Senior High School

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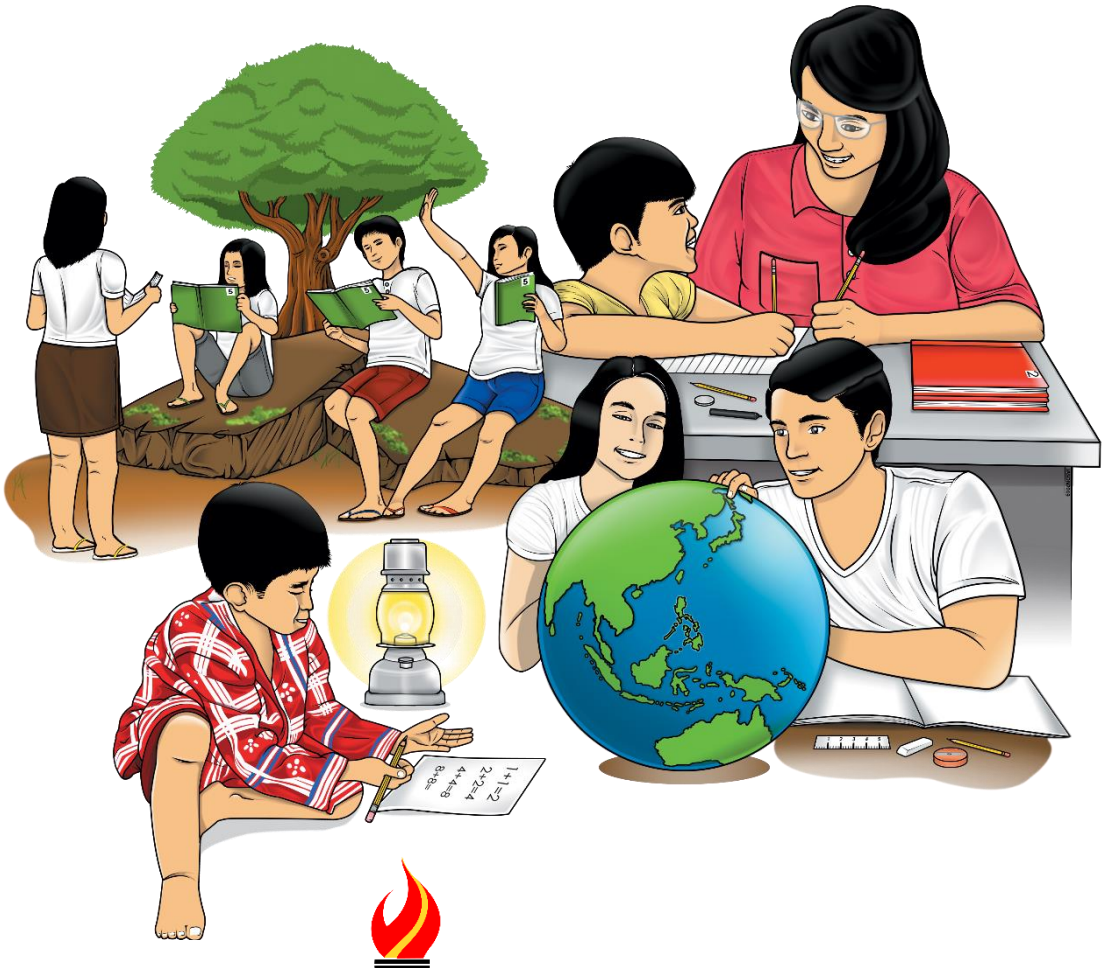
DEPARTMENT OF EDUCATION

Earth and Life Science

Quarter 1 – Module 1: Origin and Structure of the Earth (Planet Earth)



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Secretary: Leonor Magtolis Briones
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Development Team of the Module

Writer: Rochelle M. Mercado

Editors: Melanie I. Samudio
Jocelyn M. Manset

Reviewer: Jason Ricaforte, Angelica Beriña, Princess Paolah L. De Guzman, Marissa C. Betchaida, Louie L. Alvarez, Gregorio M. De Chavez, Jr., Jocelyn M. Manset, Mario B. Maramot, Elaine T. Balaogan, Job S. Zape Jr., Leah C. Villegas, Waylie Niña D. De Claro

