

Lesson Plan

NEUROHEADWAY

Neuroscience Into Education

The Solar System

Lesson Two

Lesson 2 – Extra Advanced activity for gifted and talented students

Find out which planets are currently visible, with the naked eye, in the sky from where you live.

Make a table of when they arise and when they set. Highlight the ones that you could see during your early evening after sunset or early in the morning before the Sun rises.

Make a handout for the rest of the class which has this table and instructions where to look in the sky. Leave a column labelled “Observed”. Ask your classmates to try and find the planets in the sky when they are at home. Get them to tick this box when they see the planet.

To find out when the planets rise and set and where they are visible (e.g. north, south, east or west), use this very good website:

Power point Example

NEUROHEADWAY

Neuroscience Into Education

SOLAR SYSTEM MNEMONICS

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.

- My Violent Evil Monster Just Scared Us Nuts
- My Very Educated Mother Just Served Us Nachos



Solar system artwork: NASA ID number AC72-1279.

Before and after Pluto was demoted:

- My Very Easy Memory Jingle Seems Useful Naming Planets
- My Very Easy Memory Jingle Seems Useless Now

ROCKY PLANETS

The four innermost planets of our solar system are made up of rock, metals, water and ice.

Our planet, Earth, is the largest of them. All three other rocky planets can be seen from Earth by the naked eye.



NASA/Lunar and Planetary Institute

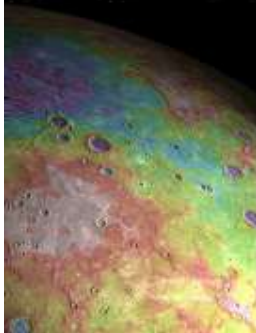
MERCURY

- Mercury is about as wide as the Atlantic Ocean, 18 times smaller than Earth.

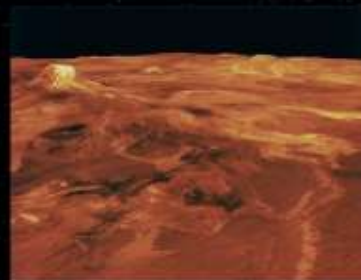
- It is both hot and cold: 425°C on its day side and -175°C on its night side
- It has such low gravity that you could jump three times as high as you could on Earth.
- Doesn't have any moons or natural satellites.



NASA/JHUAPL/CARNEGIE INSTITUTION OF WASHINGTON



VENUS



It was once thought that Venus was a tropical paradise, but was later found to be completely inhospitable. The atmosphere is mostly carbon dioxide, covered in a layer of clouds of **sulphuric acid**.

- Like Mercury, it also has no moons.
- You can see Venus in the night sky. It is the brightest object apart from the Moon.
- If you landed on Venus you would be poisoned by the atmosphere, squashed by the intense atmospheric pressure and burnt to a crisp by the temperature : around 460°C .

ACTIVITY

Draw the position of Mercury at four points in its orbit around the Sun.
Shade in the night side of the planet on each position.

Bonus activity:

List three reasons why life isn't likely to exist on Mercury or Venus.

EARTH



Image Credit: NASA

Earth is the only known planet with water in **frozen, liquid** and **vapour** forms. It is the perfect distance from the sun so the temperature is just right to support life. It is in what we call the **Goldilocks Zone**.

- Our planet is the largest rocky planet in the solar system, and the only one known to support life.
- Was once thought to be the centre of the universe, with the sun and planets orbiting it. It was also believed to be flat, which some (crazy) people still believe today!



NASA / Apollo 8

THE MOON

Our moon is the only other celestial body that mankind has visited. This was done in 1969, with less complex technology than that which is inside your mobile phone today.



Gregory H. Revera



- There have been 6 moon landings in total, all American missions. 12 people have walked on the moon's surface.
- No one has visited the Moon since 1972.
- The gravitational pull from the moon controls the tides on Earth.

MARS

- Pieces of Mars have crash landed on Earth in the form of meteorites that have been ejected from the planet.
- There is water on Mars, but this has only been confirmed in ice form.
- Mars has no oxygen in the atmosphere, so we would have to wear space suits on the surface.
- The temperature varies a lot, but typically is -50 degrees.
- Mars' existence was first recorded by the Egyptians.
- Mars has two small moons, Phobos and Deimos.



Image Source: NASA

Teachers Evaluation and Handouts

Solar System

Lesson Two

The Rocky Planets

Teachers' Notes

Slide 1

Title Slide

Slide 2

Recap: Solar system Mnemonics

Check if the pupils still remember the order of the planets.

Slide 3

Introduction to the Rocky Planets

- The four closest planets to the Sun are made up of rock, metals, water and ice. Only the earth has liquid water. The others are either too hot or too cold to have water in liquid form. Their surfaces range from scorching hot to sub-freezing temperatures.
- They all have an iron core (molten) and a rocky surface
- Our planet, Earth, is the largest of them, and the only known planet to support life.
- Stress that all three other rocky planets can be seen from Earth by the naked eye.

