

Senior High School

Department of Education
National Capital Region

**SCHOOLS DIVISION OFFICE
MARIKINA CITY**

Earth & Life Science

First Quarter-Module 1

Uniqueness of Earth

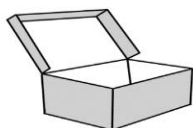


Evangeline C. Agtarap



City of Good Character
DISCIPLINE • GOOD TASTE • EXCELLENCE

Government Property
NOT FOR SALE



What I Need to Know

This module was designed and written with you in mind. It is here to help you understand what makes our planet Earth unique from all the other planets. This module permits it to be used in many different learning situations.

The module has one lesson which is **Uniqueness of Earth**.

At the end of the module, you are expected to:

1. describe the characteristics that make Earth unique;
2. explain how these characteristics enable Earth to support life; and
3. recognize the uniqueness of Earth, being the only planet in the solar system with properties necessary to support life (S11/12ES-Ia-e-3).



What I Know

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

1. Which of the following is **NOT** a type of life forms on Earth?
A. Archaea
B. Asteroids
C. Bacteria
D. Plants
2. How does the presence of the ozone layer contribute to make Earth habitable?
A. It makes the water cycle possible.
B. It allows for the recycling of nutrients.
C. It protects Earth from its internal heat.
D. It protects the planet from ultraviolet rays from the sun.
3. How does the magnetic field of Earth enable life to thrive in it?
A. by allowing nutrients to be recycled
B. by producing Carbon Dioxide and Oxygen
C. by protecting it from solar winds of the sun
D. by providing the right temperature for liquid water to exist
4. Which of the following element or compound is the **least** important to life?
A. Carbon dioxide
B. Mercury
C. Oxygen
D. Water



5. How do plate tectonics enable Earth to support life?
 - A. It protects Earth from solar flares.
 - B. It helps regulate Earth's temperature.
 - C. It prevents the burning of Earth's surface.
 - D. It protects Earth from meteoroids and asteroids.

6. How does the distance of the planet from the sun affect its ability to support life?
 - A. Planets that are too near to the sun have conditions conducive for life.
 - B. Planets that are too far from the sun have conditions conducive for life.
 - C. A planet should neither be too far, nor too near the sun to be able to support life.
 - D. There is no relationship between a planet's distance from the sun and its ability to support life.

7. Why is the presence of water on Earth so important to life?
 - I. It flows in a natural cycle.
 - II. It is very minimal on Earth's surface.
 - III. Many organisms depend on water for survival.
 - IV. Earth is the only known planet with water in it.
 - A. I and II
 - B. III and IV
 - C. I, II, and III
 - D. I, III, and IV

8. Why is Earth unique?
 - I. Earth is not located in the habitable zone.
 - II. There are different types of organisms on Earth.
 - III. Earth is the only known planet where life forms exist.
 - IV. The Earth's atmosphere is very conducive to life's existence.
 - A. I and II
 - B. III and IV
 - C. I, II, and III
 - D. II, III, and IV

9. How does Earth compare with the other planets in the solar system?
 - I. It is protected by its ozone layer.
 - II. It is not too close or too far from the sun.
 - III. It has a strong magnetic field that protects it from solar flares.
 - IV. It has Oxygen and Carbon Dioxide which are not essential to life.
 - A. I and II
 - B. III and IV
 - C. I, II, and III
 - D. II, III, and IV

10. How does the location of a planet in the solar system affect its characteristics?
 - I. The nearer the planet to the sun, the hotter it is.
 - II. The nearer the planet to the sun, the colder it is.