Illustrator: Ednelinda Robles, Lovely Joy La Rosa, Charles Erick A. Jusay, Sandro Carlo B. Tablizo

Layout Artist: Elizalde L. Piol, Anselma M. Ebero
Jocelyn M. Manset

Management Team: Francis Cesar B. Bringas
Job S. Zape Jr.
Eugenio S. Adrao
Elaine T. Balaogan
Merthel M. Evardome
Nadine C. Celindro
Nicolas M. Burgos
Mario B. Maramot
Fe M. Ong-ongowan
Rosalinda A. Mendoza

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Department of Education – Region IV-A CALABARZON

Office Address: Gate 2 Karangalan Village, Barangay San Isidro
Cainta, Rizal 1800
Telefax: 02-8682-5773/8684-4914/8647-7487
E-mail Address: region4a@deped.gov.ph

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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

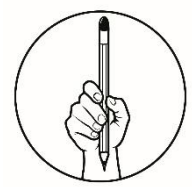
This module was designed and written with you in mind. It is here to help you master the nature of Earth and Life Science. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged 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.

The module focuses on the lesson:

- Lesson 1 – Planet Earth

After going through this module, you are expected to:

1. identify the characteristics of the Earth that supports life; and
2. expound how the characteristics of the Earth sustain the needs of a living organism.



What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Why is Earth called “the living planet?”
    A. It sustains life.
    B. It has atmosphere.
    C. It has water at the surface.
    D. All of the above
2. Which among the set of planets are called terrestrial?
    A. Jupiter, Neptune, Uranus
    B. Mercury, Venus, Mars, Earth
    C. Earth, Venus, Mars, Jupiter
    D. Jupiter, Saturn, Uranus, Neptune
3. What makes the planet Earth habitable compared to other planets?
    A. It has soil.
    B. It has trees.
    C. It has people.
    D. It has liquid water.
4. What makes planet Earth habitable?
    A. It has comfortable distance from the sun.
    B. It has atmosphere that protects from radiation.
    C. The atmosphere holds carbon dioxide and other gases.
    D. All of the above
5. Why is Earth called a terrestrial planet?
    A. It has life.
    B. It is closest to the sun.
    C. It is farther from the sun.
    D. It is placed at almost the middle planets.
6. Which of the following best describes the surface of the planet Earth?
    A. a thick layer of hydrogen gas
    B. cloudy and hot with lots of volcano
    C. cold, rocky, and covered with red dust
    D. mostly water surface with some areas of land
7. Earth is said to be a unique planet. Which answer verifies the statement?
    A. It supports life.
    B. It is mostly covered in water.
    C. Its atmosphere is mostly nitrogen and oxygen.
    D. All of the above
8. Which is supported and sustained by planet?
    A. life
    B. a moon
    C. a rocky core
    D. an atmosphere

9. How many percent of water comprises the Earth?
    A. 15%
    B. 30%
    C. 50%
    D. 70%
10. Which factors are needed for organisms to live on Earth?
    A. temperature and nutrient
    B. atmosphere and energy
    C. only A
    D. both A and B
11. What characteristics does the Earth have to maintain an organism's body to survive?
    A. Earth has a water cycle and atmosphere.
    B. Earth has volcanic activities to circulate nutrients.
    C. Earth has sub-surface water or molten rock that can circulate and replenish nutrients for organisms.
    D. All of the above
12. What makes Earth similar to Venus?
    A. Earth and Venus are the right sizes to hold a sufficient atmosphere.
    B. Venus' atmosphere is 100 times thicker than Earth.
    C. Among all the solid planets and moons, only Earth, Venus, and Titan have significant atmospheres.
    D. Both A and C
13. Which statement about the Earth's energy in sustaining life is incorrect?
    A. Earth survives in too little energy.
    B. Earth is in the right distance from the sun
    C. Earth is kept warm by an insulating atmosphere.
    D. Earth has magnetic field to protect from solar radiation.
14. Which distinct characteristic made Earth different from any other planet?
    A. It is the only rocky planet.
    B. It is the only planet that turns around in space.
    C. It is the only planet that has a large amount of liquid water.
    D. It is the only planet that changes its structure.
15. What does Earth offer to human in order to sustain life?
    A. Earth has abundant plant life.
    B. Earth has sufficient nutrients from ocean to land.
    C. Only A
    D. Both A and B.

