

Gr. 6 Science

The Universe and Our Solar System

Students will be able to:

<ul style="list-style-type: none">• Explain the overall scale, structure and age of the universe
<ul style="list-style-type: none">• Explain the components of our solar system
<ul style="list-style-type: none">• Describe the differences between planets, moons, asteroids, comets and meteors

In this project, you will create a presentation using PowerPoint to demonstrate your learning of the following:

You may choose to do the 'MEETING' ACTIVITIES, that include:

- Question 1 - a to d (inclusive), and g
- Question 2
- Question 3 - Definitions only

Or, you may do 'FULLY MEETING' and 'EXCEEDING' that include:

- ALL questions and elements
- The difference between Fully Meeting and Exceeding will be in your presentation of the concepts.
- To achieve Exceeding, you must demonstrate a clear understanding of the concepts and content, and you must make CONNECTIONS that are meaningful and thoughtful.
- Example: (you may not use this one) - The space between stars is like the space between continents. While flying over the oceans, there is nothing there. It is a long flight that takes many hours in a plane. Imagine that you are a mosquito, and you have to fly from New York City to Madrid, Spain. That distance and time would be what it is like to fly to the next nearest star in our own galaxy.

1. You will explain the cosmologic size, the basic structure, and the age of the universe by answering the following questions.
 - a. How old is the universe?
 - b. What is the Big Bang (simple explanation)?
 - c. How big is the universe?
 - d. How old is the Earth?
 - e. How was the moon formed?
 - f. What are 5 - 10 entities you will find in the universe?
 - g. Extras - no fewer than two
2. You will explain our solar system and its major components (planets, moons, sun, asteroid belts, etc.)
3. You will demonstrate an understanding of (describe) and explain the difference between
 - a. Planets and moons
 - b. Asteroids, comets, and meteorites

Strategies for completing this assignment.

1. Create a document/PowerPoint/notes that will have clear HEADINGS for each question.
2. Answer one question at a time.
3. Read from various sources of information BEFORE taking notes. UNDERSTAND the concepts before note taking.
4. Watch videos explaining the concepts. TAKE NOTES from those videos.
5. Keep you notes organized.
6. Use HEADINGS and TITLES to keep things separated.

Resources:

1. [European Space Agency \(ESA\) for Kids](#) - This page is a great place to start. There are other links on the page to help you with other elements of this assignment.

https://www.esa.int/esaKIDSen/SEM4EBE8JG_OurUniverse_0.html

2. [Science Kids](#) (New Zealand) - This is a great place to start your research for the section on our solar system.

<http://www.sciencekids.co.nz/sciencefacts/space/solarsystem.html>

3. Kids Fun World - <http://www.kidsworldfun.com/amazing-facts/space-and-the-universe-for-kids.php>
4. Kids Fun World - <http://www.kidsworldfun.com/amazing-facts/interesting-space-facts.php>
5. There are more pages to look at on Kids Fun World. Scroll to the bottom of the facts sheets and you will find more pages to which you can navigate.
6. Space Kids - <http://space-kids.org/solar-system/>
7. Planets for Kids - <http://www.planetsforkids.org/>
8. The Big Bang (DKFindOut) - <https://www.dkfindout.com/us/space/stars-and-galaxies/big-bang/>
9. The Big Bang (ESA Kids) - https://www.esa.int/esaKIDSen/SEMSZ5WJD1E_OurUniverse_0.html

The information on the next few pages will help you answer some of the questions. Use the resource links provided above to help you too. Remember, do one question at a time if you are having trouble keeping organized.

The Universe – From ESA Kids: The story of the universe

The Universe is everything we can touch, feel, sense, measure or detect. It includes living things, planets, stars, galaxies, dust clouds, light, and even time. Before the birth of the Universe, time, space and matter did not exist.

The Universe contains billions of galaxies, each containing millions or billions of stars. The space between the stars and galaxies is largely empty. However, even places far from stars and planets contain scattered particles of dust or a few hydrogen atoms per cubic centimeter. Space is also filled with radiation (e.g. light and heat), magnetic fields and high energy particles (e.g. cosmic rays).

The Universe is incredibly huge. It would take a modern jet fighter more than a million years to reach the nearest star to the Sun. Travelling at the speed of light (300,000 km per second), it would take 100,000 years to cross our Milky Way galaxy alone.

No one knows the exact size of the Universe, because we cannot see the edge – if there is one. All we do know is that the visible Universe is at least 93 billion

light years across. (A light year is the distance light travels in one year – about 9 trillion km.)

The Universe has not always been the same size. Scientists believe it began in a Big Bang, which took place nearly 14 billion years ago. Since then, the Universe has been expanding outward at very high speed. So the area of space we now see is billions of times bigger than it was when the Universe was very young. The galaxies are also moving further apart as the space between them expands.

The Solar System is a very exciting place. Much of it is still unknown to us and we discover new things about it every day. As technology is advancing so is our ability to see further into this amazing space that surrounds our planet. Here are some great facts about Earth's neighbourhood.