- III. The nearer the planet to the sun, the smaller it is.
 IV. The distance from the sun determines whether liquid water can exist.
- A. I and III
 B. II and III
 C. II and IV
 D. I and IV
11. Why is Earth's atmosphere unique?
- I. It protects it from the impact of celestial objects.
 II. It shields it from harmful radiation from the sun.
 III. Earth's mass and size give it a thin atmosphere.
 IV. It has the right kind and proportion of gases needed by living things.
- A. I and II
 B. III and IV
 C. I, II, and III
 D. I, II, and IV
12. Suppose someone asks you how Earth can support life, what will be your answer?
- I. It has liquid water that is renewable.
 II. Its temperature is very conducive for life.
 III. Its atmosphere is just like the other planets.
 IV. Its magnetic field protects it from solar flares.
- A. I and II
 B. II and III
 C. I, II, and III
 D. I, II, and IV
13. Suppose Earth **DOES NOT** have an atmosphere like the one Earth has now, which of the following scenarios would happen?
- I. Vegetation and organisms would survive.
 II. The earth's temperature would be conducive for life.
 III. The Earth's surface would burn from sun's radiation.
 IV. We will be experiencing the impact of meteoroids and asteroids.
- A. I and II
 B. III and IV
 C. I, II, and III
 D. I, II, III and IV
14. How will the habitable zone be affected if the sun grows bigger and hotter?
- A. The habitable zone would be nearer the sun then be farther from it.
 B. The habitable zone would be farther from the sun.
 C. The habitable zone would not be affected at all.
 D. The habitable zone would be nearer the sun.
15. How will Earth's characteristics change if it moved farther from the sun?
- A. It would be much colder.
 B. It would be much hotter.
 C. It would have water in abundance.
 D. It would have properties conducive to life.



Lesson

Uniqueness of Earth



What's In

Activity 1. Planets Word Search Puzzle

In your previous science classes, you have learned that our planet Earth belongs to the solar system: a group of planets and other celestial objects that revolve around the sun. You learned how the planets are positioned according to how far they are from the sun. In the word search puzzle below are the names of the planets. Find them all and arrange your answers from the nearest to the farthest planet from the sun.



The planets in the solar system (from the nearest to the farthest from the sun) are: _____, _____, _____, _____, _____, _____, and _____.



? What's New

What makes life on Earth possible?

Activity 2. Comparing Venus, Earth, and Mars

Below is a list of some information about the three planets Mercury, Venus, and Earth. Examine the information provided in the table below and answer the questions that follow.

(Note: 0.8 M_{Earth} means that the planet has a mass that is 80% the mass of Earth.)

Table 1. Venus, Earth, and Mars' Fact Sheet

Characteristic	Venus	Earth	Mars
Planet Mass (M _{Earth}):	0.8 M _{Earth}	1 M _{Earth}	0.1 M _{Earth}
Planet Radius (R _{Earth}):	0.95 R _{Earth}	1 R _{Earth}	0.5 R _{Earth}
Distance from Sun (D _{Earth}):	0.7 D _{Earth}	1 D _{Earth}	1.5 D _{Earth}
Average Surface Temperature:	464 °C	15 °C	-65 °C
Atmosphere:	Thick	Medium	Thin

- How will you compare the three planets? Fill in the gaps.
 - (mass) The heaviest planet is _____ followed by _____ and the lightest is _____.
 - (radius). The biggest planet is _____ followed by _____ and the smallest is _____.
 - (distance from the sun) The planet closest to the sun is _____, followed by _____ and the planet farthest from the sun is _____.
 - (average surface temperature) The planet with a very hot temperature is _____ and the planet with very cold temperature is _____. The planet with temperature not too hot or too cold is _____.
 - (atmosphere) The planet with a thick atmosphere is _____ and the planet with a thin atmosphere is _____. The planet with an atmosphere not too thick or thin is _____.
- Based on the information listed on the table, what characteristics do you think allow life to flourish on Earth but not on Venus or Mars? Explain your answer.





What Is It

The Uniqueness of Earth

Earth, where we live, is the only planet we know where life exists. Scientists are always on the lookout for planets with characteristics that could possibly support life like Earth. Earth has unique characteristics. These are atmosphere, water, location in the solar system, plate tectonics, magnetism, and life forms.

