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Earth Science Curriculum Map

The experiments in this module fall under ten topics that relate to two aspects of earth and space science.

1. Solar System

2. Technology in Space

The activities in this module have two intentions:

- to teach concepts related to earth and space science
- to provide students the opportunity to apply necessary skills needed for mastery of science and technology curriculum objectives.

In each section you will find teacher notes designed to provide you guidance with the learning intention, the success criteria, materials needed, a lesson outline, as well as provide some insight on what results to expect when the experiments are conducted. Suggestions for differentiation are also included so that all students can be successful in the learning environment.

Lesson Topics

Lesson 1 - Our Solar System
Lesson 2 - The View From Earth
Lesson 3 - The Moon
Lesson 4 - Constellations
Lesson 5 - Asteroids, Comets, and Meteoroids
Lesson 6 - Space Exploration
Lesson 7 - Space Explorers
Lesson 8 - Going to Extreme Environments!
Lesson 9 - Technology in Extreme Environments
Lesson 10 - Aboriginal Contributions

OUR SOLAR SYSTEM

Learning Intention:

Students will learn about the unique features of each planet in our solar system.

Success Criteria:

- identify and describe unique features of the eight planets in our solar system
- participate in a quiz of knowledge about our solar system
- create a model of the solar system

Materials Needed:

- a copy of "Our Solar System" Worksheet 1 for each student
- a copy of "The Planets" Worksheet 2, 3, 4, and 5 for each student
- a copy of "Planet Trivia" Worksheet 6, 7, 8, and 9 for each pair of students
- a copy of "A Model of the Solar System" Worksheet 10 for each student
- 9 Styrofoam balls (4 large, 4 small, 1 extra large), a piece of flat Styrofoam (15 cm x 15 cm), a large Styrofoam cup, 13 bamboo skewers (for each pair of students)
- assorted colors of paint and paint brushes, string, rulers, masking tape, scissors
- markers, pencils

Procedure:

***This lesson can be done as one long lesson, or be divided into three shorter lessons.**

1. Using Worksheet 1, 2, 3, 4, and 5, do a shared reading activity with the students. This will allow for reading practice and learning how to break down word parts in order to read the larger words in the text. Along with the content, discussion of certain vocabulary words would be of benefit for students to fully understand the passage.

   Some interesting vocabulary words to focus on are:

   - terrestrial
   - dwarf
   - surrounded
   - erupt
   - particles
   - astronomy
   - diameter
   - surface
   - rotate
   - span
   - atmosphere
   - canyon
   - horizontal
   - hurricane
   - orbit

2. Divide students into pairs. Give them Worksheets 6, 7, 8, and 9. They will cut out the trivia cards, creating two more questions to add to the game. Each student will take a turn asking their partner a planet trivia question (correct answer is highlighted).

3. Give pairs of students Worksheet 10 and the materials to create a model of the solar system. Read through the materials needed and what to do sections to ensure their understanding of the task before they begin. This project may span over a couple of days, as the painted planets will need time to dry before assembly can begin.

Differentiation:

Slower learners may benefit by working as a small group with teacher support in order to participate in the planet trivia game. They may need to reference the information as they provide answers to the questions. This would allow these learners to have another opportunity to re-read the information on Worksheets 1, 2, 3, 4, and 5 in a small group.

For enrichment, faster learners could choose a planet and create a travel brochure to convince people to visit it. (Provide sample brochures so students understand the purpose and layout). Students' travel brochures should include:

- location, size, composition, appearance (unique features), temperature, weather, moons, length of day and year, how long it takes to travel there from Earth, its distance from the sun.

