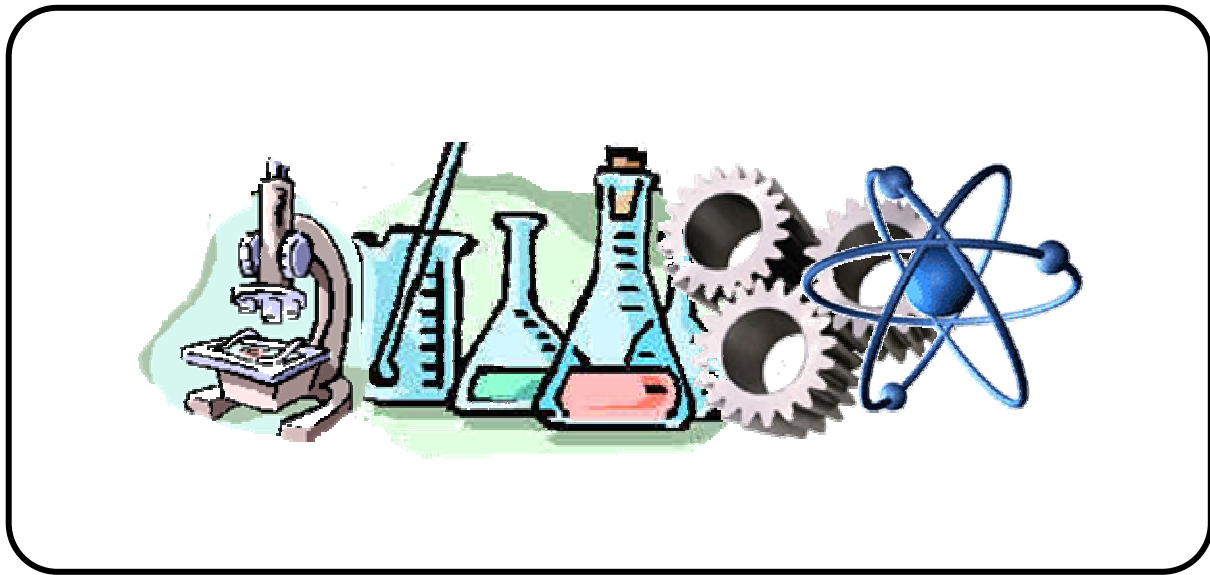


Project EASE

(Effective and Alternative Secondary Education)

INTEGRATED SCIENCE I



MODULE 15



BUREAU OF SECONDARY EDUCATION

Department of Education
DepED Complex, Meralco Avenue
Pasig City



Module 15

Planets in the Solar System



What this module is about

Have you ever wondered what lies beyond earth? Try to look at the sky at night. What are the things that you see? You probably have seen the moon and the stars. Some bright objects in the sky are the other planets. Sometimes we see meteors and comets. Would you like to learn more about them? Come, let us explore the Solar system.

This module will help you find out many things about our solar system. There will be activities prepared for you to help you understand our lesson much better. Self-tests are also provided for you for a good look at your progress. Have fun and enjoy learning the following lessons:

- **Lesson 1 - The Origin of the Solar System**
- **Lesson 2 - Sun: The Center of the Solar System**
- **Lesson 3 - Our Neighbors: A Close Look**



What you are expected to learn

1. Describe how the solar system evolved.
2. Describe how the sun emits its energy.
3. Identify the members of the solar system.
4. Compare the physical properties of the planets.
5. Identify the newest member of the solar system.



How to learn from this module

Here's a simple guide for you in going about the module.

1. Read and follow the instructions very carefully.
2. A simple 10-item multiple-choice test is provided at the start of this module to determine how much you know about the module.

3. Check your answers against the correct answers provided at the last page of the module.
4. Be very honest in taking the test so you know how much knowledge you already have about the topic.
5. After taking the pre-test, different lessons about the solar system are provided for you.
6. Perform all the activities, as these will help you have a better understanding of the topic.
7. Self-tests are also available at the end of each lesson for you to determine how much you remember about the lesson.
8. Before the end of this module a simple 10-item multiple-choice test is prepared for you.

Good Luck and have fun!



What to do before (Pretest)

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

1. All the solar system planets could easily fit on the inside of ...
 - a. Jupiter
 - b. Saturn
 - c. Uranus

2. The Sun can be classified as a _____
 - a. Yellow star
 - b. Yellow dwarf star
 - c. Protostar
 - d. White star

3. Olympus Mons, the largest active volcano in the solar system, is found on Mercury.
 - a. True
 - b. False

4. Pick the true statement:
 - a. The Earth is at the center of a heliocentric system.
 - b. The Moon is at the center of a heliocentric system.
 - c. The Sun is at the center of a heliocentric system.

5. Of all the planets in the solar system, which is the closest to the Earth in terms of size and mass.
 - a. Mars

- b. Mercury
 - c. Venus
 - d. Pluto
6. Which of the following statements is correct?
- a. Pluto is the smallest planet – it is smaller than the Earth’s moon.
 - b. Mars is the smallest planet – it is smaller than the Earth’s moon.
 - c. Venus is the smallest planet – it is smaller than the Earth’s moon.
7. When is energy in the Sun produced?
- a. During the conversion of hydrogen atoms into helium atoms.
 - b. During the conversion of helium atoms into hydrogen atoms.
8. Which of the following statements is correct?
- a. Saturn’s moon, Titan, is the largest moon in the solar system.
 - b. Jupiter’s moon, Ganymede, is the largest moon in the solar system.
 - c. Neptune’s moon, Triton, is the largest moon in the solar system.
9. Which statement is true?
- a. Mercury is the hottest planet and Pluto is the coldest planet.
 - b. Venus is the hottest planet and Pluto is the coldest planet.
 - c. Mercury is the hottest planet and Neptune is the coldest planet.
10. Pick the true statement:
- a. The Sun consists mostly of hydrogen.
 - b. The Sun consists mostly of helium.
 - c. Sunspots appear all over the Sun, not just in one small area.