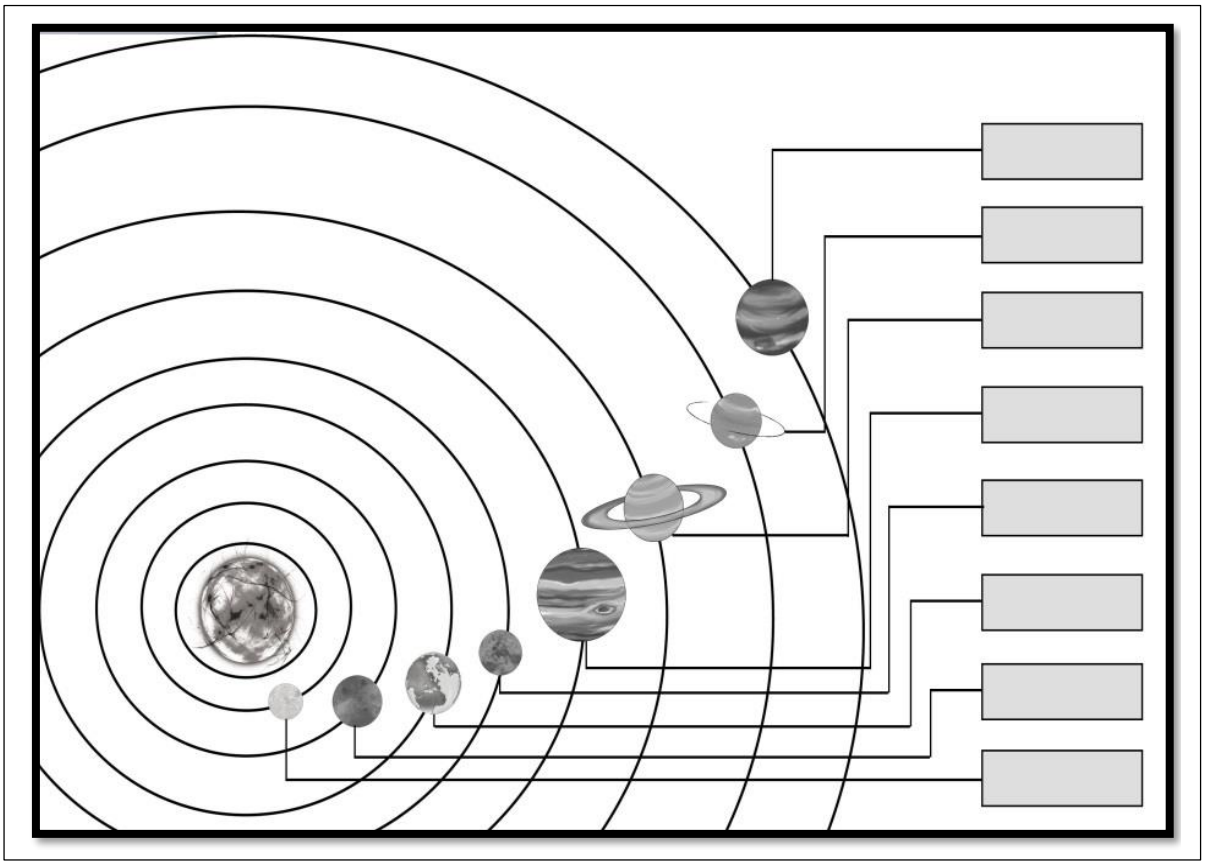
Lesson 1 Origin and Structure of the Earth- Planet Earth

Earth is the only planet in the solar system known to harbour life. Our planet has a molten nickel-iron core which gave rise to an extensive magnetic field, which, along with the atmosphere, shields us from harmful radiation coming from the Sun. In this module, you will understand why this planet is called the "living planet."