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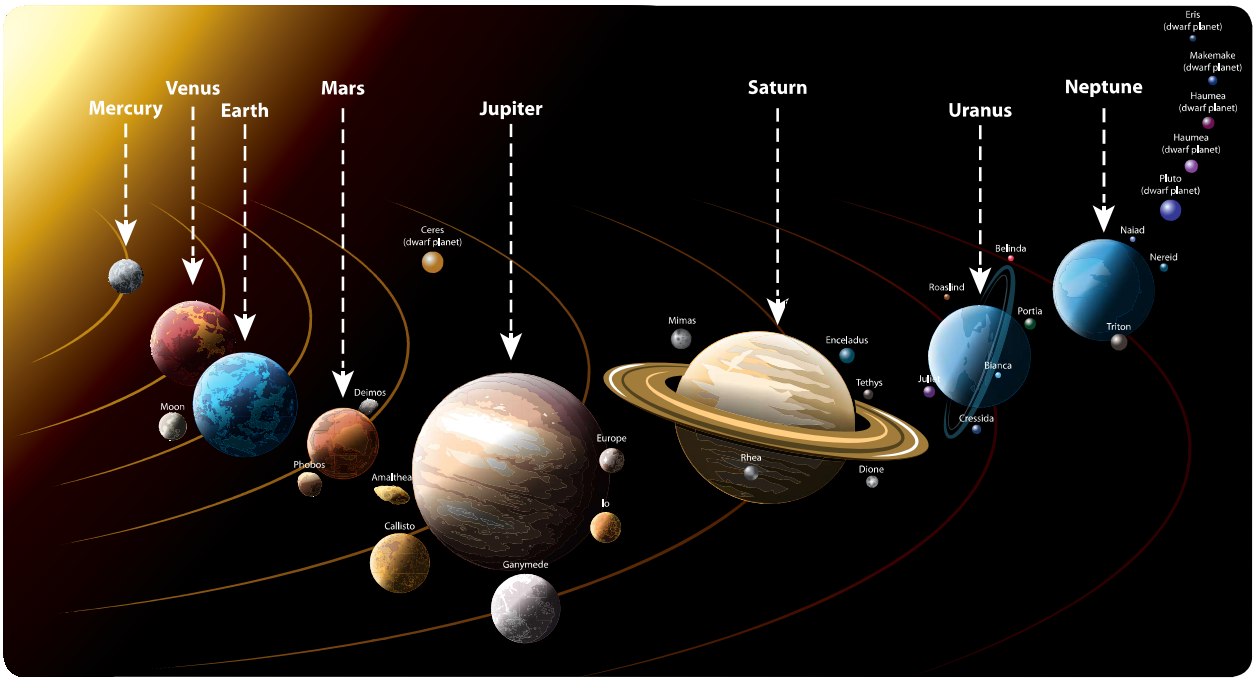
Worksheet 1 Name:

Our Solar System

Have you ever wondered what is out there, beyond Earth?

Earth is just one of **eight planets** and **five dwarf planets** that orbit the Sun, along with many other objects such as asteroids, comets, meteoroids, and satellites.



The four planets closest to the sun are Mercury, Venus, Earth, and Mars. They are called the **terrestrial planets** because they have solid rocky surfaces.

The four large planets, Jupiter, Saturn, Uranus, and Neptune, are called the **gas giants** because they have a thick atmosphere of hydrogen and helium.

Did You Know?

Pluto was the ninth planet in our solar system until 2006 when it was demoted to a **dwarf planet**. A professor discovered an icy object about the same size as Pluto, out beyond its orbit. This object is the dwarf planet called Eris. It turns out that Pluto is just a fraction of the icy objects in its realm, so it is now considered a dwarf planet.