Key to answers on page 25



Lesson 1 The Origin of the Solar System



What you will do

Activity 1.1 Theories about the Solar System

Try this! Match the scientist to the theory and view attributed to him. Draw a line, which will connect one to the other.

Earth – Centered Solar system	Heliocentric Theory	 Copernicus
Sun – Centered Solar system	Geocentric Theory	 Ptolemy



Key to answers on page 25

Origin of the Solar System

There were two different views about our solar system. Ptolemy, a famous astronomer, once said that earth is the center of the solar system and everything moves around it. This idea is known as the *geocentric view of the solar system*. *Geo* means *earth* and *centric* means *center*. His idea was anchored on the fact that man is known to be created like God thus he must be very close to God.

Copernicus, on the other hand, is one great man who opposed Ptolemy's theory. He said that the sun is the center of the solar system and revolving around it are the planets. This is known as the *heliocentric theory* (helio –fire and centric – center). Now who do you think has a better idea?



What you will do

Activity 1.2 The Origin of the Solar System

Read this!

Did you know how the solar system was formed?

The orderly nature of our solar system is believed by astronomers to have formed 5 billion years ago. The planets, the sun and all other members of the solar system are believed to have formed at the same time from a vast cloud of dust and gases called *nebula*. This concept is called the *nebular theory* of the solar system



According to the nebular theory, about 5 billion years ago the huge cloud of dust and gases (nebula) began to contract (move toward each other) under its own gravitational force. A rotating ice skater who pulls her hand towards her body rotates faster than with extended arm. Just like the nebula while it contracts, it rotates faster and faster. This constant rotation caused the nebular cloud to assume a disk-shape producing the sun. However, due to this rotation, some dust and gases remained orbiting the sun, eventually forming the planets just like earth.

Answer this!

1. How old is the solar system? _____
 2. To what particular matter did the solar system originate? _____
 3. How did the solar system form? _____
- _____
- _____



Key to answers on page 25

Movement of the Solar System

How do planets in the solar system move? For thousands of years, people have watched the stars at night. The stars appear to rise and set slowly as the night goes on. These stars are like our sun, which can make their own light.

From night to night, some points of light seem to move along with the stars. These points of light are the planets. Like our planet – the Earth, the moons and other planets do not make their own light. They only reflect the light from the sun.

Take a look at the picture of the solar system. Can you find the earth? Trace its path. What path does it take around the sun? Like all other planets, Earth orbits the sun in an elliptical path, which lies along the same plane except

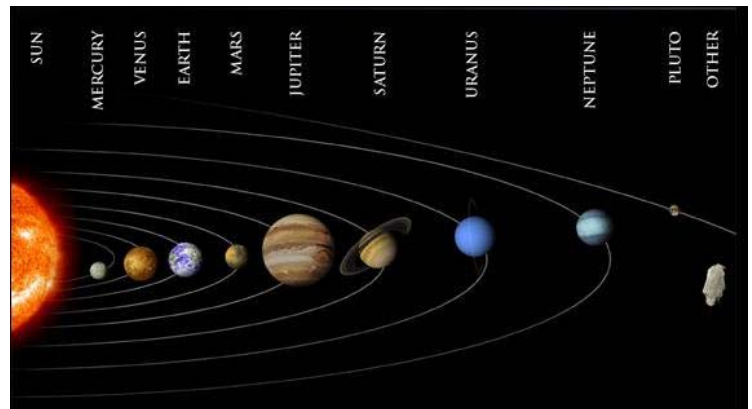


Figure 1.2. The Solar System

for Pluto. Now try this one. Get

a chair and move around it. While moving around the chair, turn around. Your motion around the chair is like the motion of all the planets around the sun. This is called revolution. One complete revolution of a planet means one complete year of the planet. On the other hand, when you turn around in one place, the motion is basically called rotation. All planets in the solar system rotate about their own axis (axis - an imaginary line running across the planet on which the planet turns about). One complete rotation is equivalent to one whole day in the planet.

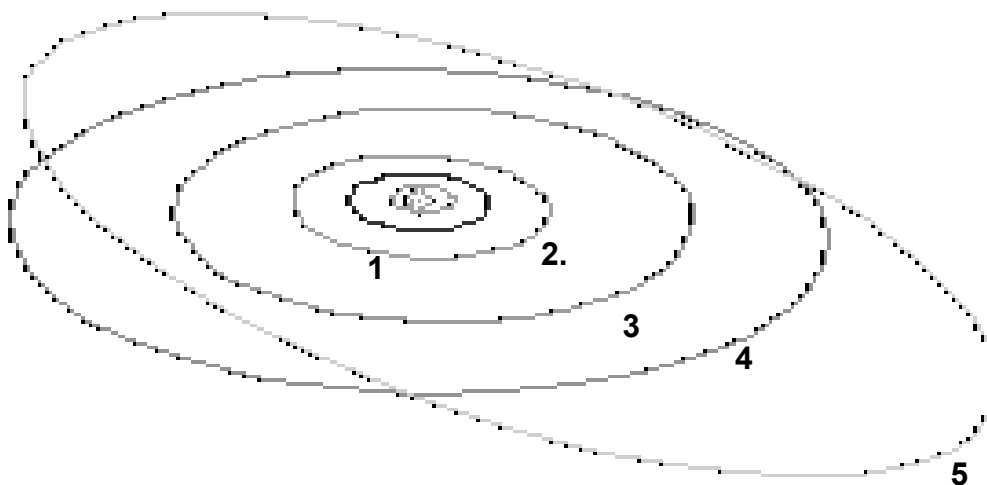


What you will do
Activity 1.3 Orbits

Here's a good glimpse of the motion of each planet.