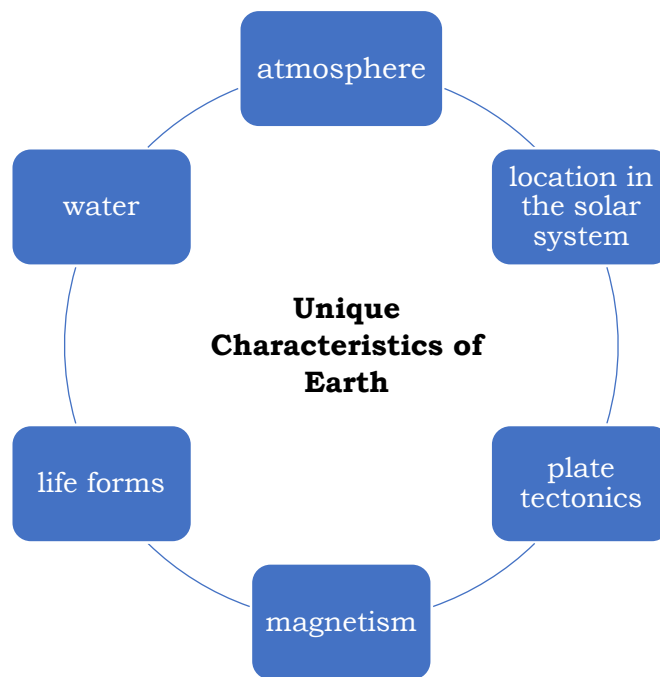


Figure 1. Unique Characteristics of Earth

Earth is unique because of its **atmosphere**. It is the only planet with enough oxygen and carbon dioxide needed by plants, animals, and other living things. Also, Earth's atmosphere has a protective layer called the ozone layer. This layer protects the planet from harmful ultraviolet radiation from the sun. In addition, Earth's atmosphere protects it from the impact of meteoroids and asteroids.



Figure 2. Earth's Atmosphere

Sources: (From left to right)

- (1) "Sunset". Wikipedia. Accessed August 7, 2020. https://en.wikipedia.org/wiki/File:Sunset_2007-1.jpg
- (2) "Diagram Earth-Sun". Pixabay. Accessed August 7, 2020. <https://pixabay.com/vectors/diagram-earth-sun-atmosphere-layer-29982/>

Another unique thing about Earth is the presence of **water**. Water is essential to life. We all need water for survival. Water is present in solid, liquid, and gaseous phases and flows in a natural cycle called the water cycle. This cycle allows water to be used again and again.

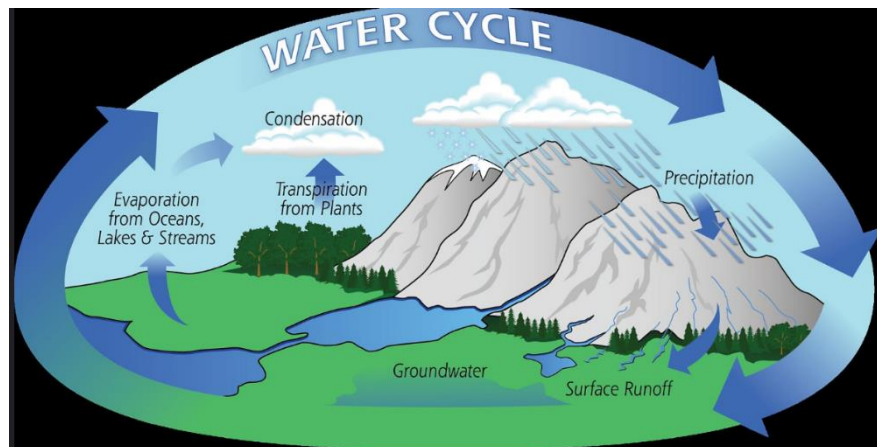


Figure 3. Water Cycle

Source: "Water Cycle". Flickr. Accessed August 7, 2020. <https://www.flickr.com/photos/atmospheric-infrared-sounder/8265046380>

The **location** of Earth is also unique. It is in the so-called **habitable zone**. The habitable zone is defined as the distance from a central star where liquid water can exist on the planet's surface. Because of Earth's location in the solar system, its physical characteristics make it conducive to life. Earth's temperature is not so high or so low for organisms to thrive. Also, at this temperature, liquid water can exist in abundance.