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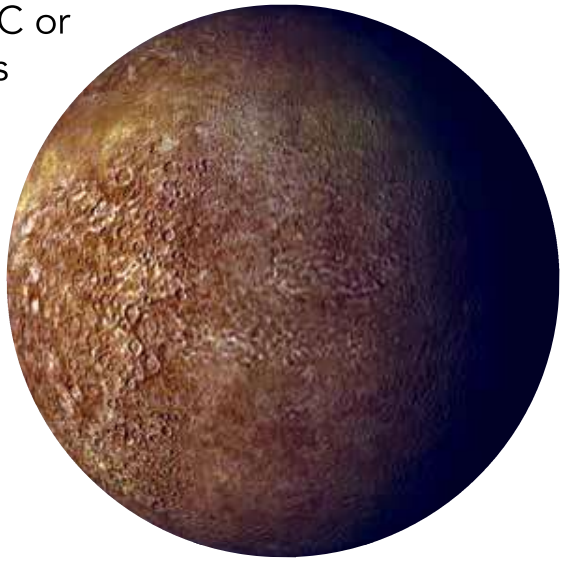
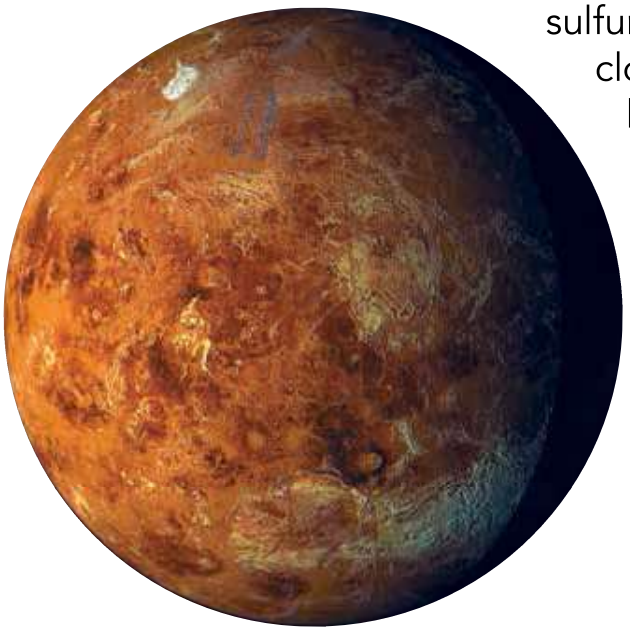
The Planets

Mercury is the closest planet to the sun. Its diameter is 4880 kilometres. It can get as hot as 430 °C or as cold as -170 °C. It has no weather patterns or water. On its surface there are mountains and craters, and it has a heavy iron core.



It takes Mercury 88 days to go around the sun once. This means that one year on Mercury is equal to 88 Earth days.

Venus is the second planet from the sun. It is 12 104 kilometres in diameter. It is surrounded by clouds containing a poisonous gas called sulfuric acid. These clouds trap the sun's heat. As a result, the temperature on Venus is about 450 °C. This hot temperature causes it to glow red.



It takes Venus 225 days to orbit the sun. This means one year on Venus is equal to 225 Earth days.

The surface of Venus is rocky and desert-like, hot and dry. There is no water. Much of its surface is covered by hardened lava flows from volcanoes that erupted a long time ago.

Did you know that Venus spins backwards, in the opposite direction that other planets do?

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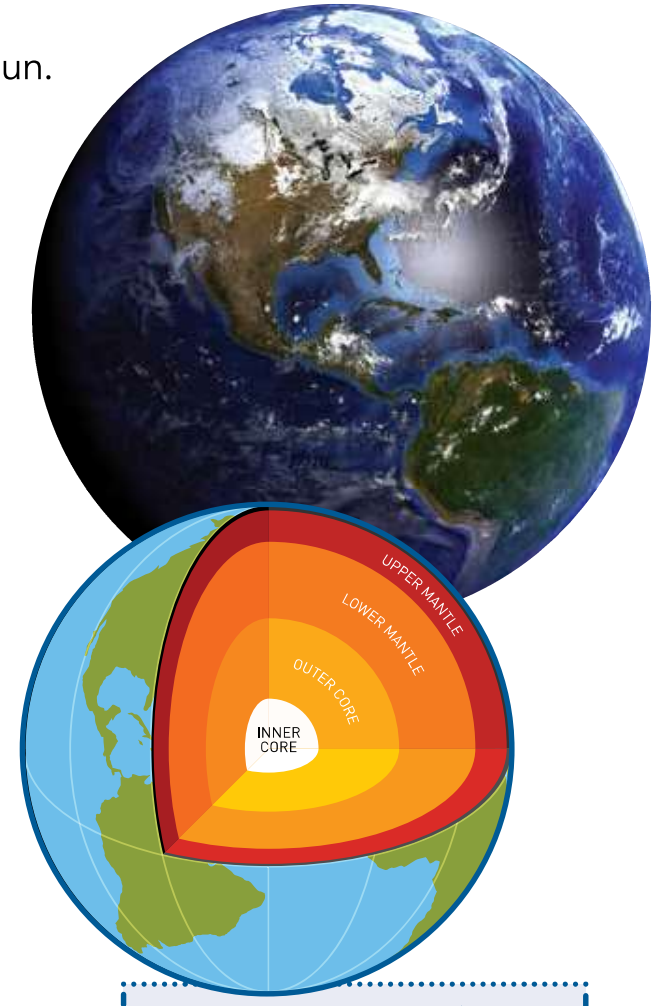
The **Earth** is the third planet from the sun. Its diameter is 12 756 kilometres. The Earth has hot deserts and cold, icy poles. The average temperature on Earth is 22 °C, which makes it ideal for life forms. It is the only planet known to have life on it. The Earth's atmosphere contains mainly oxygen and carbon dioxide, and it protects life forms from the rays of the sun. It takes 365 days for the planet Earth to rotate around the sun. This is equal to one Earth year.