Name	Time for 1 revolution (in Earth time)	Time for 1 rotation (in Earth time)
Mercury	88 days	179 days
Venus	225 days	244 days
Earth	1 year	23h 56m 04s
Mars	1.9 years	24h 37m 23s
Jupiter	12 years	9h 50m
Saturn	29.5 years	10h 14m
Uranus	84 years	17h 14m
Neptune	165 years	16h 03m
Pluto	248 years	6.4 days

Identify the planet located on the orbits based on the time for 1 revolution



Key to answers on page 25



What you will do
Self-Test 1.1

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

1. Which term means Earth –centered?
 - a. Heliocentric
 - b. Geocentric

2. Which of the following statement is TRUE?
 - a. The Sun is at the center of a heliocentric system.
 - b. The Moon is at the center of a heliocentric system.
 - c. The Earth is at the center of a heliocentric system.

3. Which of the two statement is TRUE?
 - a. Geocentric means Sun-centered, heliocentric means Earth-centered.
 - b. Geocentric means Earth-centered, heliocentric means Sun-centered.

4. Scientists hypothesize that the Sun formed _____.
 - a. less than a billion years ago
 - b. from a cloud of gas and dust
 - c. less than a million years ago
 - d. from a chunk of Jupiter

5. People once believed that all planets and stars orbited around _____.
 - a. Mercury
 - b. Venus
 - c. Earth
 - d. Mars



Key to answers on page 26

If you score 3 or more out of 5 – Congratulations!

You may now proceed to the next lesson. If you score below 3 you need to go back and read the lesson again!

Lesson 2 Sun: The Center of the Solar System

Did you know that the sun is not really located at the center of the planets' orbit? Take a look at the orbit of Earth. Earth follows an elliptical path and the sun is located at one of the foci.

Do you know how big the sun is? The sun is 140 000 km in diameter. Compared to other stars, the sun is a medium-sized star. The Earth's diameter is about 13000 km. More than 100 Earths could fit in a line along the sun's diameter and it would take over a million earths to fill the entire space taken up by the sun.

Now take a look at the picture of the sun. What color do you see? Is this the real color of the sun? What about the energy or light it emits? Is it also yellow? The sun is really a yellow star. This is because the sun as a star is a middle-aged star. The color of the star tells us its temperature. Yellow stars have surface temperatures of about 6000 °C. But the inside of the sun is much hotter than the surface.

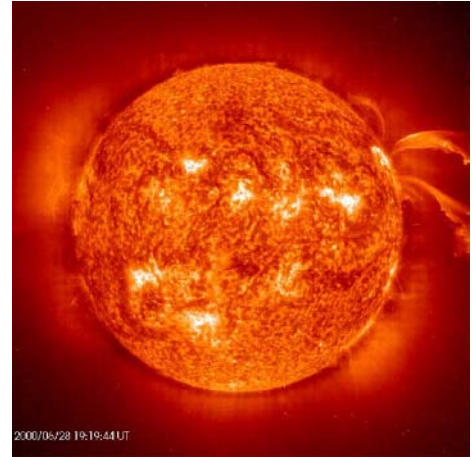
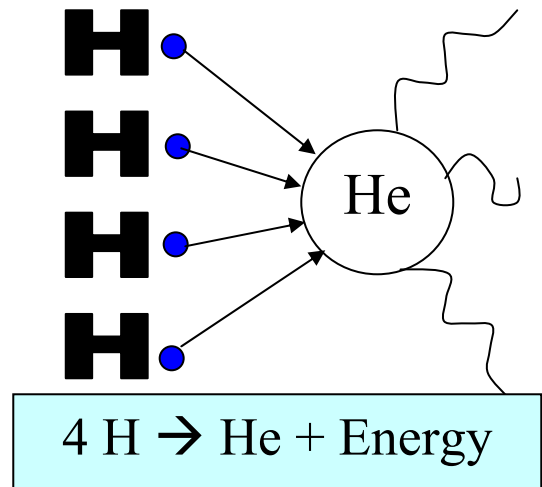


Figure 2.2. The Sun – A Gaseous Ball

Astronomers believe that the inside temperature of the sun is over 13 million degrees Celsius (13000000 °C). This very high temperature on the inside makes it possible for the sun to undergo a process called nuclear reaction. In a nuclear reaction, the atomic nuclei are changed. Atomic nuclei combine in the sun's interior. This kind of nuclear reaction is called thermonuclear fusion. Since the sun is about 80% hydrogen, 18% helium, and 2% other elements deep inside the sun, the hydrogen nuclei fuse or combine to form a nucleus of helium.



In this reaction, 4 hydrogen nuclei combine to form 1 helium nucleus. The mass of the helium nucleus is usually much less than the combined mass of the 4 hydrogen nuclei. This missing mass is a matter that is changed into an amount of energy. A part of which is visible light or white light.

Figure 2.3. Thermonuclear Fusion

Do you know how earth and the organisms like us make use of sun's energy to maintain life? Plants need sunlight for photosynthesis to exist. *Photosynthesis is the process of making food by plants.* For evaporation to occur, sunlight, which provides enough amount of energy, is needed. *Evaporation is a change of phase from liquid like water to gas*

like water vapor. Other organisms need sunlight for them to be able to maintain constant body temperature. *Temperature is the hotness or coldness of a body.* People like us need sunlight for our skin to produce vitamin D, which is essential to living. Other countries make use of sunlight as their main source of energy. They make use of solar cells or solar panels to collect sunlight and convert this energy to electrical energy that can light their houses, cook their food, and iron their clothes, and wash their clothes. What about you, how can you make use of sunlight?

Here's a simple activity that can give you an idea how you can make use of solar energy for practical purposes



What you will do

Activity 2.1 Investigating Solar Power

Goal: You will investigate solar power.

