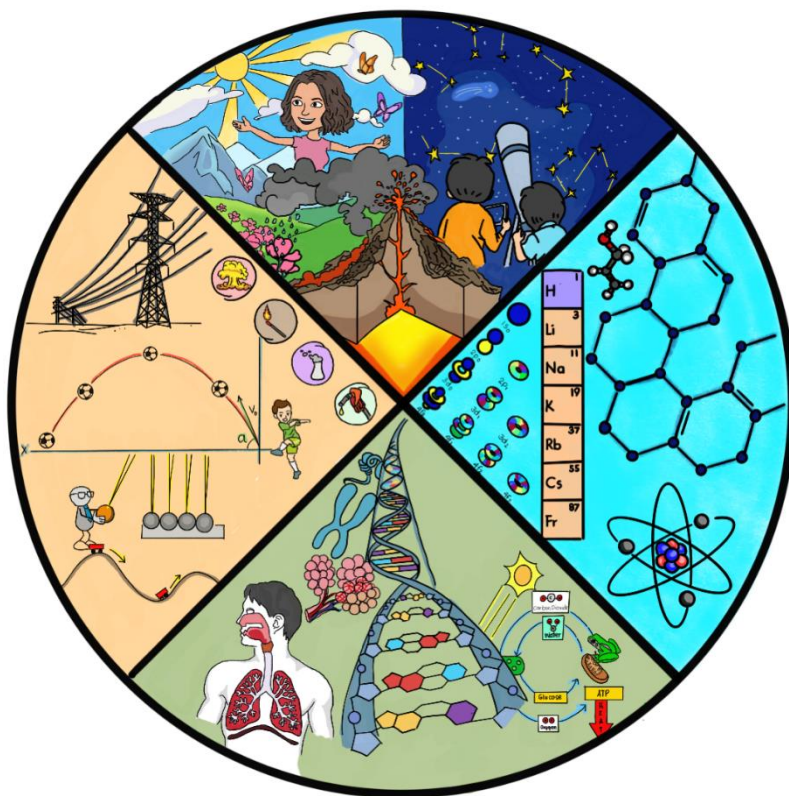


9

Department of Education
National Capital Region
SCHOOLS DIVISION OFFICE
MARIKINA CITY

Science

Quarter 3 - Module 5 **Climatic Phenomena** **on a Global Level**

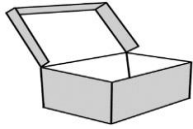


Jordan B. Plopino



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What I Need to Know

The purpose of this module is to help you identify the causes of greenhouse effect and global warming and its relationship to climate change and understand the difference between El Niño from La Niña.

This module contains one lesson: Climatic Phenomena on a Global Level

After going through this module, you are expected to **describe certain climatic phenomena on a global level. S9ES-III F-30)**

Specifically, you should be able to:

- identify the causes of greenhouse effect and global warming;
- explain global warming and its relationship to climate change; and
- differentiate El Niño from La Niña.



What I Know

Read and understand each question then encircle the letter of the correct answer.

1. Which of the following is **TRUE** to greenhouse effect?
 - A. It is a natural phenomenon that directly results to global warming.
 - B. It is the natural way on warming the planet to help maintain all life forms.
 - C. It is a condition wherein more heat is trapped in the atmosphere causing global warming.
 - D. All statements are true.
2. Which of the following greenhouse gases has the highest percentage in the atmosphere?
 - A. Carbon dioxide
 - B. Fluorinated gases
 - C. Methane
 - D. Nitrous oxide
3. Which is the main reason why **enhanced greenhouse effect** occurs at present time?
 - A. People are planting more trees to help revive the nature.
 - B. Greenhouse gases are always present in the atmosphere.
 - C. Excessive emission of greenhouse gases like CO₂ in the atmosphere.
 - D. Greenhouse effect is continuously happening that helps warm the planet.