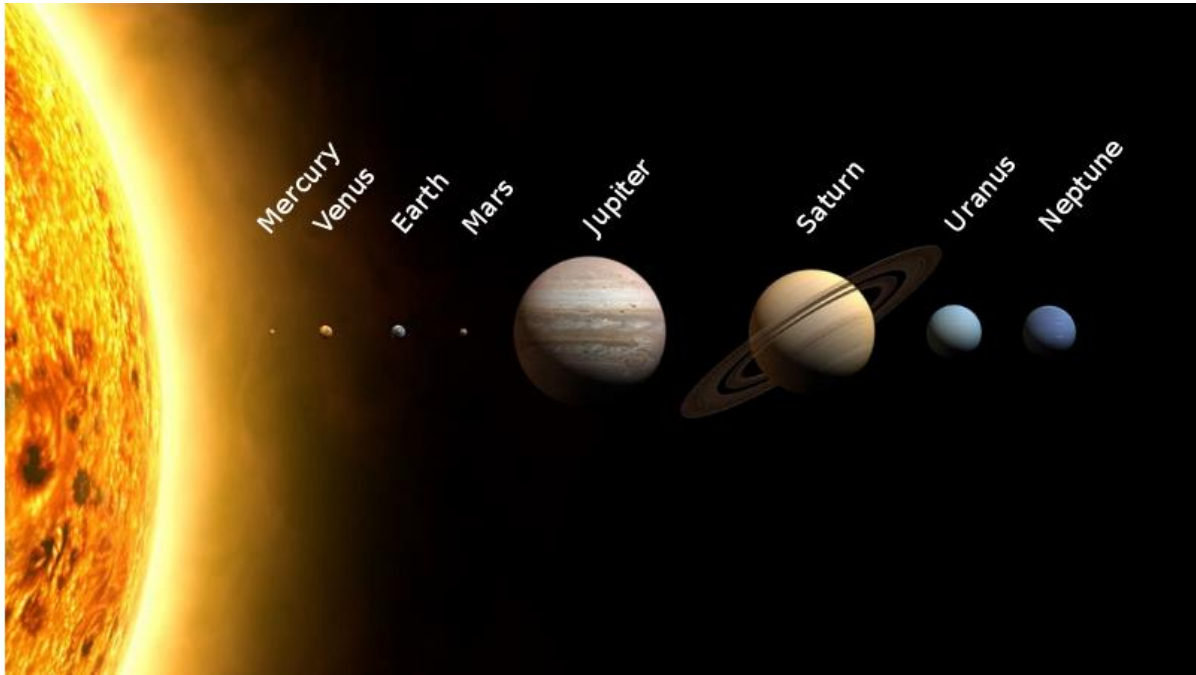


Figure 4. Solar System

Source: "Planets". Wikimedia Commons. Accessed August 7, 2020.
<https://commons.wikimedia.org/wiki/File:Planets2013.svg>

Another unique characteristic of Earth is its **plate tectonics**. Recall that plate tectonics is what allows the formation of landforms like mountains and volcanoes. Scientists believe that the constant movement of plates is important in helping to maintain the planet's temperature.

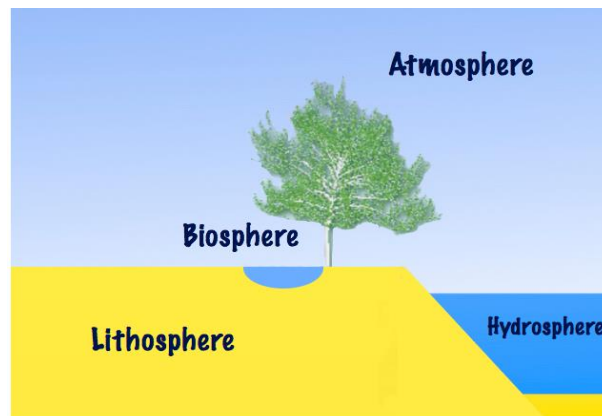


Figure 5. Lithosphere

Source: "Atmosphere-Biosphere-Hydrosphere-Lithosphere". Wikimedia Commons. Accessed August 7, 2020. <https://commons.wikimedia.org/wiki/File:Atmosphere-Biosphere-Hydrosphere-Lithosphere.png>

The Earth's **magnetic field** is also unique. Scientists believe that due to the Earth's strong magnetic field, it can protect the planet from solar winds. Without

the magnetic field, solar winds could possibly break the ozone layer and scorch Earth.