Materials

- large bowl
- aluminum foil
- plastic knives or spreaders
- paper plates and napkins
- Peanut butter (refrigerated)
- cheese
- crackers
- stop watch

Procedure

1. Make a solar oven by lining the inside of a large bowl with aluminum foil. Place a glob of cold peanut butter on the bottom of the bowl, and position the bowl in direct sunlight so that the sun's rays are shining on the inside of the bowl. You may need to use blocks to prop the bowl at an angle to catch the rays.
2. Let the bowl sit for about an hour and regularly check the melting progress. Then spread the melted peanut butter on crackers and serve for a simple picnic treat.
3. Put a slice of cheese on one cracker and some stiff peanut butter on another. Predict which will melt first. Then find other items to melt, such as an ice cube, crayon, and candle. Record on a chart the time it takes each item to melt, and compare your predictions.

Data and Results

<i>Material</i>	<i>Predicted Melting Time</i>	<i>Actual Melting Time</i>
Cheese		
Crayons		
Ice cube		
Birthday candle		

Guide Questions:

1. What can you tell me about the sun?

2. How do people use it?

3. How is an oven like the sun?

Oops! Before you go on, try this one!



Key to answers on page 26



What you will do Self-Test 2.1

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

1. Compared to other stars, the sun is _____.
- a. small
 - b. medium-sized
 - c. large

2. The surface temperature of a yellow star is about _____.
 - a. 600°C
 - b. 6000°C
 - c. 60000°C
3. In the sun, hydrogen nuclei combine to form _____.
 - a. Helium
 - b. Salts
 - c. Water
4. The mass lost in thermonuclear fusion is changed into _____.
 - a. Helium
 - b. Nuclei
 - c. Energy
5. Which of the following is the color of the sun?
 - a. Red
 - b. Yellow
 - c. White



Key to answers on page 26

Check your answers against the answer key provided on page 25. If you score 3 or more out of 5 – Congratulations! You may now proceed to the next lesson. If you score below 3 you need to go back and read the lesson again!

Viewing the Sun

The sun's light is too bright for direct viewing. *Never ever look at the sun with your naked eyes.* Special instruments are needed to study the sun. One such solar telescope is located at Kitt Peak, Arizona. It is about 800 meters long and built into the ground. The telescope is made so that the total amount of the sun's light and heat entering the telescope can be carefully controlled. In this way we can study the sun thoroughly.

Unlike the earth, no part of the sun is a liquid or solid. It is too hot to have any liquid or solid in it. Thus, the sun is simply a large ball of hot gases. Beyond the sun itself is an atmosphere. It too is made up of gases. But did you know that the sun also has an atmosphere? The atmosphere has three layers. The layer closest to the sun is the



Figure 2.4. Solar Telescope at Kitt Peak, Arizona

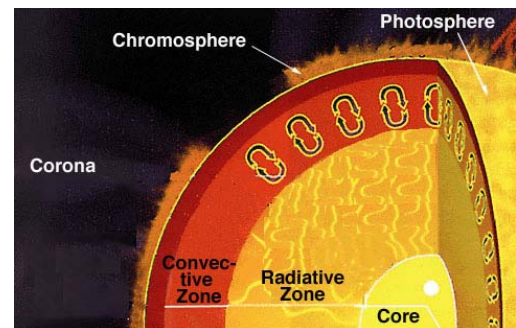


Figure 2.5. The Layers of the Sun

photosphere, which is about 550 kilometers thick. It is the layer that emits the sun's light.

The *chromosphere* is the layer of the sun's atmosphere next to the photosphere. It is believed to be responsible in emitting the color of the sun. The *corona* is the last layer of the sun's atmosphere. It is also known as the *crown* of light that surrounds the sun. (*Corona comes from the Latin word meaning crown*). The corona is the layer of the sun's atmosphere farthest from the sun. The temperature in the corona is more than 1 million degree Celsius.



What you will do

Self-Test 2.2

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

1. The layer of the sun's atmosphere next to the photosphere is the _____.
 - a. corona
 - b. chromosphere
 - c. solar sphere
2. The chromosphere can best be seen _____.
 - a. on a dark, moonless night
 - b. during a solar eclipse
 - c. at noontime on a sunny day
3. Which among the following is the layer of the sun's atmosphere that is responsible for emitting white light?
 - a. Photosphere
 - b. Chromosphere
 - c. Corona
4. Which layer of the sun's atmosphere is farthest away from the sun?
 - a. Photosphere
 - b. Chromosphere
 - c. Corona
5. When does the corona become visible?
 - a. During solar eclipse
 - b. During solar flare
 - c. During prominence



Key to answers on page 26

If you score 3 or more out of 5 – Congratulations! You may now proceed to the next lesson. If you score below 3 you need to go back and read the lesson again!

Lesson 3 Our Neighbors: A Close Look!