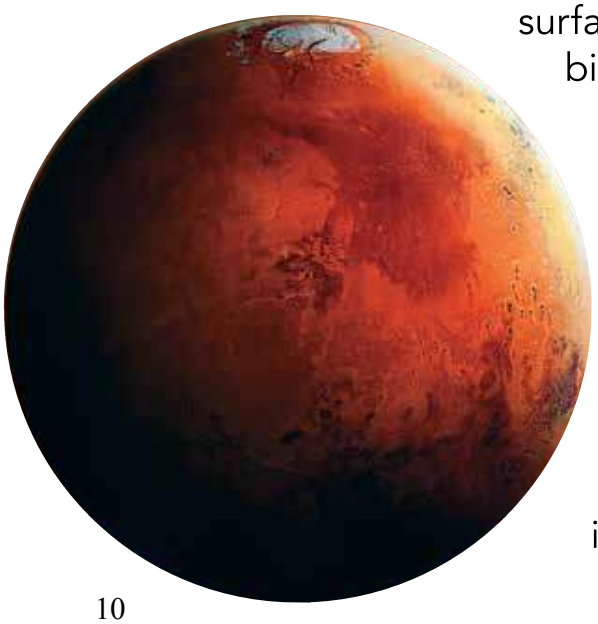


Almost 3/4 of the Earth is covered by water. The rest of Earth is land. The land and water are above the Earth's crust.

Under the Earth's crust is a deep layer of rock called the mantle. Under this is the core, which is made up of mostly iron and nickel.

Mars is the fourth planet from the sun. It is 6 787 kilometres in diameter. It has two moons, Phobos and Deimos. Its temperature ranges from -120 °C during the winter and 25 °C in the summer. It has a thin atmosphere made mostly of carbon dioxide.

Mars is nicknamed the **Red Planet** because of the red color caused by rusted iron in its dusty, rocky surface. Mars has big volcanoes, and many channels and canyons on its surface which could have been eroded by water a long time ago. Presently, there is no liquid water on Mars, and instead only frozen water at its polar ice caps. A year on Mars is as long as 687 Earth days.



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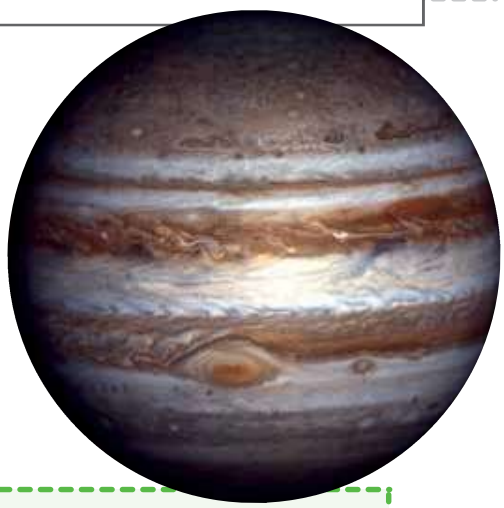
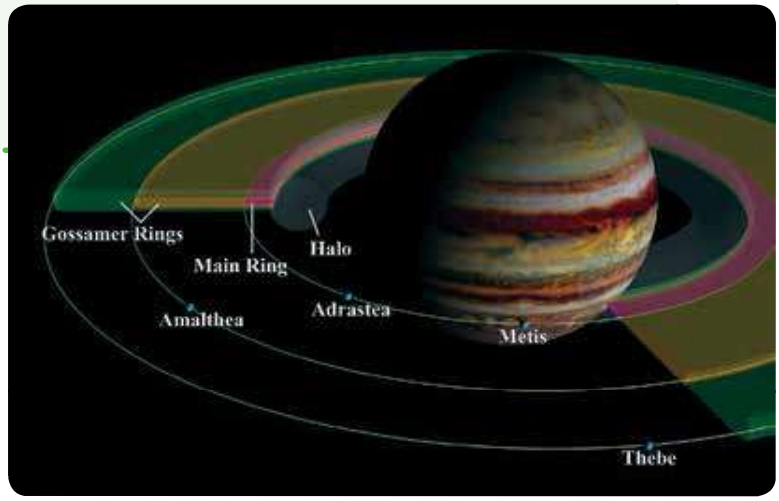