Slide 4 - Mercury

- Mercury is quite small, just a little bigger than our Moon (Mercury's diameter is 4880km and the Moon is 3480 km)
- It is both extremely hot and cold. 425°C on its day side and -175°C on its night. This is because it is very close to the Sun, but has no atmosphere, so while it heats up fast, it loses heat quickly as well.
- It has very low gravity, so you could jump 3 times as high as you could on Earth.
- Stress it has no moons.
- *Extra Fact:* As the iron core of the planet cooled and contracted, the surface of the planet became wrinkly. Scientist have named these wrinkles **Lobate Scarps**. These Scarps can be up to a mile high and hundreds of miles long.

Slide 5 - Venus

- It was once thought to be a tropical paradise until we developed the technology to take a closer look.
- Like Mercury, it gets incredibly hot. It is the **hottest** planet in the solar system, due to its dense atmosphere, which is mainly composed of carbon dioxide. It also has thick clouds of sulphuric acid. So, while it may be around the same size as Earth (considered our 'sister planet'), it has been rendered completely inhospitable.
- We can't see the surface from earth, even with powerful telescopes. This is because the clouds of sulphuric acid make the surface opaque. The image of the surface on the slide, is from radar measurements from NASA's Magellan spacecraft that visited Venus in the 1990s
- It too has no moons.
- You can easily see Venus in the night sky, since it is the brightest object apart from the Moon. But because it is towards the Sun you can only see it at certain times of the year, either at dawn or dusk.

Slide 6 - Activity

Worksheet: Lesson 2 Worksheet 2a.pdf

Draw the position of Mercury at four points in its orbit around the Sun.

Shade in the night side of the planet on each position.

Bonus activity:

List three reasons why life isn't likely to exist on Mercury or Venus.

Extra activity for gifted and talented pupils: Find out which planets are currently visible in the night sky. Since planets orbit the Sun at different speeds to the Earth, they are not always visible. There are certain times when they are visible and here is a good website that gives you daily updates on what is available.

<https://www.schoolsobservatory.org/learn/astro/nightsky/maps>

Worksheet: Lesson 2 Worksheet G&T pupils.docx

Slide 7 - Earth

- Our planet is the only one known to support life. This is due to its distance from the Sun, in the **Goldilocks Zone**, meaning it is neither too hot or too cold.
- The metal core of our planet, coupled with its fast rotation, produces a strong magnetic field that protects us from solar winds (like the **Carrington Event**, mentioned in Lesson 1).
- Though the earth is mostly covered in water, 97% of it is salt water, 2% is frozen, leaving only 1% as fresh water.
- The Earth was once thought to be the centre of the Universe, the Sun and the rest of the planets orbiting it. Ancient civilizations all thought the Earth was the centre of the Universe (including the Greeks and Romans) until 1543 when Copernicus proposed the Sun was at the centre of the solar system, and Galileo (in 1609) proved it to be true with the first observations using a telescope.

Slide 8 - The Moon

- Our moon is the only celestial body other than the Earth that mankind has walked upon. This was done in 1969, with less complex technology than that which is inside our mobile phones today.
- There have been 6 Moon landings in total, all American missions. 12 people have walked on the Moon's surface.
- No one has visited the Moon since 1972.
- The gravitational pull from the Moon controls the tides on Earth.

Slide 9 - Mars

Mars is the planet we know the most about, and the one we have sent most unmanned missions to (45, but only around half of these resulted in success). It is a potential habitat for humans in the future, and while does not support life today, it could potentially have done so in the past.

- Pieces of Mars have crash landed on Earth in the form of meteorites that have been ejected from the planet.
- There is water on Mars, but has only been confirmed in ice form.
- Liquid water is likely to have been present in the past, since we see geographic features like dried up river flows and canyons on the surface.
- Mars has no oxygen in the atmosphere, so we would have to wear space suits on the surface.
- The temperature varies a lot from the equator to the poles. A typical temperature is -50 degrees Celsius. But temperatures of around +20 degrees (warmer than the UK and Ireland !) have been recorded near the equator during the day at Mars noon.
- Mars' existence was first recorded by the Egyptians.

- Mars has two small moons, Phobos and Deimos.

Slide 10 - Curiosity Rover

- In 2012, the Curiosity Rover landed on Mars with a mission:
- Determine whether Mars could ever have supported life.
- Plan for a Human mission to Mars.
- Though the mission was only supposed to last 98 days, Curiosity has been exploring the planet for 6 years! Ground control programmed him to sing Happy Birthday to himself on the 1st anniversary of landing in 2013.

Curiosity has a certain 'cute' personality that the pupils can relate to. It looks a lot like the Disney robot Wall-E, definitely something to play up on.

Slide 11

Activity:

Lesson 2 Worksheet 2b.pdf

Answer the multiple choice questions

Answers for the teacher are labelled on:

Lesson 2 Worksheet 2b Answers.pdf