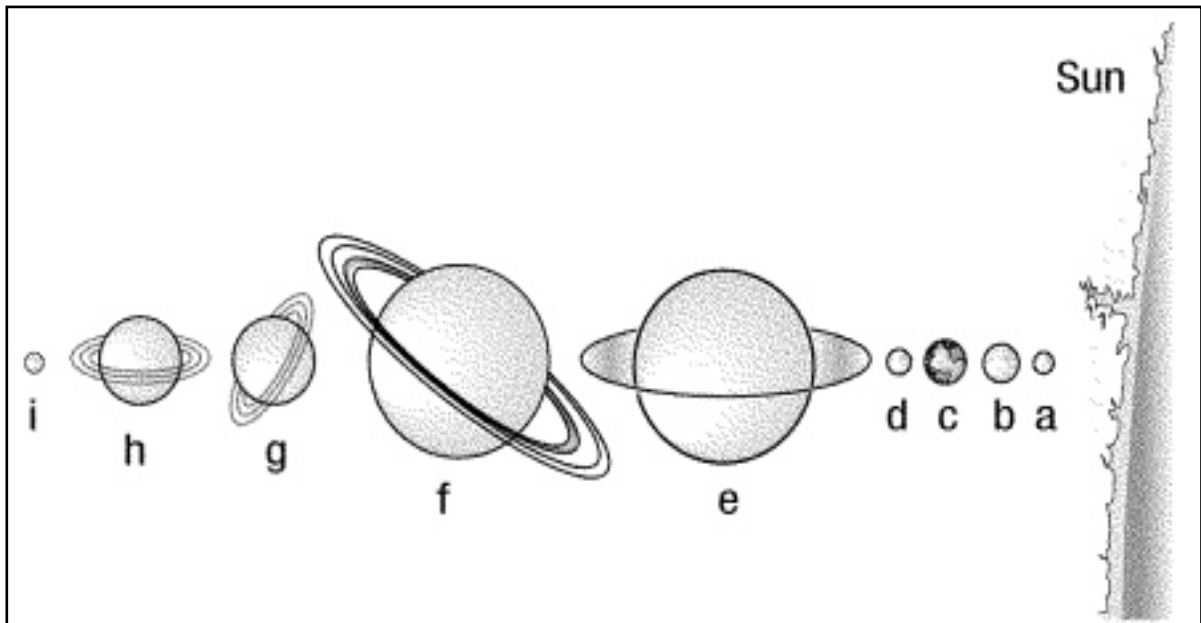
There are basically nine members of the solar systems. Our nine planets are grouped into two: the terrestrial planets (innermost planets), which include Mercury, Venus, Earth and Mars and the Jovian planets (outermost planets), which include Jupiter, Saturn, Uranus and Neptune. Pluto is the ninth planet in the solar system. It was neither classified as a terrestrial nor a Jovian planet because of its characteristics. The tenth planet in the solar system is named after Dr. Josette Biyo, a Filipino teacher who won the Intel Excellence in Teaching award in USA.



What you will do

Activity 3.1 Planet Arrangement

Label the planets starting from the one closest to the sun.



Key to answers on page 26

Remember this!

Here's an easier way of remembering the planets starting from the one closest to the sun!

My Very Eager Mother Just Served Us Nine Putos: The Planets of the Solar System (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto)

Now let's take a close look at the different planets of the solar system. The four planets closest to the sun are known as the *inner planets*. Often times they are also called *terrestrial planets* since all of them appear solid and they look like our very own planet – The Earth!

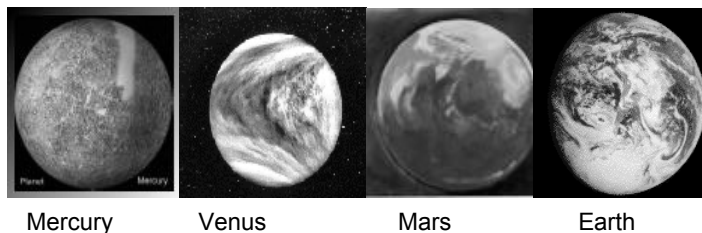


Figure 3.1. The Terrestrial Planets

Mercury: The Innermost Planet

Mercury is the closest planet to the sun, thus, it is considered as the innermost planet. Like our moon, it absorbs most of the sunlight that strikes it and reflects only about 6% into space. This happens because Mercury has no atmosphere like our moon.

No moon accompanies Mercury. It revolves quickly (88 days) but rotates slowly (179 days), thus, a night on Mercury lasts for about 3 months followed by 3 months of daylight.

Mercury is also known as a very cold planet at nighttime with a temperature of about -173°C . However it becomes very

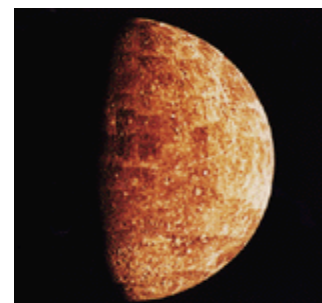


Figure 3.2. Mercury

hot at daytime with a temperature of about 427°C, hot enough to melt tin and lead! You could probably have 3rd degree burns or worse if you go there without life support. Consequently, no life has ever been discovered in Mercury.

Venus: The Goddess of Love and Beauty!

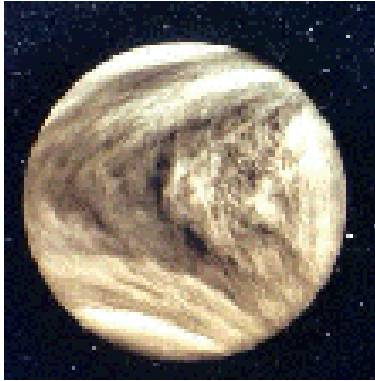


Figure 3.3. Venus

Venus is the brightest planet in the night sky next to our moon. It is usually called the twin planet of Earth because it shares a lot of similarities with Earth in terms of size, density, mass and location in the solar system. It orbits the sun in 225 days. The Venusian surface reaches temperature of about 475°C. This is because its thick atmosphere prevents excess sunlight to escape the planet. Its very thick atmosphere is composed mostly of carbon dioxide (97%). This environment makes it impossible for life to exist on Venus.

Mars: The Red Planet

Mars is believed to be the home of John Jones of Justice League and Marvin the Martian of Looney Toons. Oops! Just kidding!

Through a telescope, Mars appears as a reddish ball with some dark regions. We can also see polar ice caps which look like those we have on Earth. The Martian atmosphere has only 1% the density of earth's atmosphere. It is primarily composed of carbon dioxide with tiny amounts of water vapor. Data from discoveries confirm that polar ice caps on Mars are made of water ice, covered by thin layer of frozen carbon dioxide. When the dust that covers Mars during sandstorm clears, images of the northern hemisphere show numerous large volcanoes. The biggest of which is the Mons Olympus.



Figure 3.4 Mars

Did you also know that Mars has moons or natural satellites? They are named as *Phobos* and *Deimos*. It is believed that these moons are asteroids captured by Mars!



What you will do

Activity 3.2 The Jovian Planets

Label the Jovian Planets.

The Outermost Planets



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Can you name the next set of planets? These planets are known as the outermost planets. They were called outermost planets because they are located farther from the sun than the rest of the planets except Pluto. Other times we call these planets as Jovian planets because all the four planets have similar characteristics. They are large gaseous planets like Jupiter. All of them have rings but only the rings of Saturn are the most visible to the eyes.

