

The Moon



The Moon's relationship with Earth

- The Moon orbits the Earth every 27.3 days.
- The tides on Earth are caused mostly by the gravitational pull of the Moon and the Sun.
- The Moon's gravitational pull slows the Earth's rotation and makes the planet more stable.

The formation of the Moon

- The Moon was formed around 4.5 billion years ago when a large rock collided with the Earth.
- When it formed the Moon was much closer to Earth – approximately 14,000 miles away compared with approximately 250,000 miles today.
- The Moon is moving away from Earth by about 3.8cm a year.
- The Moon has a diameter of 2,000 miles and it has about the same surface area as the continent of Africa. It is the fifth largest moon in the Solar System.

The surface of the Moon

- The surface of the Moon is covered in impact craters as a result of asteroids and comets that have hit its surface over time. Most of these craters are billions of years old.
- There is no rain or wind on the moon and the atmosphere is very thin.

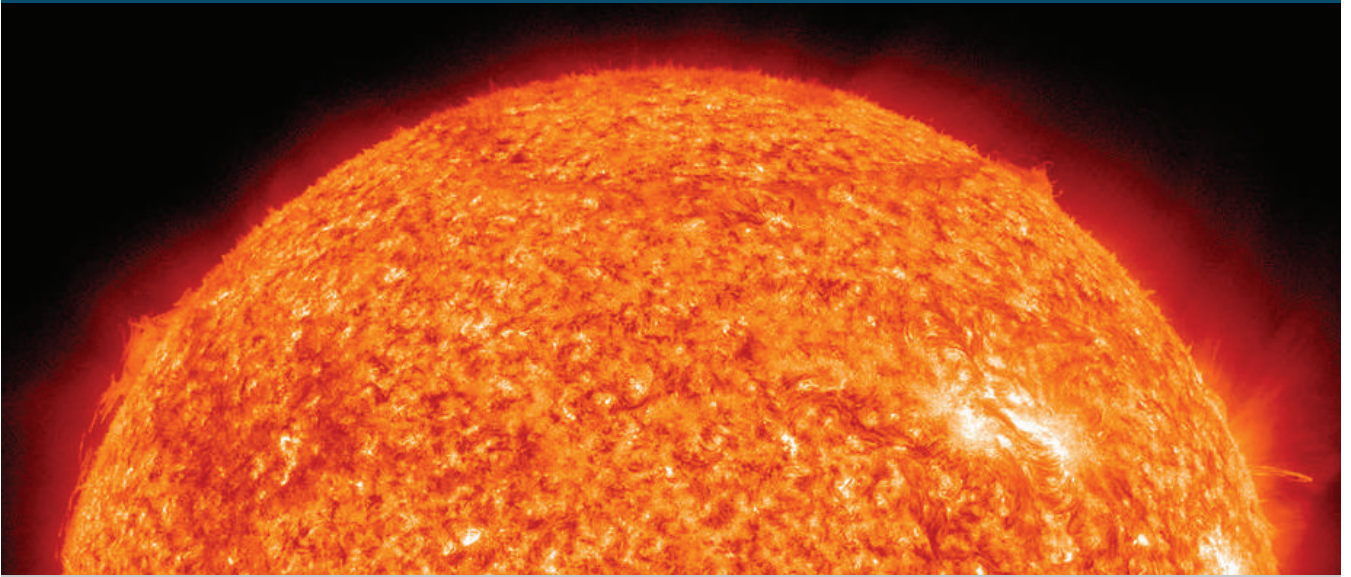
Phases of the Moon

- The Moon does not make its own light but rather it reflects light from the sun.
- The Moon has different 'phases' which make it appear as if it is changing shape in the sky. It appears to grow from a thin crescent to a full disk and then shrink back to a thin crescent again before disappearing for a few days.
- It doesn't actually disappear or change shape it only appears to because we see the bright parts of its surface at different angles as it orbits the Earth.

Travelling to the Moon

- The USA's Apollo 11 mission in July 1969 was the first manned Moon landing. During that mission Neil Armstrong became the first man to walk on the moon.

The Sun



What is the Sun?

- The Sun is a star. Stars are big exploding balls of gas, made up mostly of hydrogen and helium.
- Stars vary in size, temperature and age.
- The Sun is a medium sized star known as a Yellow Dwarf.
- The Sun (and the planets of the Solar System) formed about 4.59 billion years ago and it has enough Hydrogen to burn for another 5 billion years.
- The Sun orbits the Milky Way galaxy.

