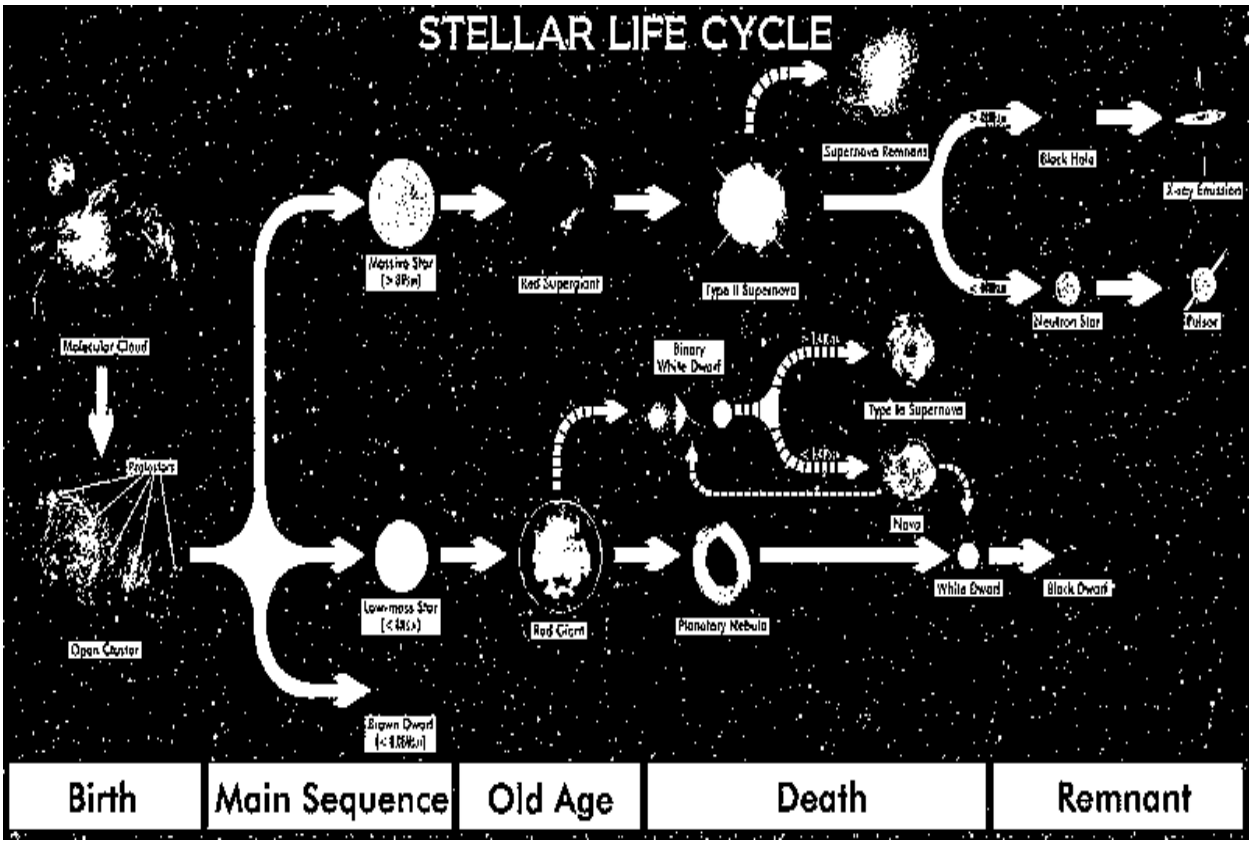


Figure 2: Life Cycle of the Star (Photo Source: R.N. Baily, 2017)

However, the hydrogen fuel that powers the nuclear reactions within stars will eventually run out, and the stars will enter the final phase of their lives. They will expand, cool, and change color over time to become **red giants**. The path they take after that is determined by the **mass** of the star.