All planets have a number of satellites.



Key to answers on page 26

Jupiter: The Giant!



Figure 3.5 Jupiter

Jupiter is known to be the largest planet in the solar system. In fact, it has a mass of about $2\frac{1}{2}$ times greater than the remaining planets, satellites, and asteroids. Jupiter also rotates much faster than any other planets, completing one rotation in slightly less than 10-hours which is the reason why its poles are flattened.

Jupiter's atmosphere is mainly made-up of hydrogen-helium with little amounts of methane, ammonia, water and sulfur compounds. It has about 16 moons. The four most visible moons were first discovered by Galileo. Thus, they are known as the Galilean moons. *Ganymede* and *Callisto* are known to be the largest moons of the solar system, while *Io* and *Europa* are about the size of Earth's moon. *Io* is also known as the most active moon because it is mostly covered with active volcanoes.

Saturn: The Ringed Planet

Saturn is known to be the most elegant planet in the solar system because of its rings which are very visible to the eyes. It circles the sun in about 29.46 Earth years. Thus, one complete year in Saturn is about 29.46 years on earth. Saturn's rings were first seen by Galileo in 1610. Recent discoveries confirm that these rings are made up of ice rocks. At present, Saturn has about 21 natural satellites, the most prominent of which is known as *Titan*.

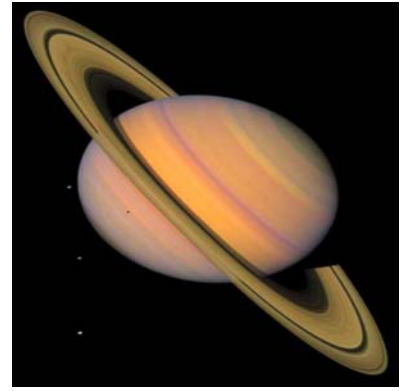
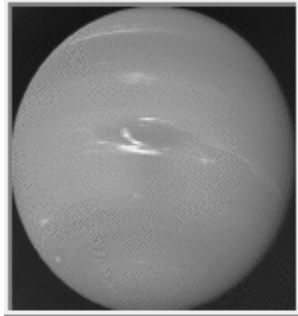


Figure 3.6 Saturn

The Twins: Uranus and Neptune



Uranus



Neptune

Uranus is known as the sideways planet because the planet rotates “on its side”. Its axis of rotation is parallel to its orbit. Uranus is the seventh planet from the Sun and is the third largest in the solar system. It was discovered by William Herschel in 1781. It has an equatorial diameter of 51800 kilometers (32190 miles) and orbits the Sun once every 84.01 Earth years. It has a mean distance from the Sun of 2.87 billion kilometers (1.78 billion miles). The length of a day on Uranus is 17

hours 14 minutes. Uranus has at least 22 moons. The two largest moons, Titania and Oberon, were discovered by William Herschel in 1787.

Neptune is the outermost planet of the gas giants. It has an equatorial diameter of 49500 kilometers (30760 miles). If Neptune were hollow, it could contain nearly 60 Earths. Neptune orbits the Sun every 165 years. It has eight moons, six of which were found by Voyager. A day on Neptune is 16 hours and 6.7 minutes. Neptune was discovered on September 23, 1846 by Johann Gottfried Galle, of the Berlin Observatory, and Louis d'Arrest, an astronomy student, through mathematical predictions made by Urbain Jean Joseph Le Verrier.

The first two thirds of Neptune is composed of a mixture of molten rock, water, liquid ammonia and methane. The outer third is a mixture of heated gases comprised of hydrogen, helium, water and methane. Methane gives Neptune its blue cloud color. Neptune has a set of four rings, which are narrow and very faint. The rings are made up of dust particles thought to have been made by tiny meteorites smashing into Neptune's moons.

Pluto: The God of the Underworld!



Pluto was discovered in 1930. The uniqueness of Pluto's orbit, rotational relationship with its satellite, spin axis, and light variations all give the planet a certain appeal. Pluto is usually the farthest planet from the sun; however, due to the eccentricity of its orbit, it is closer than Neptune for 20 years out of its 249-year orbit. Pluto crossed Neptune's orbit on January 21, 1979, made its closest approach on September 5, 1989, and will remain within the orbit of Neptune until February 11, 1999. This will not occur again until September 2226. Pluto's rotation period is 6.387 days, the same as its satellite Charon. Pluto rotates with its poles almost in its orbital plane. Pluto's rotational axis is

tipped 122 degrees.



What you will do

Activity 3.3 The Planets

Arrange the planets in increasing order by placing 1 on the planet, which corresponds to the least and to on the planet, which corresponds to the most, based on the given properties. Column no. 1 is given as an example.

Planets	Properties				
	Size	Orbit/Period	No. of Moons	Distance form the sun	Temperature
Mercury	2				
Venus	4				
Earth	5				
Mars	3				
Jupiter	9				
Saturn	8				
Uranus	6				
Neptune	7				
Pluto	1				



Key to answers on page 27



What you will do
Activity 3.4 New Planet

The Newest Member of the Solar System

Read this!

Dr. Josette Biyo is a public school teacher from Iloilo who won the Intel Excellence in Teaching award in the US, besting 4000 candidates from all around the world. The Massachusetts Institute of Technology Lincoln Laboratory in Boston named a minor planet (Planet 13241) in her honor.

Answer this!

1. What do you think is the name of the newest member of the solar system? _____
2. Where is it located? _____



Key to answers on page 27



What you will do
Activity 3.5 My Neighbors!

Find all the words listed below. You can do this by crossing out the word horizontally, vertically or diagonally.