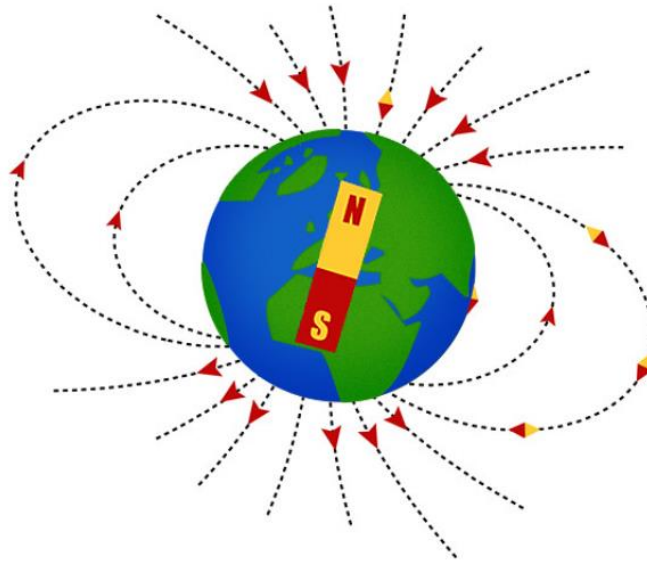


Figure 6. Earth's Magnetic Field

Source: "Earth's Magnetic Field". Flickr. Accessed August 7, 2020. <https://www.flickr.com/photos/102642344@N02/9859928405>

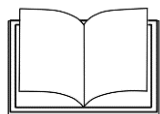
Of all the characteristics we have mentioned, probably the most unique feature of Earth is its **life forms**. Earth has a variety of life forms. Scientists categorize Earth's life forms into six types: bacteria, archaea, fungi, protists, plants, and animals. Truly, there is no other planet like Earth. We should be good stewards of our home planet.



Figure 8: Earth's Life Forms

Sources: (From left to right)

- (1) "Flowers Photography: Cebu 2014." Flickr. Accessed August 7, 2020. <https://www.flickr.com/photos/xavieryuncs/14932142849/>
- (2) "Philippines Dolphin". Pikist.com. Accessed August 7, 2020. <https://www.pikist.com/free-photo-vpcjq>
- (3) "Philippine Tarsier". Flickr. Accessed August 7, 2020. <https://www.flickr.com/photos/rayinmanila/25685444152>
- (4) "The Philippine Eagle". Flickr. Accessed August 7, 2020. <https://www.flickr.com/photos/shankaronline/9103402533>



What's More

Activity 3. Defining the Habitable Zone

The habitable zone is defined as "the area around a star where liquid water can exist". For a star the size of the sun, the habitable zone has been identified as between 0.95 AU and 1.67 AU or Astronomical Unit. The AU or Astronomical Unit is the average distance between Earth and the sun, which is approximately 149,570,000 kilometers.

In this activity, you will construct a scale model of the solar system and mark the habitable zone. Study the table below.

Table 2: Planets' Distance to Sun

Planet Name	Distance to Sun in km	Distance to Sun in AU
Mercury	57,950,000	
Venus	108,110,000	
Earth	149,570,000	
Mars	227,840,000	
Jupiter	778,140,000	
Saturn	1,427,000,000	
Uranus	2,870,300,000	
Neptune	4,499,900,000	

1. Convert the distances from km to AU for each of the planets in our solar system. Your answers should be up to one decimal place.
2. Construct a scale model of our solar system. Represent the sun with a large circle at one end of the model. Place smaller circles at the correctly scaled distances away from the sun to represent each of the eight planets.
3. Mark the habitable zone on your solar system scale model.





What I Have Learned

Activity 4. Characteristics of Earth

Summarize what you have learned by completing the sentences below.



Figure 9: Earth

Earth is unique because of _____.

The most unique characteristic of Earth is _____.



What I Can Do

Activity 5 Appreciating Our Planet

Considering your new knowledge, what are some ways you can show appreciation to and care for our habitable planet? You can choose to do either an essay or a poem to answer this question. Your output should be written on a clean sheet of paper. Be guided by the following rubric:

Criteria	3 points	2 points	1 point	0 point
Content	Has these elements: easy to understand, expresses appreciation to our planet and identifies ways to care for it	Lacks two elements	Lacks one element	No elements present
Originality and Creativity	The work shows originality and creativity all the	The work shows originality and creativity most	The work shows originality	The work does not show



	time.	of the time.	and creativity sometimes.	originality and creativity.
Neatness	Incredibly neat, with no tears or smudges	Neat, with a few smudges or tears	With several smudges or tears	With many smudges or tears