Jupiter is the fifth planet from the sun. The diameter of this huge planet is 142 200 kilometres. Jupiter is a cold planet, with the average temperature being -150 °C.

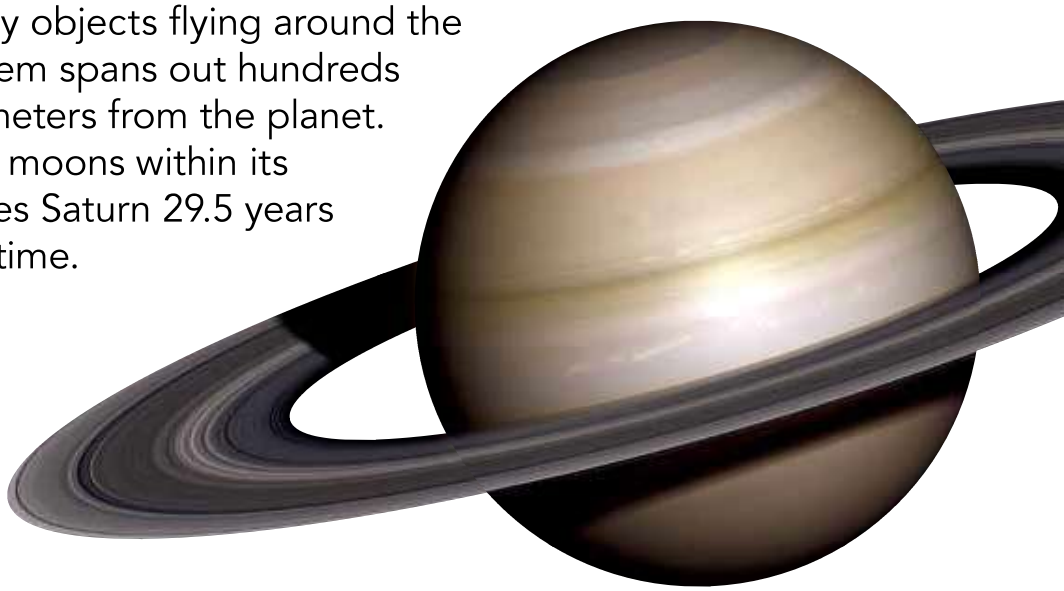
Its atmosphere and surface are mostly made up of hydrogen and helium. Jupiter has a great red spot, which is a giant mass of swirling gases. This spot is like a hurricane storm that has been raging for hundreds of years. One Earth year takes almost twelve Jupiter years.

Jupiter has 50 known moons circling around it. It also has three rings, made of fine particles like dust, that are more easily seen when backlit by the sun.

Saturn is the sixth planet from the sun. This large ringed planet has a diameter of 119 300 kilometres. It is a cold planet, with the average temperature being -180 °C.



Its atmosphere and surface are mostly made up of the gases hydrogen and helium. Saturn's ring system is actually made of icy objects flying around the planet. This ring system spans out hundreds of thousands of kilometers from the planet. Saturn has 53 known moons within its magnetic field. It takes Saturn 29.5 years to orbit the sun one time.