- Biyo
- Charon
- Earth
- Ganymede
- Jovian
- Jupiter
- Mars
- Mercury
- Phobos
- Planet
- Pluto
- Saturn
- Terrestrial
- Titan
- Uranus

LPLUTOKCNHVAZXL
 PAXKTXUJFELEMLP
 LNIUFFWONYPANHV
 ALARJUPITERTSUN
 NNFITSUNARUAUBS
 EOADVSSRAMTQMNS
 TREEZOEVBWYBOE
 SAADEKJRRWRIBVT
 IHRERGFNRUCOYIZ
 PCTMKOWZCEHKTQP
 XQH YHX YRNPTARTZ
 EIDNSHEIDQNAHRU
 LNPACMULBEUSBJJ
 TYWGLCGZGGMPTGC
 ZBXTSCLGZLHKTMG



Key to answers on page 27



What you will do
Self-Test 3.1

A. Direction: Choose the letter of the best answer. Write your answer on a separate sheet of paper.

1. Which of the following statements is true?
 - a. Mars, Jupiter and Saturn are called the outer planets.
 - b. Earth, Jupiter and Saturn are called the outer planets.
 - c. Mars, Jupiter up to the planet Pluto are called the outer planets.
 - d. None of these statements are correct.

2. Which among the following are known as the outermost planet in the solar system?
 - a. Jupiter, Venus, Saturn, Pluto
 - b. Jupiter, Saturn, Uranus, Neptune
 - c. Jupiter, Saturn, Uranus, Pluto
 - d. Jupiter, Saturn, Neptune, Pluto

3. Which of the following was known as Planet **X** before it was completely discovered?
 - a. Uranus
 - b. Neptune
 - c. Mercury
 - d. Pluto

4. How many moons does the planet Mercury have?
 - a. one
 - b. two
 - c. none

5. What does the atmosphere of Venus consist of?
 - a. over 90% Nitrogen
 - b. over 90% Hydrogen
 - c. over 90% Carbon dioxide

6. Which is the 7th planet from the sun?
 - a. Uranus
 - b. Neptune
 - c. Saturn
 - d. Pluto

7. What is Saturn's largest satellite called?
 - a. Titan
 - b. Rhea
 - c. Minas
 - d. Io

8. Which of the following statements is true?
 - a. Helium gives Neptune its blue cloud color
 - b. Water gives Neptune its blue cloud color.
 - c. Methane gives Neptune its blue cloud color.

9. What is Pluto's satellite (moon) called?
 - a. Caron
 - b. Charon
 - c. Charone

10. Which planet is farthest from the sun next to Pluto?
 - a. Jupiter
 - b. Saturn
 - c. Neptune

B. Direction: Draw a ☺ if the statement is true and ☹ if the statement is false.

1. Saturn's density is so low that the entire planet could float in water.
2. Earth's axis of rotation is almost parallel to the plane of its orbit.
3. Venus experiences an intense greenhouse effect.
4. Io, the largest moon to Saturn, is volcanically active.
5. Galileo discovered that the orbits in which planets move around the Sun are elliptical.
6. Ganymede is a volcano on the planet Jupiter
7. The surface of Mars has long channels that may have been caused by flowing water.
8. The innermost planet in the solar system is called Pluto.
9. The outer planets are small, rocky planets with iron cores.
10. Charon is a satellite of Venus.



Key to answers on page 28

If you score 15 or more out of 20 – Congratulations! You may now proceed. If you score below 7 you need to go back and read the lesson again!



Let's summarize

1. There were two (2) different views about the solar system:
 - The *Geocentric view* coined by *Ptolemy*, claims that earth is the center of the solar system.
 - The other view established by *Nicolaus Copernicus*, is known as *heliocentric theory* claims that the sun is the center of the solar system.
2. The nebular theory was proposed as the basis of origin of the solar system, it states that the solar system came from clouds of dust and gasses called nebula which rotates faster and faster as the particles move toward each other to the center forming what is now known as the sun.
3. The *sun* is a gaseous ball mainly composed of *hydrogen* and *helium*.
4. It can produce its own light and energy by the process known as *thermonuclear fusion* in which *4 hydrogen nuclei* combine to form a *helium nucleus* with an excess matter, which is converted to an amount of energy given off by the sun.
5. It has several layers such as the *photosphere*, *the chromosphere*, and *the corona*. The sun's energy is utilized in different ways and processes such as in photosynthesis, and the production of vitamin D by organisms.
6. Nowadays, solar energy is one of our alternative sources of energy.
7. There are basically nine members of the solar systems.
8. The nine planets are grouped into two: the terrestrial planets (innermost planets), which include Mercury, Venus, Earth and Mars and the Jovian planets (outermost planets), which include Jupiter, Saturn, Uranus and Neptune.
9. Pluto is the ninth planet in the solar system. It was neither classified as a terrestrial nor a Jovian planet because of its characteristics.
10. The tenth planet in the solar system is named after Dr. Josette Biyo, a Filipino teacher who won the Intel Excellence in Teaching award in USA in 2001



Posttest

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

1. Of all the planets in the solar system, which is the closest to the Earth in terms of size and mass.
 - a. Mars
 - b. Mercury
 - c. Pluto
 - d. Venus

2. The Sun, a yellow star emits its own light through a process known as thermonuclear fusion. What does thermonuclear fusion mean?
 - a. Splitting of an object.
 - b. Splitting of a nucleus.
 - c. Combining of an object.
 - d. Combining of nuclei.

3. Which theory explains the origin of the solar system?
 - a. Big Bang theory
 - b. Binary Star Theory
 - c. Nebular Theory
 - d. None of the above.