4. Which of the following is TRUE to La Niña?
 - A. It brings warm temperature than usual in some areas.
 - B. It brings too much drought and high temperature to the Philippines.
 - C. It is the result of strong trade winds pushing warm water towards Asia.
 - D. None of the above.

5. Which of the following is the most alarming effect brought by global warming?
 - A. climate change B. deforestation C. pollution D. rising temperature

6. The following are TRUE about El Niño, **EXCEPT**:
 - A. It brings drought and very hot weather in the Philippines.
 - B. In simple terms, it is regarded as the warm phase in the Pacific Ocean.
 - C. It is a periodic change in the temperature on the surface of Pacific Ocean.
 - D. It is brought about by unusual stronger trade winds push warm water towards Asia and bring cold water in the surface.

7. Which of the following human activities would result to an increased amount of carbon dioxide in the atmosphere?
 - A. Reforestation or reviving of the forests.
 - B. Excessive use of air conditioning units at home.
 - C. Burning of fossil fuels to sustain the use of electrical energy at home.
 - D. Turning off electrical appliances to conserve energy.

8. Which is TRUE about global warming?
 - A. It is a natural process of warming the earth.
 - B. It is the result of heat (infrared radiation) that is trapped.
 - C. It is a phenomenon that helps maintain the life on this planet.
 - D. It is the result of enhanced greenhouse effect due to large amount of greenhouse gases concentrated in the atmosphere.

9. When solar radiation enters the atmosphere, the earth's land and water surfaces heat up. What happens to the heat produced from the earth's surface as it rises in the atmosphere?
 - A. It is completely reflected to space.
 - B. Some are reflected to space and some are trapped by greenhouse gases.
 - C. It stays on the earth's surface making our planet very warm than usual.
 - D. It completely penetrates and passes through the earth's atmosphere.

10. What type of radiation is referred in item #9 as the result of heating up of the earth's surface?
 - A. infrared B. microwave C. solar radiation D. ultraviolet



Lesson

Factors Affecting the Climate



What's In

Guided by the illustrations and letter cues, identify the corresponding factors that affect the world's climate.