The Sun's relationship with Earth

- The Sun is the star at the centre of our Solar System.
- The Earth orbits the Sun once every 365 days.
- The Earth is one of 8 planets that orbit the Sun in our Solar System.
- The gravity of the Sun holds all the planets in place.
- Energy from the Sun is essential to the Earth and without it there would be no life on the planet.
- The Sun warms the Earth and is responsible for our climate and weather.
- It is 92.96 million miles from the Earth.
- It takes 8 minutes for light from the Sun to reach the Earth.
- Looking directly at the Sun without protective glasses is very dangerous.

Temperature and size

- The Sun is the biggest object in the Solar System. It makes up 99.8% of the entire mass of the whole Solar System.
- The diameter of the Sun is 864,938 miles and approximately one million Earths could fit inside it.
- The temperature inside the Sun can reach as high as 15 million degrees Celsius and 5,500 degrees Celsius on the surface.

Our Solar System



What's in the Solar System?

- The Solar System is made up of all the planets that orbit the Sun as well as moons, comets, asteroids, dwarf planets, dust and gas.
- The Sun is the largest object in our Solar System, containing 99.8% of the Solar System's mass. It is thought that the edge of the Solar System is about 9 billion miles from the Sun.

The formation of the Solar System

- The Solar System was formed around 4.6 billion years ago from a giant, rotating cloud of dust and gas known as the solar nebula.
- There are billions of other Solar Systems in the Milky Way galaxy and there is thought to be over 100 billion galaxies in the universe.

The planets of the Solar System

- There are 8 planets in the Solar System as well as many dwarf planets like Pluto.
- Mercury, Venus, Earth and Mars are considered the four 'inner planets'. They are made mostly of rock and metal and are smaller than the four 'outer planets': Jupiter, Saturn, Uranus and Neptune.
- The outer planets are also known as gas giants.
- Jupiter is the biggest planet in the Solar System and Mercury is the smallest.
- No human has walked on another planet but we have walked on the moon and we have sent unmanned space probes to fly past and land on other planets in the Solar System.

The weather of the Solar System

- Earth has the weather best suited to sustaining life. The weather on the other planets is very extreme.
- Mercury and Mars have very thin atmospheres and experience big changes in temperature.
- Venus has a very thick atmosphere and is about five times hotter than boiling water.
- Jupiter is a very stormy planet. The Great Red Spot visible on its surface shows a storm that has been raging for at least 400 years.
- Saturn, Uranus and Neptune are also very stormy and have extremely fast winds.
- Neptune has wind speeds that reach 1600mph – the fastest in the Solar System.
- Uranus is the coldest planet with temperatures getting as low as -224 degrees Celsius.

Galaxies



What is a galaxy?

- A galaxy is a huge group of stars, gas and dust, which is held together by gravity.
- It is thought that galaxies formed shortly after a cosmic 'big bang' that began the universe.
- It is possible for a single galaxy to have as many as a 100 trillion stars.
- Some galaxies are relatively small with around 10 million stars. These are called dwarf galaxies.
- The light from stars can take millions of years to reach Earth, so looking up at the stars is a bit like looking back in time.

Our galaxy

- We live in the Milky Way galaxy. This is just one of over 100 billion galaxies in the universe.
- The Milky Way contains between 100-400 billion stars and there is at least one planet per star.
- It is thought that the Milky Way contains at least two billion planets that have liquid water on their surfaces and orbit around their stars in the 'habitable zone'. It is possible that these planets could sustain life.
- The Milky Way is thought to be about 13.2 billion years old. This makes it almost as old as the universe which is thought to be about 13.8 billion years old.
- Most galaxies fall into one of three categories based on their shape: spiral, elliptical or irregular.
- The Milky Way is a Spiral galaxy.
- Galaxies regularly gain and lose stars. A galaxy the size of the Milky Way is thought to gain seven new stars per year.

Space exploration



- Space begins 100km above the surface of the Earth.
- The first rocket to reach space was the German V2 in 1942.

Animals in Space

- The first animals to reach space were fruit flies, sent aboard captured German V-2 rockets in 1947.
- The first mammal in space was a Rhesus monkey called Albert II in 1949.
- The first animal to orbit Earth was a dog called Laika in 1957.

Humans in space and the Moon landings

- Russian cosmonaut Yuri Gagarin orbited the Earth in 1961 and became the first man in space.
- The first woman in space was Valentina Tereshkova in 1963.
- The first spacecraft to reach the surface of the Moon was the unmanned Luna 2 in 1959.
- On July 20 1969, Neil Armstrong became the first man to walk on the Moon.