- **The Solar System is 4.6 billion years old!** There are many theories on how the Solar System came to be. Unfortunately, no one was here to see how it was created so we can only look at the science and figure out for ourselves what makes sense.
- **The most popular idea for the creation of the universe is the Big Bang Theory.** To put it simply this is the idea that 14 billion years ago the universe was just a tiny space. This space was very hot and dense. All of a sudden, this space expanded very quickly like an explosion sending pieces of the universe, space and time all over space. All of these things are still growing today as our universe continues to change.
- **The Solar System is classed as the Sun and all objects that go around it, controlled by the Sun's gravity.** This includes planets, asteroids, moons, comets and many more! The bigger the object is, the more gravity it has, because the Sun is so huge it has enough gravity to hold all these items in orbit. Some are tiny but some that aren't even classed as planets are bigger than the planet Mercury, for example Jupiter's moon Ganymede.
- **As of 2015 there are 8 planets and 5 dwarf planets in the Solar System.** In order of distance from the Sun these planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. The dwarf planets in order of distance from the sun are Ceres, Pluto, Haumea, Makemake and Eris.
- **There are four inner planets called the terrestrial planets.** These are Mercury, Venus, Earth and Mars. These are made up of metal and

rocks and have a very heavy core. They tend to have surfaces marked with craters, valleys, mountains and volcanoes. These things make them very different to the outer planets.

- **There are four outer planets called the gas giants.** These are Jupiter, Saturn, Uranus and Neptune. These tend to be larger than the four inner planets and have very thick atmospheres full of gas such as hydrogen and helium. Jupiter and Saturn are almost entirely made of these gases whilst it only forms the outer layer of Uranus and Neptune. It would be almost impossible to land on these planets as they only have a very small solid core, the rest of the planet is made up of stormy gases and severe temperatures.
- **There are five dwarf planets and probably more to be found!** These are Ceres, Pluto, Eris, Makemake and Haumea. A dwarf planet is an object that goes around the Sun (this is called orbiting), is big enough to make a large roundish shape, does not move items out of its orbit path and is not a moon. Scientists believe there could be hundreds more waiting to be found.
- **Between Mars and Jupiter there is an asteroid belt.** This is a section of space filled with millions of oddly shaped asteroids. They go around the sun in the space between Mars and Jupiter's orbit path. Scientists think it is likely that these asteroids were either unable to form a planet, or are pieces of a planet that broke apart long ago. One of the objects in this area is the dwarf planet Ceres.
- **Beyond the orbit of Pluto is the Kuiper Belt.** This is similar to the asteroid belt. It is a disk-shaped area that goes around the Sun filled with small space objects. However instead of asteroids the Kuiper Belt mostly contains objects that are made out of dust and frozen gases. These are called comets. Every so often one of these will lose its place in orbit and be thrown back towards the Sun. These can sometimes be spotted from Earth as they melt into a ball of light. The Kuiper belt is also 20 times bigger than the asteroid belt.
- **Outside of the Kuiper Belt is an area called the Oort Cloud.** This area is sort of like a huge cloud containing more icy objects and comets. The area does not rotate around the Sun, this is thought to be because the Sun is so far away, its gravitational pull is not as strong as other large stars surrounding the Oort Cloud.
- **In ancient times people were unaware of the Solar System.** It was actually believed that the Earth was the center of the universe and that all objects orbited around us!

- Several very intelligent astronomers and scientists created the new sun centric model. They helped to explain how the Sun is the center of the universe and its huge amount of gravity causes all other items in the Solar System to travel around it. The names of these astronomers are Nicolaus Copernicus, Galileo Galilei, Johannes Kepler and Sir Isaac Newton.
- Most of the Solar System's mass is contained in the Sun. It is so big that it makes up 99.86% of the Solar System! The other big planets, Saturn and Jupiter make up for most of the rest. Compared to these, other planets like Earth and Mars are very small and make a up for a very tiny percentage.

The Big Bang Theory (no...not the tv show)

Most astronomers believe the Universe began in a Big Bang about 14 billion years ago. At that time, the entire Universe was inside a bubble that was thousands of times smaller than a pinhead. It was hotter and denser than anything we can imagine.

Then it suddenly exploded. The Universe that we know was born. Time, space and matter all began with the Big Bang. In a fraction of a second, the Universe grew from smaller than a single atom to bigger than a galaxy. And it kept on growing at a fantastic rate. It is still expanding today.

As the Universe expanded and cooled, energy changed into particles of matter and antimatter. These two opposite types of particles largely destroyed each other. But some matter survived. More stable particles called protons and neutrons started to form when the Universe was one second old.

Over the next three minutes, the temperature dropped below 1 billion degrees Celsius. It was now cool enough for the protons and neutrons to come together, forming hydrogen and helium nuclei.

After 300 000 years, the Universe had cooled to about 3000 degrees. Atomic nuclei could finally capture electrons to form atoms. The Universe filled with clouds of hydrogen and helium gas.

The Birth of the Moon

The Moon has been circling the Earth for more than four billion years. But where did it come from? Some scientists thought that it was captured by the Earth when it came too close. Others thought that it was once part of the Earth.

Today, most scientists believe it is the 'Earth's child'. It was born when a wandering planet crashed into the young Earth. Huge amounts of material were thrown into space, eventually coming together to form the Moon. This 'big splash' theory would explain why the Moon's rocks are very similar to those on the Earth.

Unlike the Earth, the Moon seems to be dead inside. Today, there are no volcanic eruptions and any Moonquakes are very small. At its centre is a small, solid iron core. There is no magnetic field, so explorers could not use compasses on the Moon.

The Big Bang Theory. Origin of the universe.