What's In

Just a part of the vast universe is the solar system. From the previous concepts learned, identify the planets in the solar system in the given illustration.

Question: What do you think are the characteristics of the planet Earth that make it different from all the other planets?



What's New

Earth: A Habitable Planet

Read the document carefully and answer the questions that follow

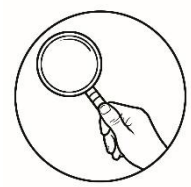
Table 1. Factors that make a planet habitable

Factors that make a Planet Habitable	Not Enough of the Factor	Just Right	Too Much of the Factor	Situation in the Solar System
Temperature influences how quickly atoms and molecules move.	Low temperatures cause chemicals to react slowly, which interferes with the reactions necessary for life. It can also cause the freezing of water, making liquid water unavailable.	Life seems to be limited to a temperature range of -15°C to 115°C. In this range, liquid water can still exist under certain conditions.	At about 125°C, protein and carbohydrate molecules, and the genetic material (e.g., DNA and RNA) start to break apart. Also, high temperatures cause the quick evaporation of water.	Surface: only the Earth's surface is in this temperature range. Sub-surface: the interior of the solid planets and moons may be in this temperature range.
Atmosphere	Small planets and moons have insufficient gravity to hold an atmosphere. The gas molecules escape to space, leaving the planet or moon without an insulating blanket or a protective shield.	Earth and Venus are the right size to hold a sufficient atmosphere. Earth's atmosphere is about 100 miles thick. It keeps the surface warm and protects it from radiation and small- to medium-sized meteorites.	Venus's atmosphere is 100 times thicker than Earth's. It is made almost entirely of greenhouse gasses, making the surface too hot for life. The four giant planets are completely made of gas.	Of the solid planets and moons, only Earth, Venus, and Titan have significant atmospheres. Mars' atmosphere is about 1/100th that of Earth's, too small for significant insulation or shielding.
Energy	When there is too little sunlight or too few of the chemicals that provide energy to cells, such as iron or sulfur, organisms die.	With a steady input of either light or chemical energy, cells can run the chemical reactions necessary for life.	Light energy is a problem if it makes a planet too hot or if there are too many harmful rays, such as ultraviolet. Too many energy-rich chemicals is not a problem	Surface: The inner planets get too much sunlight for life. The outer planets get too little. Sub-surface: Most solid planets and moons have energy-rich chemicals.
Nutrients used to build and maintain an organism's body.	Without chemicals to make proteins and carbohydrates, organisms cannot grow. Planets without systems to deliver nutrients to its organisms (e.g., a water cycle or volcanic activity) cannot support life. Also, when nutrients are spread so thin that they are hard to obtain, such as on a gas planet, life cannot exist.	All solid planets and moons have the same general chemical makeup, so nutrients are present. Those with a water cycle or volcanic activity can transport and replenish the chemicals required by living organisms.	Too many nutrients are not a problem. However, too active a circulation system, such as the constant volcanism on Jupiter's moon, Io, or the churning atmospheres of the gas planets, interferes with an organism's ability to get enough nutrients.	Surface: Earth has a water cycle, an atmosphere, and volcanoes to circulate nutrients. Venus, Titan, Io, and Mars have nutrients and ways to circulate them to organisms. Sub-surface: Any planet or moon with sub-surface water or molten rock can circulate and replenish nutrients for organisms

Factors that make a planet habitable. National Science Foundation, n,d.http://www.lpi.usara.edu/education/explore/our_place/hab_ref_table.pdf

Questions:

1. What are the factors that make the planet habitable?
2. What are the characteristics of planet Earth that makes it habitable?



What is It

Earth is the only place in the known universe confirmed to host life and is the only one known for sure to have liquid water in the surface. These are reasons why planet Earth is a unique one: (1) It has liquid water; (2) surface or lithosphere which includes the crust and the upper mantle; and (3) It has atmosphere that shelters it from the worst of the sun's rays.