4. Where is the newest member of the solar system located?
 - a. Between Earth and Venus
 - b. Between Mars and Jupiter
 - c. Between Uranus and Neptune
 - d. Beyond Pluto

5. Which among the planets has the highest surface temperature?
 - a. Earth
 - b. Mars
 - c. Mercury
 - d. Venus

6. What does heliocentric theory mean?
 - a. Earth-centered
 - b. Sun-centered

7. Which of the following statements is true?
 - a. The Sun is at the center of a heliocentric system.

- b. The Moon is at the center of a heliocentric system.
 - c. The Earth is at the center of a heliocentric system.
 - d. None of the above.
8. Which among the following are known as the outermost or the Jovian planets?
- a. Jupiter, Saturn, Neptune, Pluto
 - b. Jupiter, Saturn, Uranus, Pluto
 - c. Jupiter, Saturn, Mars, Uranus
 - d. Jupiter, Saturn, Uranus, Neptune
9. What does the atmosphere of Venus consist of?
- a. Over 90% Nitrogen
 - b. Over 90% Hydrogen
 - c. Over 90% Carbon dioxide
10. Which is the 7th planet from the sun?
- a. Uranus
 - b. Neptune
 - c. Pluto
 - d. Saturn



Key to answers on page 28

If you score 7 or more out of 10 – Congratulations! You may now proceed. If you score below 7 you need to go back and read the module again!



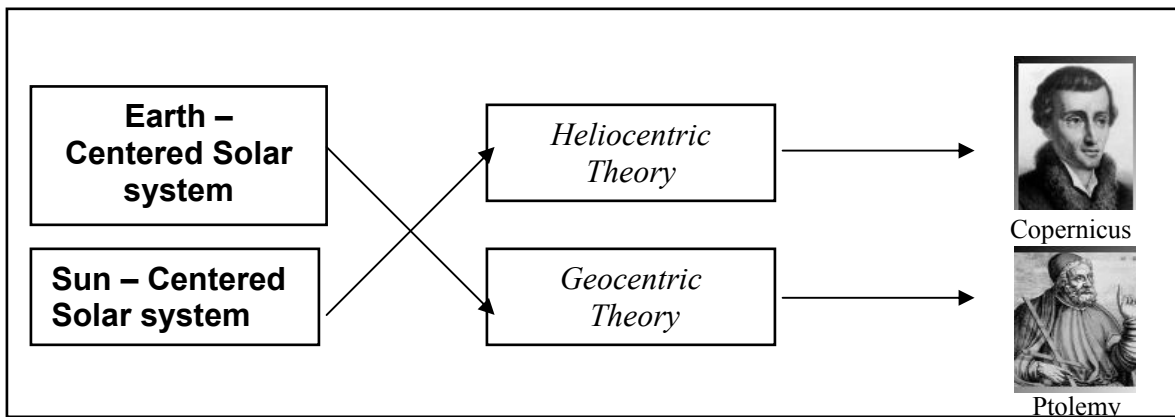
Key to Answers

Pre-Test

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

Lesson 1

Activity 1.1. Theories about the Solar System



Activity 1.2

1. The solar system is about 5 billion years old.
2. It is believed that the solar system formed from a nebula: cloud of dust and gases.
3. The nebula rotated at a constant speed that caused it to form a disk-shaped material, which is the sun. Then the gases that remained formed the planets.

Activity 1.3

1. Mercury
2. Venus
3. Earth
4. Mars
5. Pluto

Self-Test 1.1

1. b
2. a
3. b

4. b
5. c

Self-Test 2.1

1. b
2. b
3. a
- 6.

4. c
5. b

Self-Test 2.2

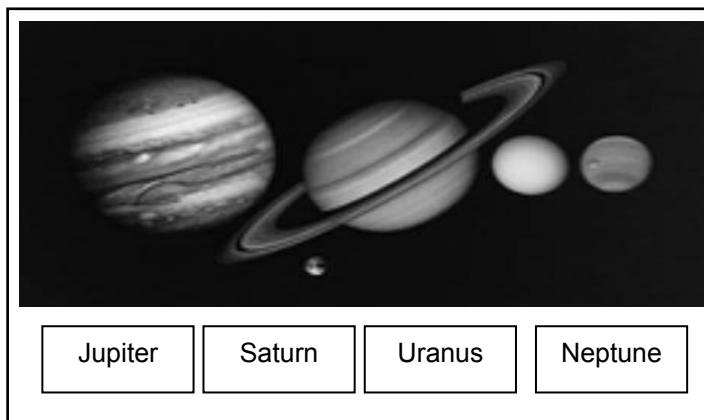
1. b
2. b
3. a

4. c
5. a

Activity 3.1. Planet Arrangement

- e. Mercury
- f. Venus
- g. Earth
- h. Mars
- i. Jupiter
- j. Saturn
- k. Uranus
- l. Neptune
- m. Pluto

Activity 3.2. The Jovian Planets



Activity 3.3. The Planets

Planets	Properties				
	Size	Orbit/Period	No. of Moons	Distance form the sun	Temperature
Mercury	2	1	1	1	8
Venus	4	2	2	2	9
Earth	5	3	3	3	7
Mars	3	4	5	4	6
Jupiter	9	5	8	5	5
Saturn	8	6	9	6	4
Uranus	6	7	6	7	3
Neptune	7	8	7	8	2
Pluto	1	9	4	9	1

Activity 3.4. New Planet

1. Planet Biyo
2. Between Mars and Jupiter

Activity 3.3. My Neighbors!

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L P L U T O K C N H V A Z X L
P A X K T X U J F E L E M L P
L H E U F F W O N Y P A N H V
A L A R J U P I T E R T S U N
M N F I T S U N A R U A U E S
E O A D V S S R A M T Q M N S
T R E E Z Q E V B U W Y B Q E
S A A D E K J A R W E I B V T
I H R E R G F N A M C O Y I Z
P C T M K Q W Z C E H K T Q P
X Q H Y H X Y R N P T A R T Z
E I D N S H E Y D Q N A H R U
L N P A C M U L B E U S B J J
T Y W G L C G Z G M P T G C
Z B X T S C L G Z L H K T M G
  
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Self-Test 3.1. A

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

Self-Test 3.1. B

1. ☺
2. ☹
3. ☺
4. ☹
5. ☹
6. ☹
7. ☺
8. ☹
9. ☹
10. ☹

Post Test

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

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