Small stars, such as the **Sun,** will die in a relatively peaceful and beautiful manner, passing through a **planetary nebula** phase to become a **white dwarf**, which eventually cools down and stops glowing to become a "black dwarf."

Massive stars, on the other hand, will die in a most energetic and violent manner, with their remains scattered throughout the cosmos in an enormous explosion known as a **supernova**. When the dust settles, the only thing left is a very dense star known as a **neutron star**. These are known as **pulsars** because they are frequently rapidly spinning. If the exploding star is massive enough, it may even form a **black hole**.

What's More

Activity: Hide and Seek

You Will Need:

- Piece of red, orange, yellow, white, blue cloth or curtain
- flashlight
- door/window

What to Do:

- Close the door and window. Use a red cloth to block the light. Switch on a flashlight and observe the light coming from it. *(Do the same activity with the other colors of cloth or curtain.)*
- Observe the brightness of the light transmitted from the flashlight.
- Compare the brightness of the transmitted light when using different colored cloths or curtains.
- Now, open the door and window. Use a red cloth to block the light. Switch the flashlight again. (*Do the same activity with the other colors of cloth or curtain.)* Observe and compare the brightness of the light transmitted.

Directions: Based on the given activity, use a table describing and comparing the different appearance of light blocked with different colored cloth or curtain.

Color of Cloth / Curtain	**Appearance (Brightness) of light with closed door and window**	**Appearance (Brightness) of light with opened door and window**
Red		
Orange		
Yellow		
White		
Blue		

Guide Questions:

1. Which color of the cloth/curtain transmits the brightest light?
2. Does the brightness of the DIY star change when the room door/window is closed and opened?

Lesson 2 The Constellations

People are always fascinated by the night sky and the stars. People in ancient times noticed how stars appear to form patterns in the sky. These star patterns are known as ***constellations***.

The ancient people first observed these groups of stars as outlines of animals, mythological heroes, gods, and other objects. They found it easier to locate and remember constellations when they try to find a distinct and particular pattern how a group of stars are arranged.

What's In

Activity 1

Directions: Copy the puzzle below in your Science notebook. Find the five (5) names of constellations by connecting the letters to find the word on the puzzle.