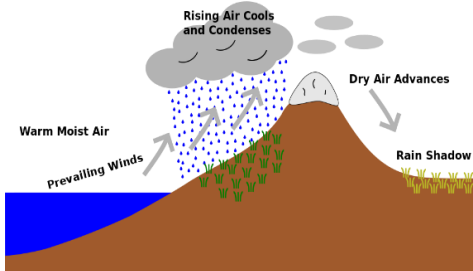


Figure 1

<http://bit.ly/30grx5O>

___ O ___ G ___ P ___

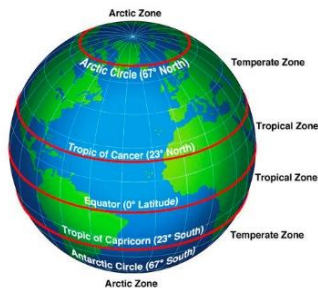


Figure 3

<http://bit.ly/3sQO31p>

___ T ___ T ___ E

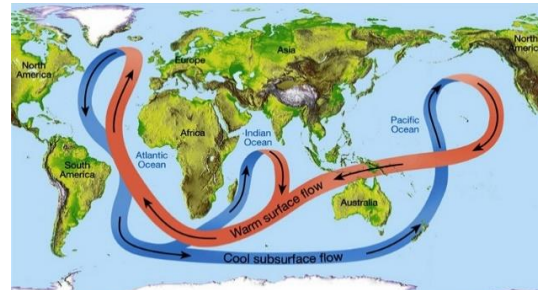


Figure 2

<http://bit.ly/3c8tZB7>

___ E ___ N ___ U ___ N ___

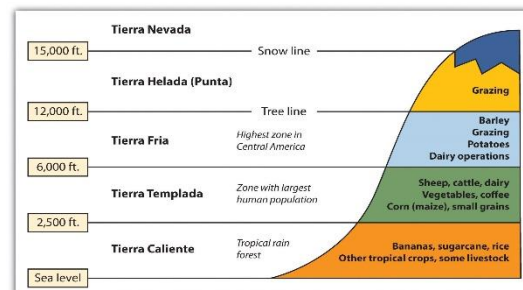


Figure 2

<http://bit.ly/2OqAHde>

___ L ___ U ___



What's New

Aside from the different factors that directly affect world's climate, there are also global natural phenomena that greatly contribute to changes in the weather systems and climatic conditions in the world. We can mention one widely known natural process which is the greenhouse effect. Is greenhouse effect really helpful in our planet or not? How will this natural process become a big threat to all life forms on earth? How is greenhouse effect related to global warming and climate



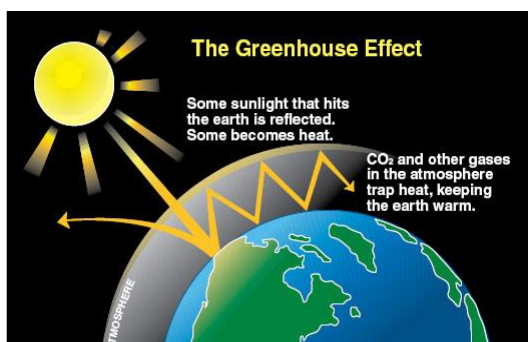
Try this! Write the important **science concepts** that you can get from the word cloud.



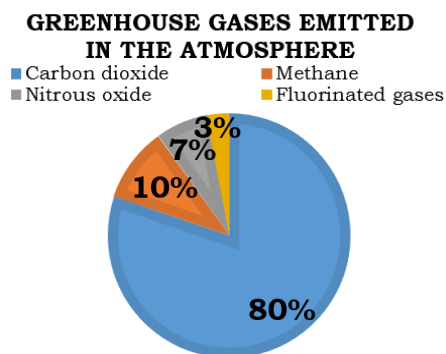
1. _____
2. _____
3. _____
4. _____
5. _____



Greenhouse effect is a natural process that warms the earth's surface and makes life possible on the planet. Some may think negatively on this natural phenomenon but it is actually the reason why organisms in the entire world are able to survive. Let's go back to the basic concepts first. What are the important greenhouse gases involved? What is the main role of these gases for a greenhouse effect to occur? Observe the diagram:



<http://bit.ly/3bgAoe0>



<http://bit.ly/2OgAHde>



The **solar radiation** from the sun enters the earth's atmosphere and **heats up the land and water** surfaces, as shown in fig 6. Some radiation are **reflected back** to space while some are **trapped by the greenhouse gases** concentrated in the atmosphere. The **infrared radiation** that resulted from the heating up of the earth's land and water surfaces are also trapped by the greenhouse gases and **re-radiated back and forth** on the earth's surface resulting to the **warming effect** commonly called as the **greenhouse effect**. Like in the usual greenhouse used for propagating and growing plants, the earth needed this warming to maintain tolerable temperature for the survival of all organisms in the planet. The **greenhouse gases** present in the atmosphere that **act as blanket** for trapping heat has certain approximated percentages, as shown in fig. 7. **Carbon dioxide (CO₂)**, with 80%, has the highest percentage followed by **methane (CH₄)** with 10%. **Nitrous oxide (NO₂)** and **fluorinated gases (like chlorofluorocarbons or CFC's)** has a percentage of 7% and 3% respectively. Observe the diagram (fig. 8).