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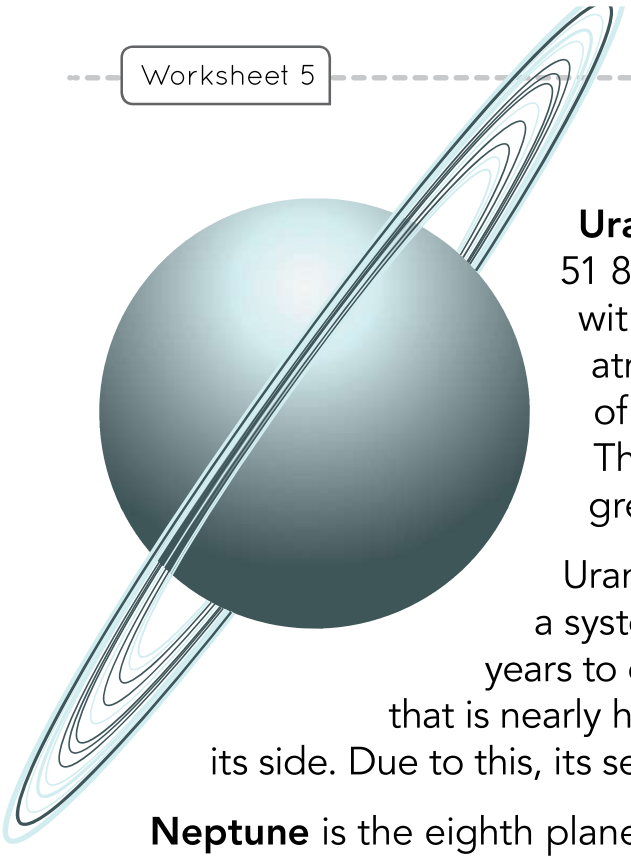


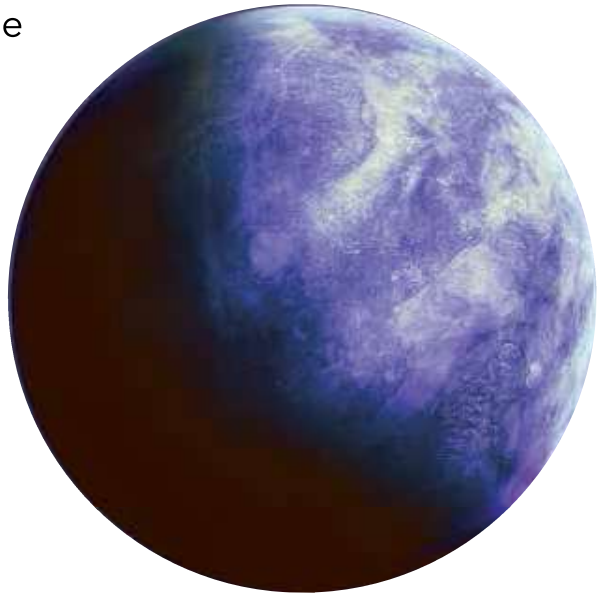
Uranus is the seventh planet from the sun. It is 51 800 kilometres in diameter. It is a cold planet, with the average temperature being -215 °C. Its atmosphere and surface are mostly made up of the gases hydrogen, helium, and methane. The methane gas is what gives Uranus its blue-green color.

Uranus has 27 known moons in its orbit. It has a system of 11 rings around it. It takes Uranus 84 years to orbit the sun once. Uranus rotates on an axis that is nearly horizontal, as though it has been knocked on its side. Due to this, its seasons last over 20 years long.

Neptune is the eighth planet from the sun. It is 30 800 kilometers in diameter. It is a cold planet with the average temperature being -220 °C.

Its atmosphere and surface are mostly made up of the gases hydrogen, helium, and methane.

Neptune has visible and very active weather patterns. This planet has fast moving winds of about 2000 km per hour! These fast moving winds are responsible for creating the great dark spot on this planet.



Neptune has 13 known moons, and a system of 6 rings that are very faint. It takes Neptune 165 years to orbit the sun one time. The long orbital period of Neptune means that the seasons on this planet last for forty Earth years!

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Name:

Planet Trivia!

Cut out the trivia cards. Place in a pile face down. Take turns reading aloud with a partner. Each correct answer gets a point.

Which planet is mainly covered with water?

A. Mars
B. Earth
C. Neptune

What is the object that all planets orbit around?

A. The sun
B. The moon
C. Mercury

Which planet is nicknamed the Red Planet?

A. Jupiter
B. Mars
C. Venus

Which planet has a great red spot?

A. Mars
B. Venus
C. Jupiter

Which planet is the hottest?

A. Venus
B. Mars
C. Mercury

How many terrestrial planets are there?