Assessment

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

- How will Earth's characteristics change if it moved farther from the sun?
 - It would be much colder.
 - It would be much hotter.
 - It would have water in abundance.
 - It would have properties conducive to life.
- How will the habitable zone be affected if the sun grows bigger and hotter?
 - It will be nearer the sun then be farther from it.
 - It would be farther from the sun.
 - It would not be affected at all.
 - It would be nearer the sun.
- Suppose Earth does **NOT** have an atmosphere like the one it has now. Which of the following scenario do we expect to happen?
 - Vegetation and organisms would survive.
 - The earth's temperature would be stable.
 - The Earth's surface would burn from sun's radiation.
 - We will be experiencing the impact of meteoroids and asteroids.
 - I and II
 - III and IV
 - I, II, and III
 - I, II, III and IV

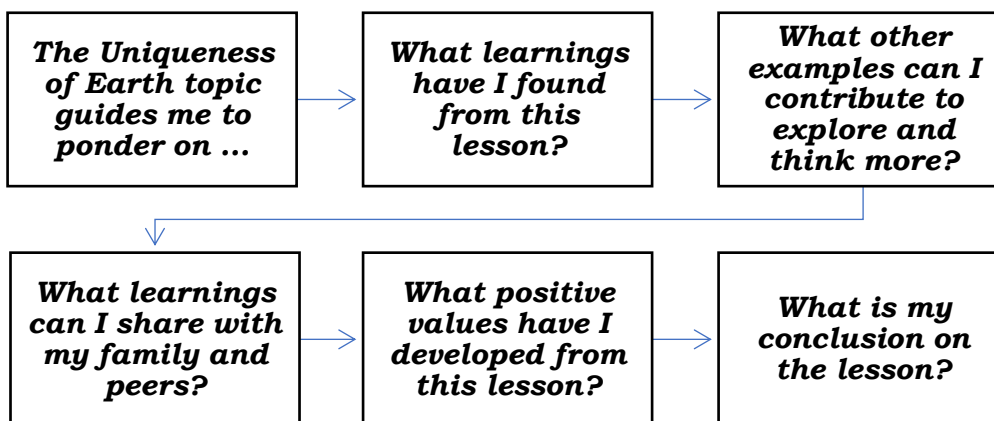


14. How does the presence of the ozone layer contribute to make Earth habitable?
- It makes the water cycle possible.
 - It allows for the recycling of nutrients.
 - It protects Earth from the Earth's internal heat.
 - It protects the planet from ultraviolet rays from the sun.
15. Which of the following is **NOT** a type of life forms on Earth?
- Archaea
 - Asteroids
 - Bacteria
 - Plants