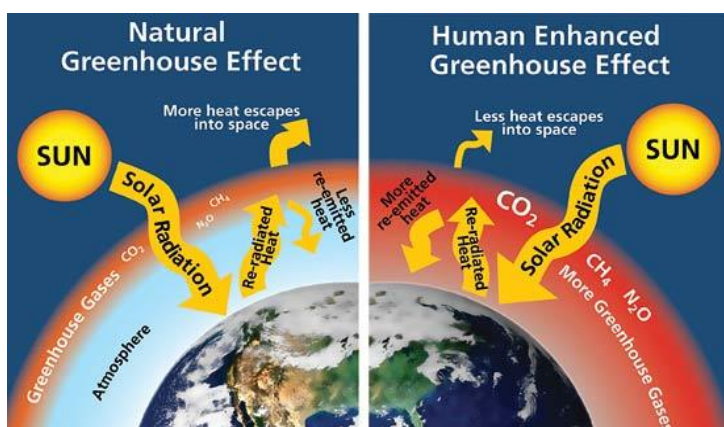


Figure 8. Natural vs. Enhanced Greenhouse effect

<http://bit.ly/3e8ghAN>

activities. Its true that anything in excess won't do any good at all. The alarming rise in the global temperature as years pass is commonly called as the **global warming**. Can you mention some human activities that directly contribute to the excessive emission of greenhouse gases?

What do you think are the results when global warming continues to happen in our planet? Do you think it would have a drastic effect on the world's climatic system? Observe the diagram (fig. 9).

There are two global climatic phenomena that occur naturally resulting to **periodic changes in Pacific ocean surface temperatures** that have impacts on weather all over the globe. These occurrences are named as **El Niño** and **La Niña** phenomena.



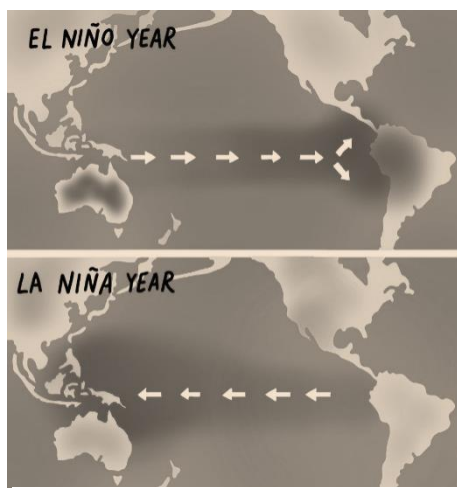
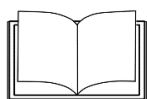


Figure 9. Trade winds in the Pacific Ocean

At **normal condition**, the **trade winds** in the Pacific ocean blow west along the equator bring warm water from South America towards Asia. Cold water rises from depths to replace that warm water – a process called **upwelling**. These normal process is altered by the said two opposing climate patterns.

El Niño (“Little Boy”) is an abnormal climate pattern brought by the warming of Pacific ocean near the equatorial region because of weak trade winds that push back warm water to east. On the other hand, **La Niña (“Little Girl”)**, as the opposite of El Niño, occurs when the unusual stronger trade winds pushes more warm water

towards Asia bringing cold-nutrient water to the surface that may also result to wetter (more rainfall) weather conditions. In simple terms, El Niño is the **warm phase** while La Niña is the **cool phase**. These phenomena becomes more intense due to climate change brought about by global warming. At severe cases, El Niño brings too much drought in some parts of the world (including Australia and Philippines) damaging crops and causing wildfires. La Niña on the otherhand, brings too much rainfall resulting to flooding and landslide to some parts of the world.



What’s More

Activity 5.1: Humans and the Greenhouse Gases

Objective: Identify various human activities or man-made sources of greenhouse gases.

What you need: pen, paper, any references available.

What to do: Use the boxes with the indicated name of greenhouse gases to write your answers. The image shows the percentage of greenhouse gases emitted in the atmosphere.

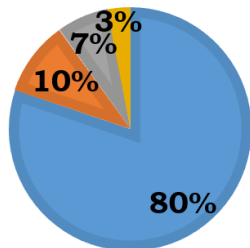
Research on what human activities or conditions can contribute to the emission of the following greenhouse gases. Write down as many as you can.