A. 4
B. 5
C. 6

Which planet has no atmosphere?

A. Neptune
B. Mars
C. Mercury

What planet has the widest temperature range?

A. Earth
B. Mercury
C. Saturn

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Worksheet 7 Name:

More Planet Trivia!

Cut the trivia cards out on the dotted lines. Place in the pile face down. Take turns asking questions to your partner.

Which planet has the only known life forms?

A. Mars
B. Jupiter
C. Earth

Which planet is surrounded by clouds containing a poisonous gas called sulfuric acid?

A. Venus
B. Neptune
C. Uranus

How many known planets are in our solar system?

A. 9
B. 8
C. 10

How many known dwarf planets are in our solar system?

A. 5
B. 6
C. 4

What planet is closest to the sun?

A. Mars
B. Venus
C. Mercury

What planet is furthest from the sun?

A. Saturn
B. Neptune
C. Uranus

How many days does it take Earth to orbit the sun?

A. 12
B. 225
C. 365

What planet has rusted iron in its dusty, rocky surface?

A. Venus
B. Mars
C. Jupiter

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More Planet Trivia!

Cut out the trivia cards. Place in a pile face down. Take turns reading aloud with a partner. Each correct answer gets a point.

Phobos and Deimos are moons of which planet?

A. Neptune
B. Mercury
C. Mars

The layer beneath the Earth's crust is called the _____

A. inner core
B. mantle
C. outer core

I rotate on an axis that is nearly horizontal. Which planet am I?

A. Saturn
B. Uranus
C. Neptune

Which planet takes about 165 years to orbit the sun?

A. Neptune
B. Jupiter
C. Venus

I rotate around the sun about every 88 days. Which planet am I?

A. Mars
B. Venus
C. Mercury

I spin in the opposite direction that other planets do. Which planet am I?

A. Saturn
B. Earth
C. Venus

Which planet has seasons that last for about 40 years long?

A. Jupiter
B. Neptune
C. Uranus

I am the third planet from the sun. Which planet am I?

A. Earth
B. Venus
C. Mars

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Name:

Even More Planet Trivia!

Cut these last trivia cards out on the dotted line. Place in the pile face down. Each partner will create one to add to the game.

Which planet's surface is covered by hardened lava flows from volcanoes that erupted long ago?

A. Mars
B. Mercury
C. Venus

Which planet is the largest?

A. Jupiter
B. Saturn
C. Uranus

Which planet is the smallest?

A. Venus
B. Earth
C. Mercury

Which planet is the closest in size to Earth?

A. Mars
B. Venus
C. Uranus

Which planet has seasons that last over 20 years long?

A. Uranus
B. Neptune
C. Saturn

Which planet has moving wind speeds of about 2000km per hour?

A. Jupiter
B. Neptune
C. Uranus

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Worksheet 10 Name:

A Model of the Solar System

You have learned a lot of interesting facts about the planets. Now it is time to create a model of our solar system!

Materials needed:

- 9 Styrofoam balls (4 large, 4 small, 1 extra large)
- assorted colors of paint and paint brushes
- a piece of flat Styrofoam (15 cm x 15 cm)
- a large Styrofoam cup
- a piece of string (30 cm long)
- 13 bamboo skewers
- a ruler
- scissors
- a marker
- masking tape

What to do:

1. Paint the Styrofoam balls the same colors as the planets. (The 4 small will be Mercury, Venus, Earth, and Mars. The 4 large will be Jupiter, Saturn, Uranus, and Neptune. The biggest one is the sun.)
2. Cut the bottom out of the large Styrofoam cup so that the "sun" can sit upright in it when the cup is turned upside down on a table.
3. Using the piece of string, place it around "Saturn". Mark the place on the string where it meets the end. Cut it to the length you need. (This will help you to make the rings).
4. Take the string you cut and make a circle with it on the flat piece of Styrofoam. Carefully outline it with the marker. Then draw **another ring** on the outside of this (about 2 cm away from the inner ring). Cut out the **inner circle**. Then cut out along **the outside of the outer ring**.
5. Once the planets are dry, use the skewers to connect them to the sun. To make them different distances from the sun, you may need to cut or break off pieces of some of the skewers.
6. Use pieces of skewers, masking tape, and a marker to create flag-like labels for the planets.

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