Earth is the only planet in the solar system that has a large amount of liquid water. About 70% of the surface of the Earth is covered by liquid or frozen water. Because of this, Earth is sometimes called "blue planet." Planet Earth is habitable because it has the right distance from the sun. It is kept warm by an insulating atmosphere, and it has the right chemical ingredients for life including water and carbon. It can provide water, oxygen, useful biological products for human, and has suitable weather and climate.

Earth, Venus, and Mars may have similarities: (1) They all are terrestrial planets, made of solid rocks and silicates; (2) They all have an atmosphere; (3) They all almost have the same time to rotate on their axes; (4) Earth and Mars both have water; (5) They all have carbon dioxide; and (6 All have landforms. Earth, Venus, and Mars have differences: (1) Venus has no water; (2) Venus and Mars don't have oxygen; and (3) Earth has life forms.

What's More

Activity 1.1 Understanding Planet Earth

Compare and Contrast

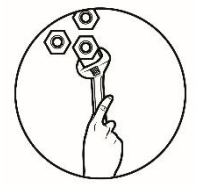
How is planet Earth similar and different from Venus and Mars? Provide possible explanations for your observations using the information in the table.

	VENUS	**EARTH**	**MARS**
Mass (1024kg)	4.87	5.97	0.642
Diameter (km)	12,104	12,756	6792
Density (kg/m3)	5243	5514	3933
Gravity (m/s2)	8.9	9.8	3.7
Escape Velocity (km/s)	10.4	11.2	5
Surface pressure (bars)	92	1	0.01
Composition of atmosphere	96% CO2, 3.5% N	77%N, 21% O2, 1%Ar	95%CO2, 2.7%N, 1.6%Ar
Major Greenhouse Gases(GHG)	CO2	CO2 H2O	CO2
Mean Temperature (0C)	464	15	-65
Temperature if no greenhouse gases are present	-46	-18	-57
Changes in Temperature (0C) due to greenhouse gases	+523	+33	+10
Distance from the Sun (106km)	108.2	149.6	227.9
Orbital Period (days)	224.7	365.2	687
Orbital Velocity (km/s)	35	29.8	24.1
Length of day (hours)	2802	24	24.7
Global Magnetic Field	No	Yes	No

Comparison of the features of Venus, Earth, and Mars
(National Aeronautics and Space Administration, 2015)

What I Have Learned

1. Planet Earth is considered habitable because of the following reasons: (1) it has the right distance from the sun; (2) it is protected from harmful solar radiation by its magnetic field; (3) it is kept warm by an insulating atmosphere; and (4) it has the right amount of ingredients for life, including water and carbon.
2. Earth is different from other planets in a way that it is the only planet with liquid water on the surface.
   a. Earth, Venus, and Mars may have similarities: (1) They all are terrestrial planets, made of solid rocks and silicates; (2) They all have an atmosphere; (3) They all almost have the same time to rotate on their axes; (4) Earth and Mars both have water; (5) They all have carbon dioxide; and (6) All have landforms.
   a. Earth, Venus, and Mars have differences: (1) Venus has no water; (2)Venus and Mars don't have oxygen; and (3) Earth has life forms.



What I Can Do

"Terraforming Mars"

Can man change or adjust Mars' environment to make it more suitable for human habitation? How?

List down your answer on the table.