Carbon dioxide <i>Ex. Burning of fuel</i>	Methane



GREENHOUSE GASES EMITTED IN THE ATMOSPHERE

■ Carbon dioxide ■ Methane
■ Nitrous oxide ■ Fluorinated gases



Nitrous oxide	Fluorinated gases

Guide Questions:

1. Why do you think carbon dioxide has the highest percentage among the greenhouse gases? _____
2. What can you suggest to help lessen the amount of greenhouse gases released in the atmosphere? _____

Activity 5.2: Let's track it down!

Objective: Trace the process of greenhouse effect using a diagram.

What to do: Complete the process on the occurrence of greenhouse effect in our planet. You can write it in a form of a **sentence** or just **key words**.

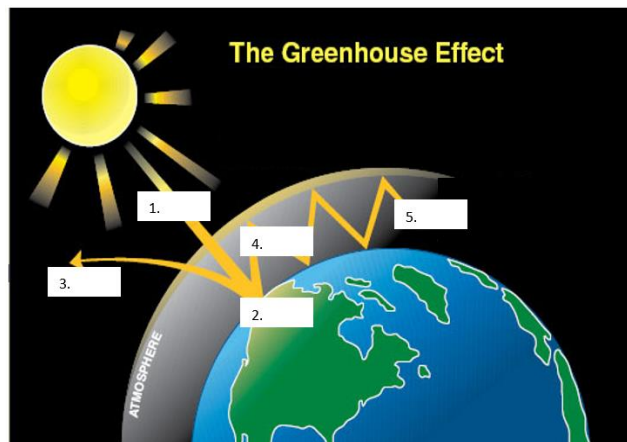


Figure 10. The Greenhouse Effect

<http://bit.ly/3bgAoe0>

1. _____
2. _____
3. _____
4. _____
5. _____

Guide Questions:

1. What is the main reason for an **enhanced greenhouse effect** to happen? _____
2. How is greenhouse effect related to global warming? _____

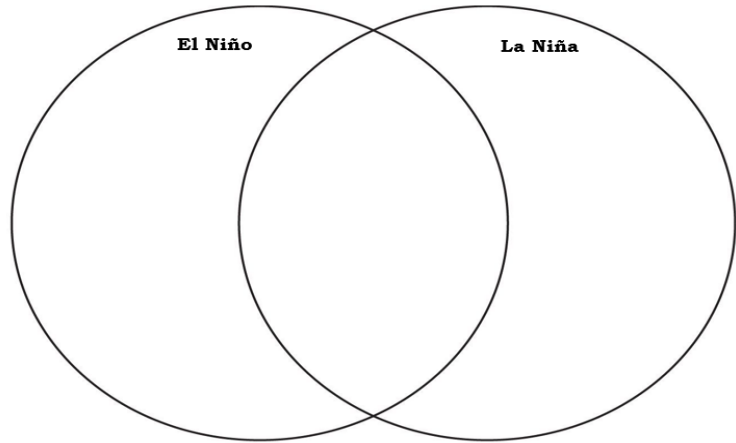


Activity 5.3: El Niño vs La Niña

Objective: Compare and contrast El Niño from La Niña phenomenon using a Venn diagram.

What to do: Supply the correct word/s from the box on the Venn diagram to compare El Niño from La Niña phenomenon.

Heavy rainfall
Severe drought
Cool phase
Warm phase
Flooding (Phil.)
Landslide
Wildfires (Aus. and Phil.)
Alter the normal climate system
Changes in ocean temperature



Guide Question:

Why do you think El Niño and La Niña's natural occurrences in the planet become intense or severe through time?



What I Have Learned

Arrange the process of greenhouse effect by assigning numbers 1-4.

- ___ A. Heat from the earth (infrared radiation) radiates towards space.
- ___ B. Some heat is trapped by the greenhouse gases and are re-emitted or re-radiated inside the earth making our planet warm enough to sustain life.
- ___ C. Solar radiation from the sun enters the atmosphere and some of this is reflected back to space.
- ___ D. The rest of the solar energy is absorbed by the land and water surfaces, heating the Earth.