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

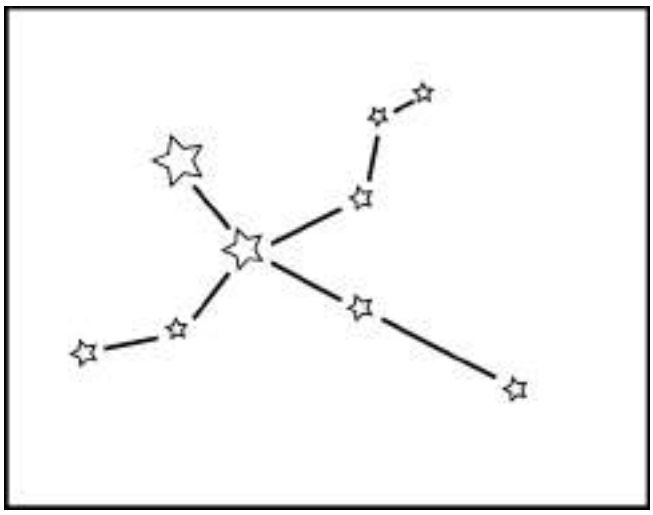
Example: DRACO

1. URSA MINOR
2. ORION
3. CEPHEUS
4. URSA MAJOR
5. HYDRA

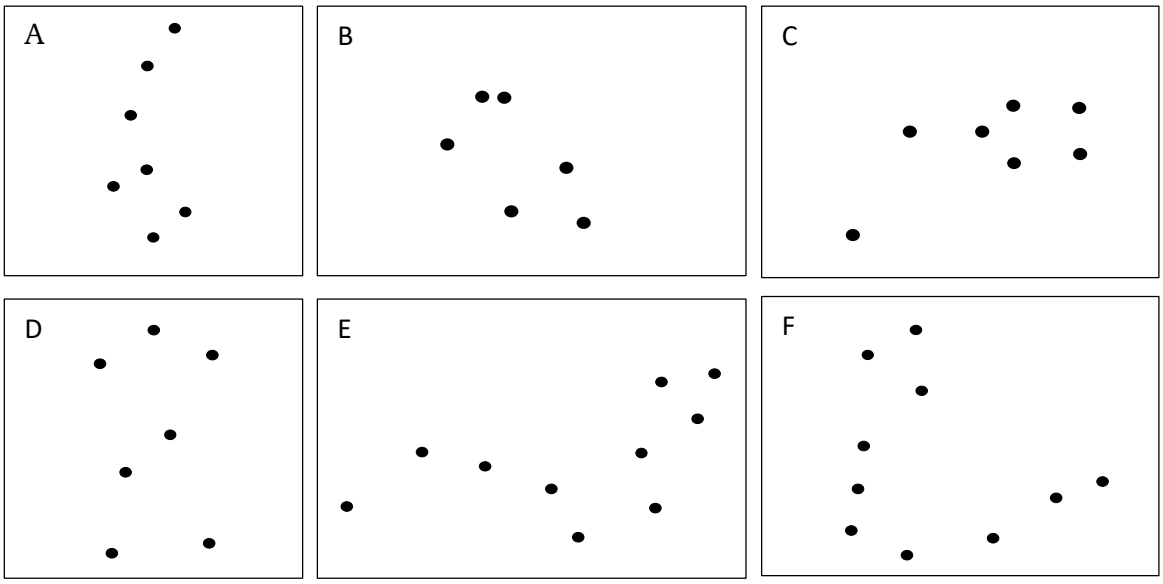
Activity 2.

Directions: Copy the boxes and blank spaces as shown below in your Science notebook. Connect the dots to form a certain pattern of a constellation.

Example:



(Illustrated by Ryan A. Machate)



What's New

Have you tried star gazing at night? What do you observe with the stars? Do the stars show different patterns? These are called constellations. A constellation is a group of stars that appears to form a pattern or picture.

Directions: Make your star pattern. You can use any kind of material you like. This may be a simple wallet, a T-shirt, or a drinking cup/mug. On this stuff, make your star template. What would the name of the star pattern you create be?

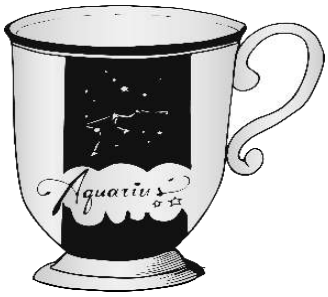


Figure 3: Sample illustration of a mug with star design
(Illustrated by Ryan A. Machate and Jose Marie E. Baculi)

What is It

Constellations can be seen through astronomical instruments used by different astronomers.

Constellations are groups of stars that appear to form different shapes or patterns in the sky**.** The word "constellation" comes from the Latin term "*constellation",* which can be translated as *"set of stars".*

We use constellations to divide up the sky. Groups of stars that are not constellations but belong to a constellation are called *asterisms.* **Asterisms** are also naked-eye star patterns, but they do not form constellations on their own. An example is the Big Dipper, which is part of Ursa Major.

The Big Dipper is a group of seven bright stars. Three stars form the handle and four stars form the bowl. Another is the Little Dipper but in an opposite form.