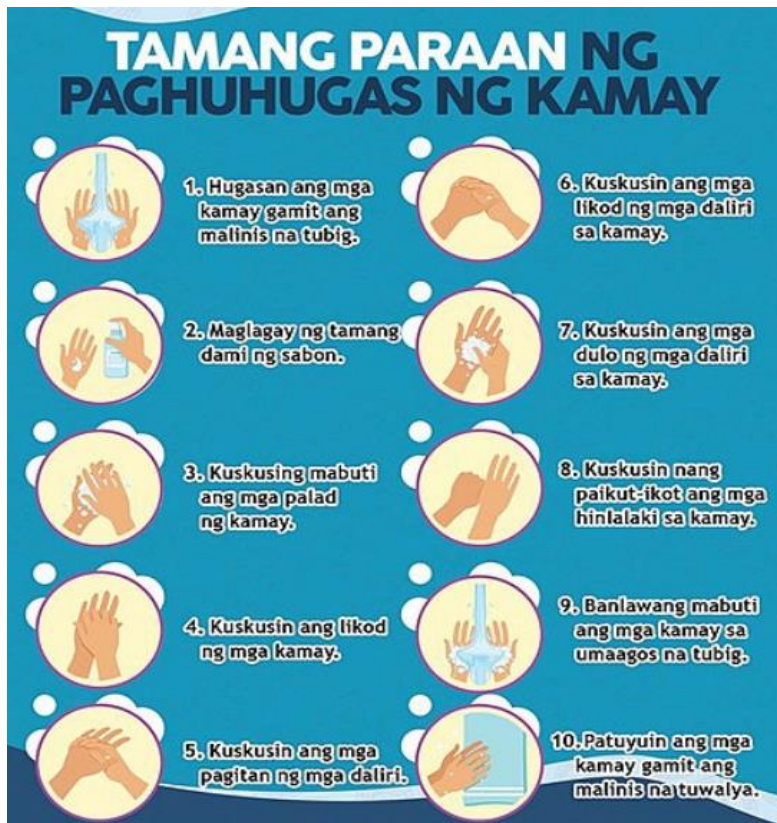
Additional Activities

I. Write your reflection on the Uniqueness of Earth by answering the questions inside the box. Express your critical and creative thinking skills in your answers. Have fun and enjoy!



II. Suppose you are a historian and you are tasked to educate the future generation about Earth. Your task is to make an infographic about the characteristics that make Earth unique. You want them to appreciate and take care of the planet because it is the only habitable planet we know. The picture on the following page shows an example of an infographic:





Source: "Paghuhugas ng Kamay". Wikimedia Commons. Accessed August 7, 2020.
https://commons.wikimedia.org/wiki/File:Paghuhugas_ng_kamay.jpg

It will be evaluated based on the following criteria:

Criterion	3 points	2 points	1 point	0 point
Content	Accurate information on three characteristics that make Earth unique	accurate information on two characteristics that make Earth unique	accurate information on one characteristic that make Earth unique	No information presented
Visual Appeal	Has all these elements: 1. The use of color, design, and space makes the infographic pleasing. 2. shows originality and 3. shows creativity.	has two of the required elements.	has one of the required elements.	Does not have any of the required elements.
Neatness	Incredibly neat, with no tears or smudges	Neat, with a few smudges or tears	With several smudges or tears	With many smudges or tears



References

- (1) "Conditions That Support Life." Learn Genetics. Accessed July 9, 2020. <https://learn.genetics.utah.edu/content/astrobiology/conditions/>.
- (2) "Earth is a Habitable Planet." Unit Collection. Last modified July 4, 2020. https://serc.carleton.edu/dig_blueprints/units/habitable.html.
- (3) "Earth's Magnetic Field." Flickr. Accessed July 20, 2020. <https://www.flickr.com/photos/102642344@N02/9859928405>.
- (4) "FRONTLEARNERS" FrontLearners E-Learning. Accessed July 9, 2020. https://frontlearners.com/blended/pluginfile.php/6013/mod_resource/co m
- (5) "Habitable Zone - Activity Page Three." Accessed July 9, 2020. <https://btc.montana.edu/ceres/html/Habitat/habitableactivity3.htm>.
- (6) "Habitable Zone - Activity Page Two." Accessed July 9, 2020. <https://btc.montana.edu/ceres/html/Habitat/habitableactivity2.htm>.
- (7) "Infographic." Oxford Learner's Dictionaries | Find Definitions, Translations, and Grammar Explanations at Oxford Learner's Dictionaries. Accessed July 9, 2020. <https://www.oxfordlearnersdictionaries.com/us/definition/english/infographic?q=infographic>.
- (8) "Interaction Between Magnetic Fields of Earth and Sun Observed." Editage Insights. Last modified November 30, 2019. <https://www.editage.com/insights/interaction-between-magnetic-fields-of-earth-and-sun-observed>. "Interstellar Real Estate - Defining the Habitable Zone." Accessed July 9, 2020. <https://btc.montana.edu/ceres/html/Habitat/habitablezone.htm>.
- (9) "New Insight into How Sun's Powerful Magnetic Field Affects Earth." The Week. Last modified April 1, 2019. <https://www.theweek.in/news/sci-tech/2019/04/01/New-insight-into-how-Suns-powerful-magnetic-field-effects-Earth.html>.
- (10) "Our Living Planet Shapes the Search for Life Beyond Earth." NASA. Last modified November 15, 2017. <https://www.nasa.gov/feature/jpl/our-living-planet-shapes-the-search-for-life-beyond-earth/>.
- (11) "Philippine Tarsier." Flickr. Accessed July 20, 2020. <https://www.flickr.com/photos/rayinmanila/25685444152> "Philippines, Dolphin, Nature, Ocean, Wildlife, Mammal, Animal, Marine, Water, Sea,