Write the causes and effects of global warming on the box provided. Use the list inside the box.

CAUSES AND EFFECTS OF GLOBAL WARMING	
Deforestation	Energy use
Land degradation	Rising sea level
climate change	
Kaingin system	Rapid industrialization
extreme weather conditions	Pollution
Rising temperature	Stronger typhoons
Agricultural practices	Transportation
Loss of biodiversity	Unpredictable weather pattern
Consumer practices	
Causes	Effects
Ex. Pollution	Ex. Stronger typhoons



What I Can Do

Make a simple **poster** that will show how you will be able to help lessen the effects of global warming and climate change. It may include the ways and practices that should be done to address this long-tackled environmental issue. Tree planting or reforestation, conservation of energy, utilization of renewable energy resources, and limitation on the use of fuel-operated vehicles, are just some of the good practices to help lessen the drastic effects of global warming and climate change. Use a short bond paper and any type of coloring materials available at home.

RUBRICS FOR POSTER MAKING

CATEGORY	5	3	1
Content/Required elements	The poster includes all the expected contents and required elements as well as additional information	The poster includes the expected contents and required elements	The poster includes few expected contents and required elements.
Graphic-Relevance	All graphics are related to the topic/theme and is easier to understand.	Some graphics are related to the topic/theme.	Few graphics are related to the topic/theme.
Attractiveness	The poster is exceptionally attractive in terms of design, layout and neatness.	The poster is attractive in terms of design, layout and neatness.	The poster is acceptably attractive though it's a bit messy.





Assessment

Read and understand each question and encircle the letter of the correct answer.

- Which of the following statements the BEST describes the enhanced greenhouse effect?
 - It is the naturally occurring phenomenon the helps maintain global temperature.
 - It is the result of the trapping of heat by the greenhouse gases in the atmosphere.
 - It happens due to the increased amount of greenhouse gases brought by human activities.
 - It forms a blanket in the atmosphere wherein heat from the earth is trapped.
- Which statement is TRUE about El Niño and La Niña phenomena?
 - Both phenomena bring too much rainfall in the Philippines.
 - Both are naturally occurring phenomena that bring periodic changes in the surface of Pacific Ocean.
 - Both happens only on the eastern part of the Pacific Ocean affecting the nearby countries.
 - Both conditions bring too much drought and sometimes wildfires in the Philippines and parts of Australia.
- Which is the most drastic and alarming effect of global warming for a long period of time.
 - Climate change
 - Deforestation
 - Pollution
 - Wildfires



Additional Activities

WORD SEARCH! Find at least 10 words from the puzzle guided by the word list.

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

CARBON DIOXIDE
CLIMATE CHANGE
DROUGHT
EL NIÑO
FLOODING
FLUORINATED GAS
GLOBAL WARMING
GREENHOUSE GAS
INFRARED
LA NIÑA
METHANE
NITROUS OXIDE
RADIATED
RAINFALL
REFLECTED





Posttest

Read and understand each question and encircle the letter of the correct answer.

1. Which of the following greenhouse gases has the lowest percentage in the atmosphere?
A. carbon dioxide
B. fluorinated gases
C. methane
D. nitrous oxide
2. Which of the following is TRUE about La Niña?
A. It brings cold water in the Pacific Ocean.
B. It brings too much rainfall resulting to flooding in some areas.
C. It is the result of strong trade winds pushing warm water to Asia.
D. All of the above.
3. The following statements are true about greenhouse effect, **EXCEPT?**
A. It is a natural phenomenon that maintains the earth's temperature.
B. It is the natural way of warming the planet to help maintain all life forms.
C. It is aided by the greenhouse gases that trap heat (infrared) from the earth.
D. It is a condition wherein more heat is trapped in the atmosphere causing global warming.
4. Which of the following is one of the causes of global warming?
A. climate change
B. planting trees
C. pollution
D. rising temperature
5. Enhanced Greenhouse Effect is already happening in our planet. Which of the following is the main reason for its occurrence?
A. People are planting more trees to help revive the nature.
B. Greenhouse gases are always present in the atmosphere.
C. Excessive emission of greenhouse gases like CO₂ in the atmosphere.
D. Greenhouse effect is continuously happening that helps warm the planet.
6. When solar radiation enters the atmosphere, the earth's land and water surfaces heat up. What happens to the heat produced from the earth's surface as it rises in the atmosphere?
A. It is completely reflected to space.
B. Some are reflected to space and some are trapped by greenhouse gases.
C. It completely penetrates and passes through the earth's atmosphere.
D. It stays in the earth's surface making our planet very warm than usual.
7. It is a type of radiation that results from the heating up of the earth's surface.
A. infrared
B. gamma rays
C. solar radiation
D. ultraviolet



8. Which of the following human activities that would result to an increased amount of carbon dioxide in the atmosphere?
 - A. “kaingin system” or forest burning.
 - B. frequent using of cars and running of various factories.
 - C. burning of fossil fuels to sustain the use of electrical energy at home.
 - D. all of the choices

9. The following is TRUE about El Niño, **EXCEPT**:
 - A. It brings drought and very hot weather in the Philippines.
 - B. In simple terms, it is regarded as the warm phase in the Pacific Ocean.
 - C. It is a periodic change in the temperature on the surface of Pacific Ocean.
 - D. It is brought about by unusual strong trade winds the blows warmer air in the eastern part of the world.

10. Which statement is **TRUE** about global warming?
 - A. It is a natural process of warming the earth.
 - B. It is the result of heat (infrared radiation) that is trapped.
 - C. It is a phenomenon that helps maintain global temperature.
 - D. It is the result of enhanced greenhouse effect due to large amount of greenhouse gases concentrated in the atmosphere.



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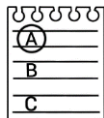
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Answer Key

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

Additional Activities:

Assessment:
1. A
2. A
3. A
4. A
5. D

(Follow Rubrics for Assessing the output)

What I Can Do:

What I have learned
a. 3
b. 4
c. 1
d. 2

GUIDE Q.
1. The two opposing climate system become more severe and intense due to global warming.

LA NINA
-heavy rainfall
-cool phase
-flooding
-alter the normal climate system
-changes in ocean temperature.

CAUSES	EFFECTS
Deforestation Energy use Rapid industrialization Pollution Transportation Consumer practices Agricultural practices	Unpredictable weather pattern Rising sea level climate change Land degradation extreme weather conditions Rising temperature

GUIDE Q.
1. Excessive emission of greenhouse gases
2. When greenhouse effect becomes enhanced due to human activities, it eventually results to global warming.

GUIDE Q.
1. Because it has the greatest number of man-made sources.
2. There is a possibility that global warming might not occur when humans don't exist at all because the main reason for an increased greenhouse gas emission is from man-made sources.
Act. 5.2
Answers may vary:
1. Solar energy enters the atmosphere.
2. Earth's surface heats up (infrared)
3. Some heat is reflected back to space.
4. Some heat is trapped by the greenhouse gases.
5. Greenhouse gases absorb and re-radiated the heat to warm the earth.

Carbon dioxide	Nitrous oxide
-burning of fuel -use of car -factories -killing system	-part of nitrogen cycle -fertilizers used in agriculture
Methane	Fluorinated gases
-sewage system -decaying organisms -garbage and landfill -raising livestock -leaks from natural gas	-refrigeration -air-conditioning -use of aerosols Gas leakage during manufacturing

What's In
TOPOGRAPHY
OCEAN CURRENT
LATTITUDE
ALTITUDE
What's New
Greenhouse gas
Greenhouse effect
Climate change
El Niño
La Niña
Global warming
What's More
Act. 5.1



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