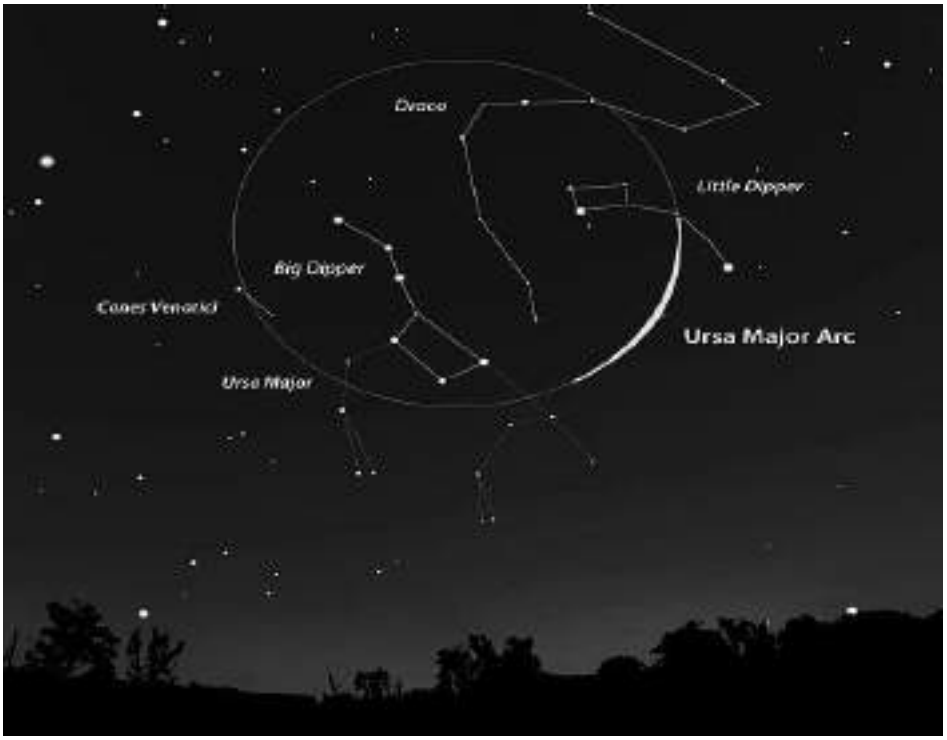


Figure 4: Big Dipper Map (Photo Source: Benjamin, 2020)

Some constellations appear all year round (circumpolar), and some appear only on certain months of the year. Those constellations that we can see year-round are called circumpolar. These constellations all circle the North Star, and because we live in the Northern Hemisphere, we see them all year round. These constellations are **Ursa Major**, **Cassiopeia**, **Ursa Minor**, and **Cygnus the Swan.**

Figure 5: Ursa Major position of the stars
(Photo Source: Michal Kryński, 2017)

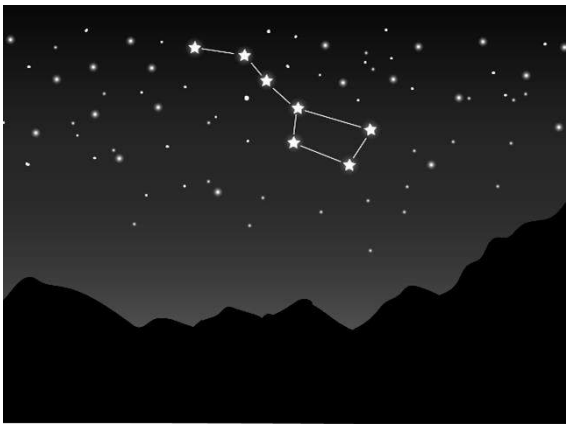


Figure 6: Ursa Major pattern
(Illustrated by Reyson Joe Cañedo)

Ursa Major, also known as the Great Bear, is a northern sky constellation with a mythology that dates back to prehistory. Its Latin name means "greater (or larger) she-bear," referring to and contrasted with **Ursa Minor**, the lesser bear, which

is located nearby. It was one of the 48 original constellations listed by Ptolemy in the 2nd century AD. It is currently the third largest of the 88 modern constellations.

Ursa Major is known primarily for the asterism of its main seven stars, which has been variously referred to as the "Big Dipper," "the Wagon," "Charles' Wain," or "the Plough." The stellar configuration of the Big Dipper, in particular, resembles the shape of the "Little Dipper." Two of its stars, Dubhe and Merak, can be used to navigate to the current northern pole star, Polaris in Ursa Minor.

Ursa Major and the asterisms that incorporate or comprise it are significant to several world cultures, most notably as a symbol of the north. Its representation on the flag of Alaska is a modern example of such symbolism.

Ursa Major is visible throughout the year from most of the northern hemisphere and appears circumpolar above the mid-northern latitudes. The main asterism is invisible from southern temperate latitudes, but the southern parts of the constellation can still be viewed.

Figure 7: Cassiopeia position of the stars (Photo Source: 4shadoww, 2020)

Figure 8: Cassiopeia pattern (Photo Source: Till Credner 2003)

Cassiopeia is a constellation in the northern sky, named after the vain queen Cassiopeia in Greek mythology, who boasted about her unrivalled beauty. Cassiopeia is located in the northern sky, and from latitudes above 34°N, it is visible year-round. The (sub) tropics can be seen at its clearest from September to early November, and at low southern, tropical latitudes of less than 25°S, it can be seen, seasonally, low in the North.

Figure 9: Position and pattern of Ursa Minor (Photo Source: Orensila, 2020)

Ursa Minor (Latin: "Lesser Bear", contrasting with Ursa Major), also known as the **Little Bear**, is a constellation in the Northern Sky. Like the Great Bear, the tail of the Little Bear may also be seen as the handle of a ladle, hence the North American name, **Little Dipper**: seven stars with four in its bowl-like its partner, the Big Dipper. It was one of the 48 constellations listed by the 2nd-century astronomer Ptolemy and remained one of the 88 modern constellations. Ursa Minor has traditionally been important for navigation, particularly by mariners, because Polaris is the North Pole star.

Figure 10: Cygnus position of the stars
(Photo Source: Hans Braxmeier, 2016)

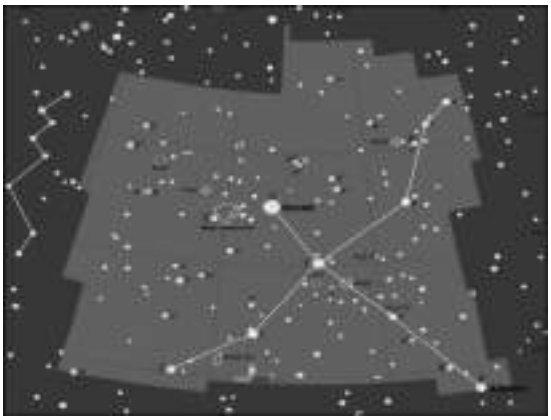


Figure 11: Constellacion Cygnus
(Photo Source: Eynaud, 2017)

Cygnus is a northern constellation lying on the plane of the Milky Way. Its name is derived from the Latinized Greek word for swan. Cygnus is one of the most recognizable constellations of the northern summer and autumn. It features a prominent asterism known as the Northern Cross (in contrast to the Southern Cross).

Why do we see different constellations during the year? If observed through the year, the constellations shift gradually to the west. Earth's orbit causes this around the Sun. In the summer, viewers look from a different direction in space at night than during the winter.

People used the stars to navigate before the invention of the compass, primarily when sailing across the ocean. They used the Ursa Minor constellation to identify the location of Polaris, also known as the North Star.

Constellations are useful because they help astronomers and stargazers in identifying specific stars in the night sky. Constellations are less important today than they were in ancient times. In ancient times, constellations were used to create and track the calendar, allowing farmers to know when to plant and harvest crops.

What's More

Directions: Perform the activity carefully, with the supervision of your parent or guardian. Write your answers to the guide questions in your science notebook.

Activity: See Me How

Note: Learners will provide the materials below. Search on the internet or draw your favorite constellations as your template.

You Will Need:

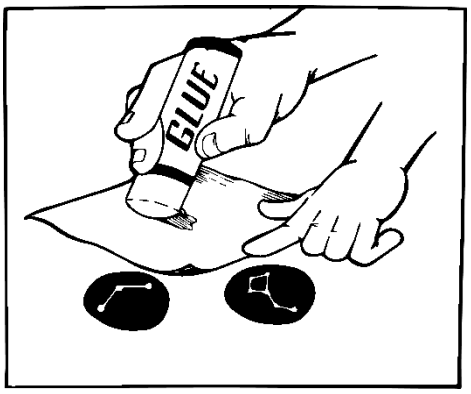
- Constellation templates
- Cardboard tubes (empty tube of tissue paper or any empty container)
- Glue
- scissors
- black construction paper (4.5 x 4.5")
- push pin / any sharp tip pen

(Photo by Adelei Kristine F. Mañoso)

What to Do:

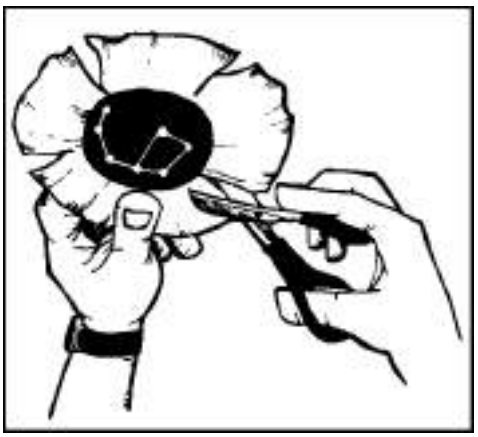
Note: Be careful in using the glue gun/ hot objects.

1. Cut and glue the constellation template in the middle of the black construction paper.



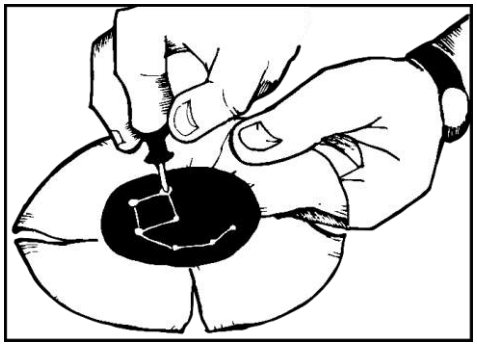
(Illustrated by Ryan A. Machate)

2. Make some diagonal cuts from the outer edge of the construction paper to the center. Do not cut into the constellation pattern. (Hint: Cut it into 8 wedges).



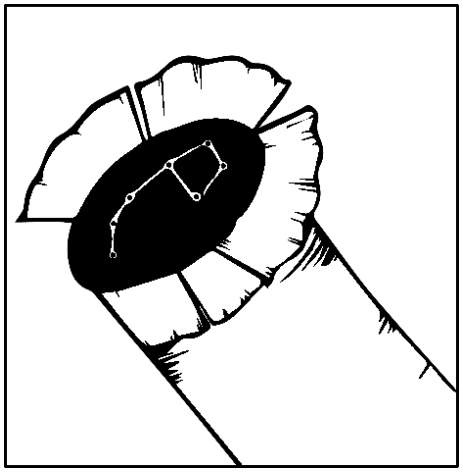
(Illustrated by Ryan A. Machate)

3. Using the pushpin or any sharp tip pen, punch the holes where the dots/ stars are located.



(Illustrated by Ryan A. Machate)

4. Glue the constellation template on the top of the cardboard tube. Tape each wedge down to secure it in place.



(Illustrated by Ryan A. Machate)

5. Close an eye and look into the other end of the cardboard tube.

(Illustrated by Ryan A. Machate)

Guide Questions:

a. What can you see from your model?
b. What constellations have you formed?
c. How will you describe the stars as you saw them with your naked eye?
d. How will you describe the stars as you saw them through your improvised telescope?

What I Have Learned

Directions: Complete the paragraph below by filling in the blanks. Choose your answer from inside the box. Write your answers in your science notebook.

Latin	star	astronomical	Ursa Major
patterns	Constellations	seven	Ursa Minor
Asterisms	Little Dipper	Big Dipper	

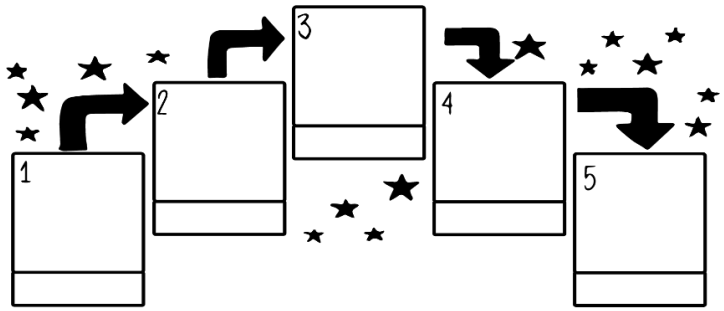
Different astronomers use different (1) _____ instruments to see constellations. (2) _____ are groups of stars that appear to form different shapes or patterns in the sky. The word "constellation" comes from the (3) _____ term "*constellation",* which can be translated as *"set of stars".*

We use constellations to divide up the sky. Groups of (4) _____ that are not constellations but belong to a constellation are called *asterisms.* (5) _____ are also naked-eye star (6) _____, but they do not form constellations on their own.

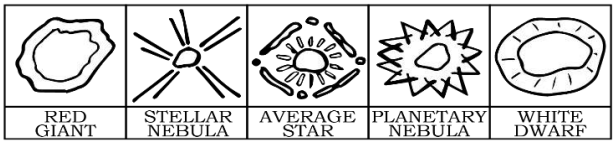
An example is the (7) _____ which is part of (8) _____. Big dipper is a group of (9) _____ bright stars. Three stars form the handle, and four stars form the bowl, also with the (10) _____ but in the opposite form.

What I Can Do

A. Directions: Arrange the following according to the stages of the life cycle of the stars. Draw them and write their labels on the space provided. Write your answers in your science notebook.



LIFE CYCLE OF A STAR



(Illustrated by Ryan A. Machate)

B. Directions: Take a look at the night sky. Look for a location where you can see the stars. Use Polaris as a starting point to connect the other stars you've seen to form your constellation. Draw and name your constellation. Make a story of at least 50 words explaining how it came to be. Write your output in your science notebook.

Performance Task Rubrics:

Top Point	Excellent (4)	Good (3)	Fair (2)	Poor (1)
Topic Sentence	The Main Idea is clear restating of the prompt.	The main Idea is present and clearly written.	There is an attempt of getting the main idea but not clearly written.	The main idea is not present and not clearly written.
Illustration	The illustration is developed in a logical order appropriate to the writer's purpose and reader's needs.	Most of the illustration is presented logically, and readers have little trouble following the supporting details.	The writer attempts to develop the illustration logically, but some of the illustrations presented are confusing to the target readers.	The supporting details within the illustration as a whole are not developed in a logical order.

Top Point	Excellent (4)	Good (3)	Fair (2)	Poor (1)
Conclusion	The conclusions do an excellent job of summing up or restating the topic and tying the details together.	The conclusion sums up the topic by restating it, but it does not tie the details together.	There is an attempt at a conclusion, but it does not restate the topic or tie the details together.	There is no conclusion. The essay just ends without summing up or restating the topic. It does not tie the details together.

Assessment

Directions: Read and understand each statement well. Choose the letters of the correct answers. Write your answers in your science notebook.