- Tropical." Pikist - Royalty Free Photos for Designers. Accessed July 20, 2020. <https://www.pikist.com/free-photo-vpcjg>.
- (12) "Planetary Fact Sheet - Ratio to Earth." Welcome to the NSSDCA. Last modified October 21, 2019. https://nssdc.gsfc.nasa.gov/planetary/factsheet/planet_table_ratio.html.
- (13) "Planetary Fact Sheet." Welcome to the NSSDCA. Last modified October 21, 2019. <https://nssdc.gsfc.nasa.gov/planetary/factsheet>.
- (14) "Thank Earth's Magnetic Field for Water That Gives You Life." ANU. Last modified June 13, 2019. <https://www.anu.edu.au/news/all-news/thank-earth%E2%80%99s-magnetic-field-for-water-that-gives-you-life>.
- (15) "The Philippine Eagle." Flickr. Accessed July 20, 2020. <https://www.flickr.com/photos/shankaronline/9103402533>.
- (16) "Water Cycle." Flickr. Accessed July 9, 2020. <https://www.flickr.com/photos/atmospheric-infrared-sounder/8265046380>.
- (17) "What is the Habitable Zone or "Goldilocks Zone"? – Exoplanet Exploration: Planets Beyond Our Solar System." Exoplanet Exploration: Planets Beyond Our Solar System. Accessed July 9, 2020. <https://exoplanets.nasa.gov/faq/15/what-is-the-habitable-zone-or-goldilocks-zone/>.
- (18) "What Is the Habitable Zone?" The Planetary Society. Last modified March 2, 2020. <https://www.planetary.org/articles/what-is-the-habitable-zone>.
- (19) "Why is the Earth Habitable? | AMNH." American Museum of Natural History. Accessed July 9, 2020. <https://www.amnh.org/exhibitions/permanent/planet-earth/why-is-the-earth-habitable>.
- (20) Commission on Higher Education. "Teaching Guide for Earth and Life Science". 2016
- (21) Hall, Shannon. "Earth's Tectonic Activity May Be Crucial for Life--and Rare in Our Galaxy." Scientific American. Last modified July 20, 2017. <https://www.scientificamerican.com/article/earths-tectonic-activity-may-be-crucial-for-life-and-rare-in-our-galaxy/>.
- (22) Moskowitz, Clara. "'Habitable Zone' for Alien Planets, and Possibly Life, Redefined." Space.com. Last modified January 29, 2013. <https://www.space.com/19522-alien-planet-habitable-zone-definition.html>.
- (23) Shaftel, Holly. "10 Things: Planetary Atmospheres – NASA Solar System Exploration." NASA Solar System Exploration. Accessed August 3, 2020. <https://solarsystem.nasa.gov/news/436/10-things-planetary-atmospheres/>
- (24) Science and Technology Academic and Research-Based Openly Operated KioskS. Accessed August 11, 2020. <https://www.starbooks.ph>

Development Team of the Module

Writer: Evangeline C. Agtarap (THS)

Editors: Reynald Alfred A. Recede (MHS)
Russel S. Berador (SEHS)
Maria Carmina R. Martin (MHS)
Emily G. Santos (PSDS)
Marites R. Del Valle (CISSL)
Jessica S. Mateo (EPS – Science)

Illustrator: Christine Ann G. Faraon (BNHS)

Layout Artists: Ed-Angelo P. Tan (SEHS)
Jemwel Dela Paz (CISSL)

Management Team:

Sheryll T. Gayola

Assistant Schools Division Superintendent
OIC, Office of the Schools Division Superintendent

Elisa O. Cerveza

Chief, Curriculum Implementation Division
OIC, Office of the Assistant Schools Division Superintendent

Jessica S. Mateo

Education Program Supervisor – Science

Ivy Coney A. Gamatero

Education Program Supervisor – Learning Resource Management Section

For inquiries or feedback, please write or call:

Schools Division Office – Marikina City
191 Shoe Ave., Sta. Elena, Marikina City, 1800, Philippines
Telefax: (02) 8682-2472 / 8682-3989
Email Address: sdo.marikina@deped.gov.ph



City of Good Character
DISCIPLINE • GOOD TASTE • EXCELLENCE