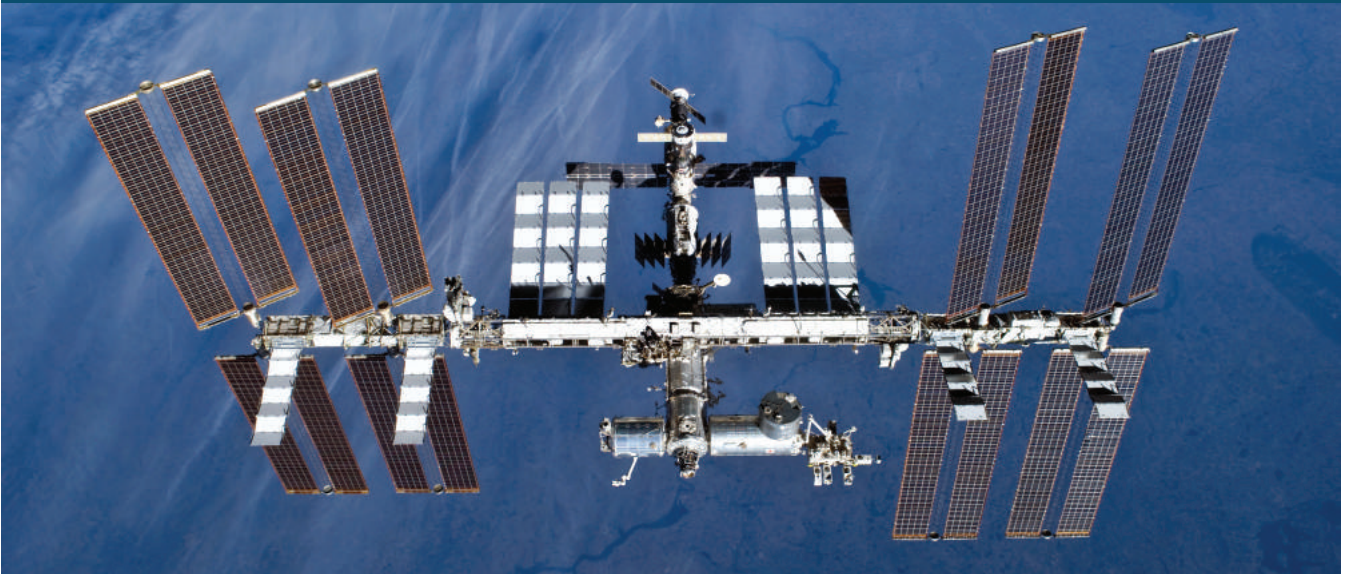
Beyond the Moon

- Unmanned space probes have been sent to 'flyby' and land on planets, asteroids and comets throughout the Solar System.
- The spacecraft that has travelled the furthest distance from Earth is called Voyager 1. It was launched in 1977 and flew past Pluto in 1990. It is travelling at a rate of approximately 11 miles per second. It is now thought to have left our Solar System.
- There is a golden record aboard Voyager 1 which contains lots of images from Earth as well as natural sounds, greetings in different languages and music.

The Space Shuttle

- Until 1981 all spacecraft were designed to be used just once.
- NASA's Space Shuttles were designed to be reused.
- They performed 135 missions flights into Space before being retired in 2011.
- In order to break free of Earth's gravity a space shuttle has to travel at a speed of 15,000 mph.
- In doing so it consumes 1.9 million litres of fuel - enough to fuel 42,000 cars.

Satellites



What are artificial satellites?

- Artificial satellites are built by humans and sent into space to orbit the Earth or other planets.
- Artificial satellites are very different to natural satellites like the Moon.
- Artificial satellites are launched into orbit using rockets.
- The first artificial satellite in Space was Sputnik 1 which was launched in 1957.
- As of 2015 there are approximately 2,465 artificial satellites orbiting the Earth.
- Artificial satellites must travel at very fast speeds (around 17,500 mph) to stay in orbit.
- We use artificial satellites for all sorts of things including: navigation, broadcasting TV programmes, relaying telephone calls, predicting weather patterns, spying and map making.

The Hubble Space Telescope

- The Hubble Space Telescope is a big telescope that was launched into low Earth orbit in 1990.
- Hubble can see space better than telescopes on Earth because it is outside the Earth's atmosphere.
- It takes high-resolution pictures of galaxies, planets and stars. It has seen galaxies that are billions of light years away and has even seen the birth and death of stars.
- Pictures from Hubble have helped scientists calculate the size and age of the universe.

The International Space Station

- The International Space Station is a habitable artificial satellite launched into low Earth orbit 1998.
- It is a big science laboratory in Space used for research and also serves as a home for crews of astronauts and cosmonauts while they work there.
- The ISS travels at a speed of 17,500 mph and orbits Earth every 90 minutes.