1. Which are groups of stars that appear to form different shapes or patterns in the sky.
   A. Big Bang
   B. constellations
   C. Milky Way
   D. stars

2. Which color of the star has the highest temperature?
   A. blue
   B. green
   C. blue red
   D. White

3. In what form of matter do stars begin their life cycle with?
   A. a rock
   B. a stone
   C. a ball of gas
   D. a light

4. The _____ of a star is determined by the amount of matter that is available in its nebula, the giant cloud of gas and dust from which it was born.
   A. gas
   B. light
   C. mass
   D. Matter

5. Which are groups of stars that are not constellations but belong to a constellation?
   A. asterisms
   B. constellations
   C. Nebula
   D. shooting stars

6. Which is a group of seven bright stars whose three stars form the handle and four stars form the bowl?
   A. Big Dipper
   B. Hydra
   C. Little Dipper
   D. Orion

7. Our nearest star neighbor in space, Alpha Centauri, is four light-years away from Earth. Why will it be difficult, if not impossible, to visit it?
   A. It is very far away.
   B. It is very bright and hot.
   C. There may be no planets near it.
   D. We are not sure exactly where it is.

8. Which is the most recognizable constellation of all?
   A. Big Dipper
   B. Little Dipper
   C. Leo
   D. Orion

9. What do you call the constellation named after the winged white horse of Poseidon in Greek mythology?
   A. Athena
   B. Pegasus
   C. Unicorn
   D. Venus

10. Which is a group of seven bright stars that form a constellation?
   A. Aquarius
   B. Big Dipper
   C. Big Dipper
   D. Sirius

Additional Activities

Activity: Man-Made Constellation

Directions: Make a man-made constellation using the following materials and procedures. You can also create your pattern dot designs and make a short story about your picked design. *(The following photos used in this activity were taken by Ms. Adelei Kristine F. Mañoso)*

You Will Need:

- flashlight
- black construction paper
- pencil
- scissors
- awl/needle

What to Do:

1. Take off the top part of the flashlight and trace onto the black construction paper the size you want the discs to fit in.

2. Remove the shiny silver part inside the flashlight to ensure that the discs will work.

3. Get a pair of scissors and carefully cut the discs as close to the tracings you made.

4. Select your favorite constellations and mark the dots onto the circled black construction papers.

5. Insert the awl/needle in each marked dot to make a hole.

(Photos by Adelei Kristine F. Mañoso)

6. Put together your new flashlight and attach the discs with the constellations.

Now, you've made your constellations!

(Photo by Adelei Kristine F. Mañoso)

This is an enjoyable activity that brings the imagination while learning about our night sky.

Guide Questions:

1. What is formed when the pattern of dots was lighted using the flashlight?
2. What have you observed with the constellations using the flashlight as your source of light?

Answer Key

Assessment

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

Additional Activities

1.Constellation is formed.
2. It glows and the pattern is clearly visible.

What I Can Do

What Have I Learned

1. astronomical
2. Constellation
3. Latin
4. Stars
5. Asterisms
6. patterns
7. Big Dipper
8. Ursa Major
9. seven
10. Little Dipper

Lesson 2 - What's In Activity 1

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

Lesson 2 Activity 2

Lesson 2
What's More:

a. Constellation

b. Big dipper and little dipper

c. Stars have different sizes, they are aligned, they formed shapes

d. Formation of the stars are clearer and looks real

Lesson 1 - What's More

Color of Cloth / Curtain	Appearance (Brightness) of light with closed door and window	Appearance (Brightness) of light with opened door and window	
Red	Slightly dark	Faded	
Orange	Slightly bright	Fine bright	
Yellow	Low brightness	Faded	
White	Highly brightness	Highly brightness	
Blue	Slightly dark	Faded	

1. White cloth/curtain transmits the brightest star.
2. Yes, it changed.

LESSON 1: The Stars
What's In

1. ☺happy face
2. ☹sad face
3. ☺happy face
4. ☺happy face
5. ☹sad face

What I Know

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

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