1	
2	
3	
4	
5	

Assessment

Multiple Choice. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

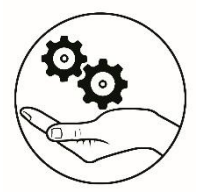
1. What makes planet Earth different from the other planets in the solar system?
   A. It supports life.
   B. It is mostly covered in water.
   C. The atmosphere holds gases.
   D. All of the above
2. Which statement does not describe planet Earth?
   A. It has 70% water
   B. It is rocky, terrestrial planet.
   C. It has solid and active surface
   D. It has atmosphere made of nitrogen alone.
3. What makes planet Earth a "house" for living organisms?
   A. It has comfortable distance from the sun.
   B. The atmosphere serves as shields from the sun.
   C. Only A
   D. Both A and B
4. Which is not true about Earth when compared to Mars?
   A. It has life mechanism.
   B. It has water and atmosphere.
   C. It has carbon dioxide in the atmosphere.
   D. It has atmosphere that supports oxygen.
5. What benefits dose the Earth's atmosphere gives to endure life on Earth?
   I. The atmosphere nourishes life on Earth
   II.The atmosphere protects Earth from meteorites.
   III.The atmosphere gases blocks damaging ultraviolet light
   IV.The atmosphere reduce temperature extremes between day and night
   A. I onlyI
   B. I, II
   C. I, II, III
   D. I, II, III, IV
6. Planet Earth is considered as "blue planet." Which of the following best describes the surface of planet Earth?
   A. Earth has atmosphere.
   B. Earth has lots of volcano.
   C. Earth is covered with red dust.
   D. Earth has mostly water on the surface.
7. For many, Earth is different from other planets. Why do you think so?
   A. Earth is mostly covered in water.
   B. Earth has comfortable distance from the sun.
   C. Earth has carbon dioxide on its atmosphere.
   D. It has approximately same size as that of Venus.

8. Which statements best define planet Earth?
    A. It has gases.
    B. It supports life.
    C. It has rocky core.
    D. It supports other planet.
9. It was found out that Earth's surface is covered with water. Approximately, how many percent of water comprises the Earth?
    A. 45% water
    B. 50% water
    C. 60% water
    D. 70% water
10. Earth can support the survival of organisms. What is/are the factor/s that make/s Earth habitable?

    I. atmosphere
    II. energy
    III. temperature
    IV. nutrient

    A. I
    B. I, II
    C. I, II, III
    D. I, II, III, IV
11. In order for an organism to survive, nutrients are needed. What are the nutrients that planet Earth can offer for an organism to exist?
    A. Earth has an atmosphere and ozone layer.
    B. Earth has both water cycle and nitrogen cycle.
    C. Earth has natural activities to circulate nutrients.
    D. All of the above
12. Many studies have shown similarities of Earth and Venus. What makes Earth similar with Venus?
    A. Earth and Venus have the same orbit.
    B. Earth and Venus have the same diameter.
    C. Earth and Venus have the same atmosphere.
    D. Earth and Venus are of the right size to hold a sufficient atmosphere.
13. What makes human and other living organisms capable to live on Earth?
    A. Earth can provide food for the organism.
    B. Earth can protect the organism from any possible threat.
    C. Earth's temperature is mostly hot compared to other planets.
    D. Earth has the right amount of temperature, water, good atmosphere, and favorable climate.
14. Planet Earth is considered uniquely different from any other planets in the Solar system. Which among the given choices correctly answers the statement?
    A. Earth is the only planet that changes structure.
    B. Earth is the only planet that turns around in space.
    C. Earth is the only planet that is mostly covered with water.
    D. Earth is the only planet that is mostly made from rocks.

15. What is the reason why every living thing on Earth has the chance of survival?
    A. Earth is covered with 65% water.
    B. Earth thick atmosphere consisted mainly of carbon dioxide.
    C. Earth has active volcanoes similar with those that are found in Venus.
    D. Earth has ozone layer to protect living organisms from harmful radiation.



Additional Activities

Creating a Planet: Fill up the data needed in your created planet.

My Planet is called _____. It is located in the _____.

The weather is _____It would have _____ kinds of organisms.

The individual who live there are called _____.

The individual look like this.

The planet looks like this.

Answer Key

What I Know	What's More	Assessment
1. D 2. B 3. D 4. D 5. B 6. D 7. D 8. A 9. D 10.D 11.D 12.D 13.A 14.A 15.D	**Venus has very thick atmosphere which is almost dense as Earth, while Mars has thin atmosphere.** Venus is hotter than Earth. Mars is colder than Earth.	1. D 2. D 3. D 4. B 5. D 6. D 7. A 8. B 9. D 10.D 11.D 12.D 13.D 14.C 15.D

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For inquiries or feedback, please write or call:

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph