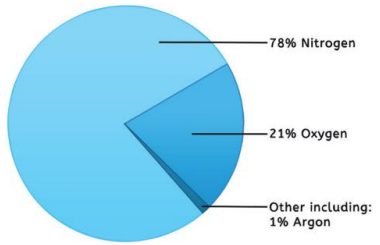
Astrophysics

Keyword	Definition
Attraction	When two or more things come together, eg the north pole of a magnet is attracted to the south pole of a magnet.
Gravity	The force of attraction between all objects. The more mass an object has, the larger the force of gravity it exerts.
Mass	Amount of matter there is in something. Measured in kilograms, kg.
Orbit	An orbit is the path that an object takes in space when it goes around a star, a planet, or a moon.
Repulsion	When two or more things are forced apart, eg the north pole of a magnet is repelled by the north pole of another magnet.
Season	One of four times of the year (winter, spring, summer or autumn).
Solar System	The solar system consists of the Sun, with planets and smaller objects such as asteroids and comets in orbit around it.
Star	A large mass at the centre of a Solar System (if there are other bodies present) that produces heat and light, eg the star at the centre of our Solar System is called the Sun.
Weight	The force of gravity on an object. Measured in newtons, N.

Keywords

The pie chart below shows the abundance of each gas in our atmosphere.

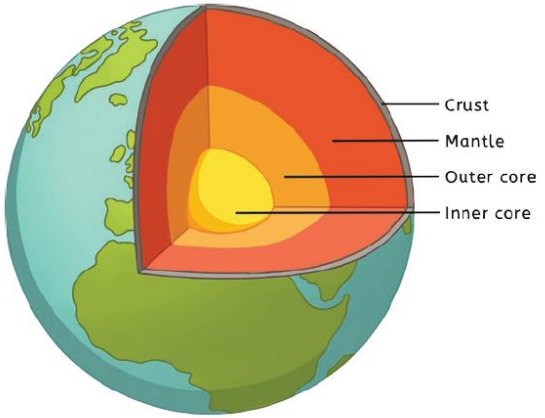


Atmosphere

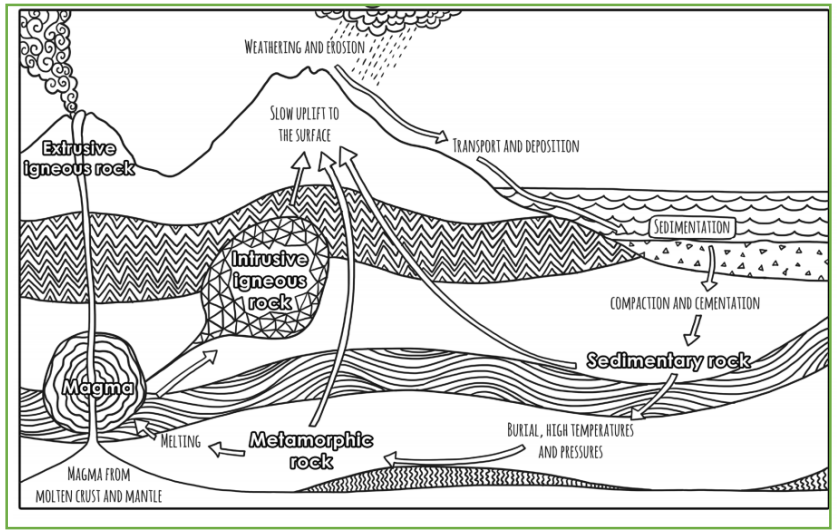
Earth

Earth Structure

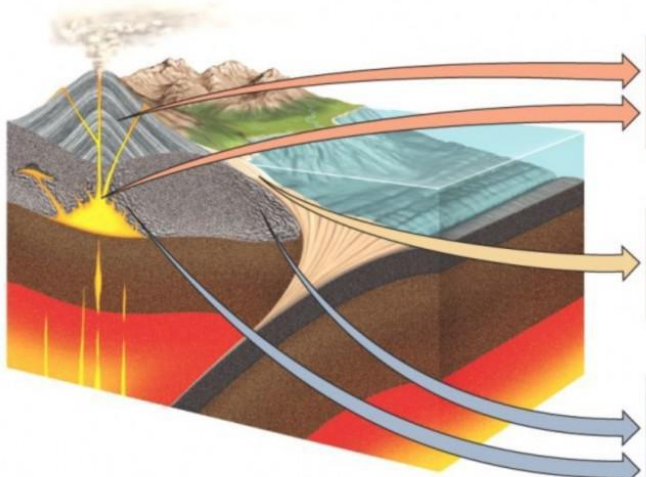
Inner Core: Solid iron and nickel
Outer core: Liquid layer of iron and nickel
Mantle: classed as a liquid.
Crust: Land is made of **continental crust**, made mostly from ***granite.*** The layer beneath the ocean bed is made of **oceanic crust**, which is made mainly from ***basalt.***

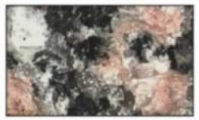


Rock Cycle

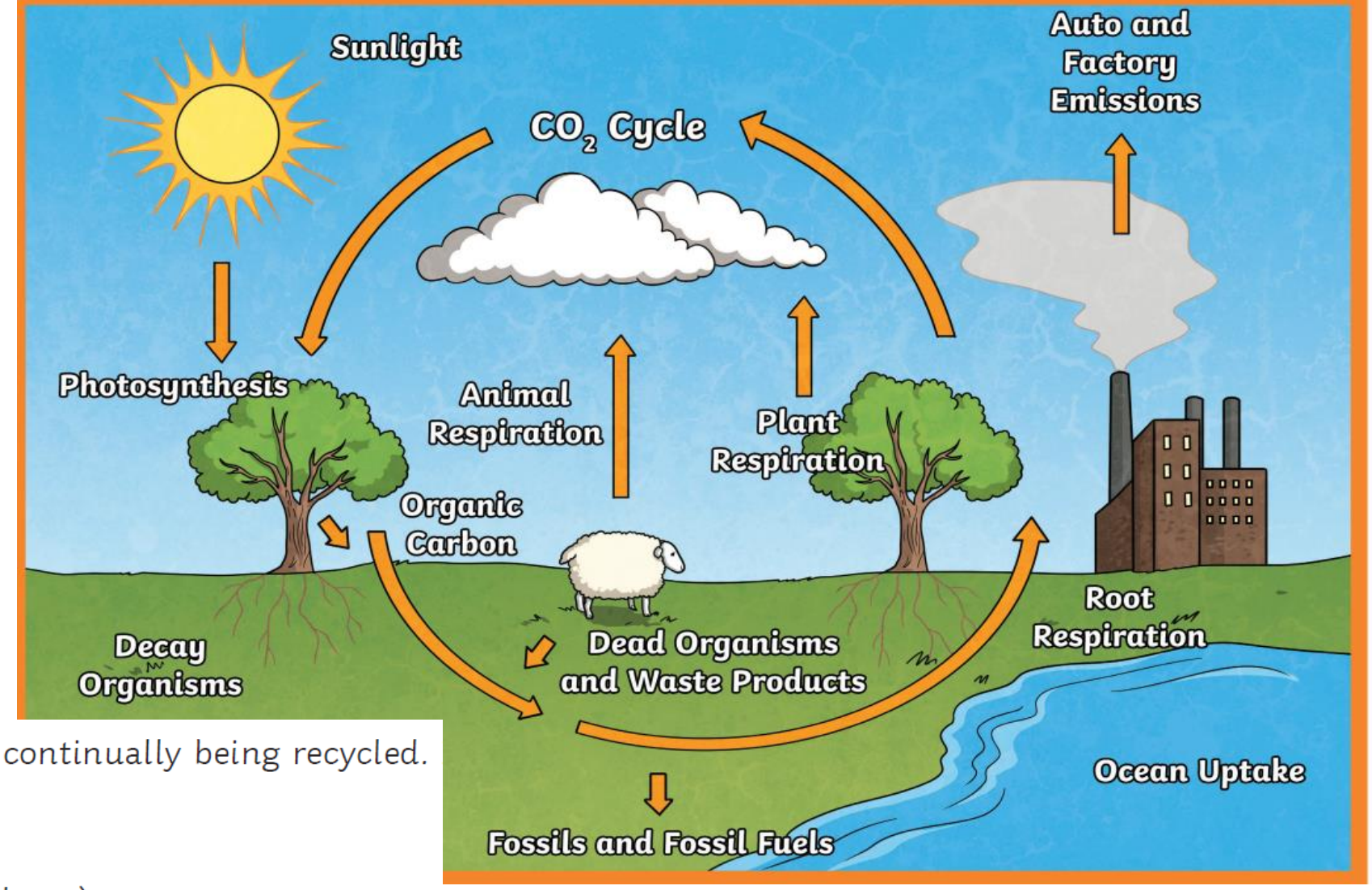


Types of Rock



Type of rock and source material	Rock-forming process	Example
IGNEOUS Melting of rocks in hot, deep crust and upper mantle	Crystallization (solidification of magma or lava)	 Coarsely crystallized granite
SEDIMENTARY Weathering and erosion of rocks exposed at surface	Deposition, burial, and lithification	 Bedded sandstone
METAMORPHIC Rocks under high temperatures and pressures in deep crust and upper mantle	Recrystallization in solid state of new minerals	 Gneiss

The Carbon Cycle



The carbon cycle illustrates how carbon is continually being recycled.

1. photosynthesis (involving all plants);
2. respiration (involving all animals and plants);
3. combustion (the burning of fuels);
4. decomposition;
5. consumerism (carbon being passed along a food chain).

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Weight and Mass

Mass is the amount of matter there is in something. It is measured in kilograms, **kg**. An objects mass the same everywhere in the universe.

Weight is the force of gravity on an object. All forces including weight are measured in Newtons, **N**. Gravity is not the same everywhere. So, an object's weight depends on where in the universe it is.

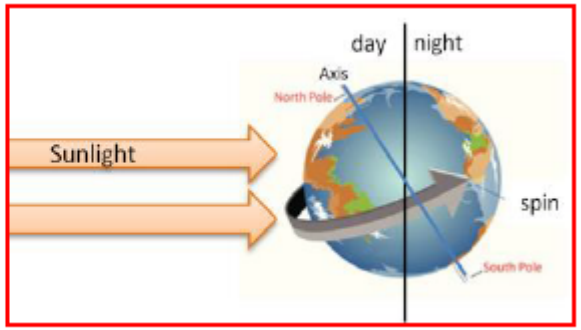
To work out the weight of an object we do some Maths. **Weight (N) = mass (kg) x gravitational field strength (N/kg)**

W = m x g

The moon has a smaller gravitational field strength than the Earth. This means that an object or person would weigh less on the moon. Their mass would remain the same.

Day and Night

The Earth rotates (spins) round on its axis once in 24hours. We spin into the light – day - and then back out again – night

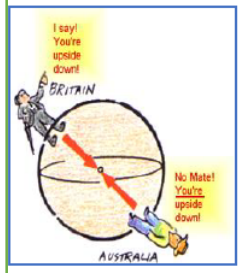


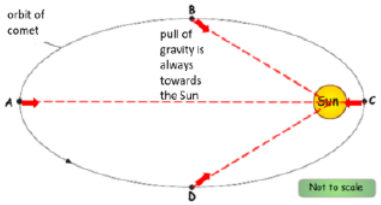
Forces

Gravity

The planets are held in their orbits by the force of the **Sun's gravity**. The Moon is held in its orbit round the Earth by the Earth's gravity.

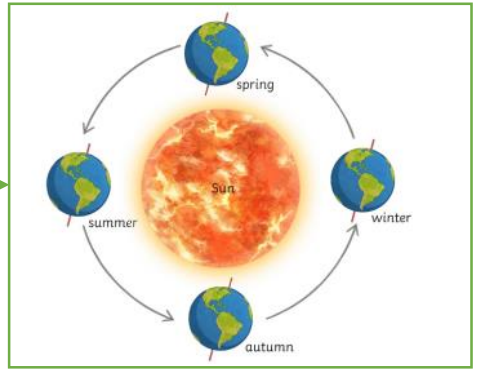
The Sun's gravity also holds dwarf planets and asteroids in their orbits. Comets orbit the Sun too. The Suns gravity pulls them in from beyond the orbit of Pluto. The **closer** they get to the Sun the **stronger the force of gravity** gets and the **faster they go**. Gravity **always pulls things towards the centre** of the mass making the gravity. So on Earth it pulls down to the centre of the Earth.





Night and day

Seasons

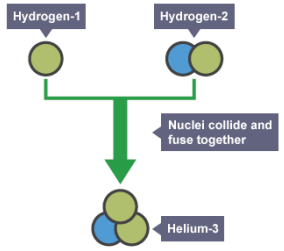


The Earth orbits the Sun ***once every 365 days***. Planets further out from the Sun travel more slowly and take longer to go round once. The Earth's axis is tipped over in space. In Britain we get different ***seasons*** because sometimes we are tilted towards the Sun and sometimes away.

Nuclear Fusion

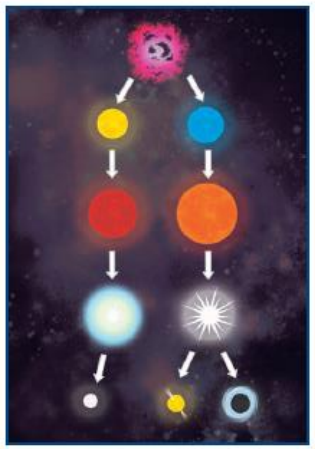
Fusion reactions occur naturally in stars like our sun, where two hydrogen **nuclei** fuse together under high temperatures and pressure to form a nucleus of helium.

Energy is released as **electromagnetic radiation** such as light, **infra-red radiation** and **ultra violet radiation**, which then travels through space.

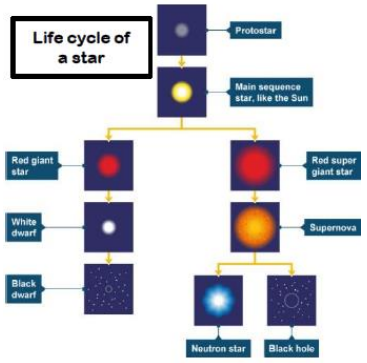


Stars

1. Stars are made from a cloud of dust and gas – a **nebula**. Gravity pulls the dust and gas together, forming a **protostar**.
2. The more dense the star, the hotter it becomes. Fusion of the hydrogen nuclei starts, emitting a lot of energy.
3. The next stage is the **main sequence star**. This stage will last for a few billion years. This is a stable phase as the force of gravity and fusion of hydrogen are balanced. Hydrogen is fused and forms helium; as this happens, energy is released.



4. Hydrogen begins to run out, turning the star into a **red giant (like the Sun)** or a **red super giant**, depending on the size of the star.
5. A red giant will become a **white dwarf** by getting rid of the outer layers of dust and gas. It will then cool down and become a **black dwarf**.
6. Red super giants will initially glow brightly. Then, they will explode into a **supernova**. The supernova will get rid of its outer layer of dust and gas and will form a black hole.



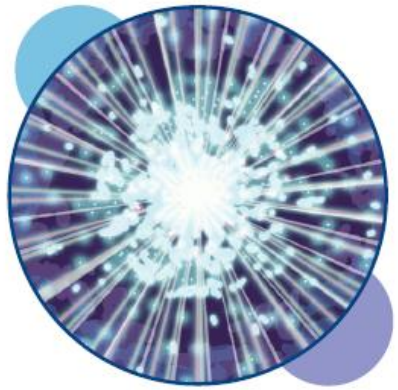
Astrophysics

Big bang

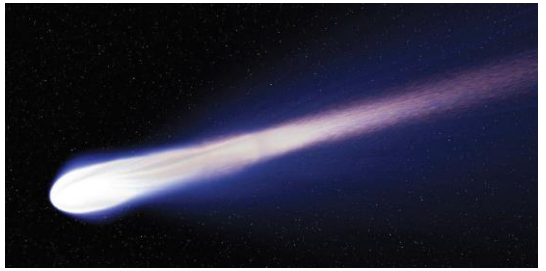
The Big Bang is a model that describes the beginning of the universe.

13.7 billion years ago the universe was a very small, hot, and dense object that rapidly expanded. As it cooled, atoms formed clouds of gas that became galaxies.

This model is based on extensive evidence.



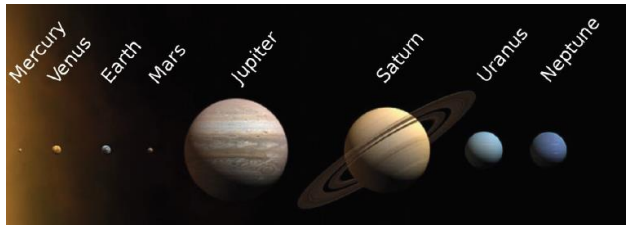
Comet



A comet is frozen dust particles that are orbiting the Sun.

Planets

Planets are objects that orbit a star (the Sun). A dwarf planet will orbit a star but will be too small to be a planet, or not quite fit the pattern of a normal planet. Pluto is an example of a dwarf planet. Moons orbit planets and are also known as natural satellites. Planets are natural satellites of the Sun. Artificial satellites are satellites that humans have built and they mostly orbit the Earth.



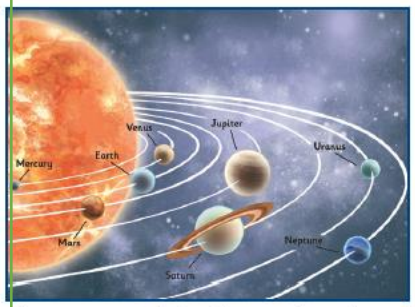
The planets in the solar system are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

Meteor

A meteor is the name given to pieces of dust and rock travelling through the sky.

Solar System

The solar system is part of the Milky Way galaxy and is made up of the Sun and anything that goes round it (orbit). There are 8 planets and some dwarf planets, including Pluto.



Asteroid

The Solar System contains smaller objects called **asteroids** - these orbit the Sun in highly **elliptical** orbits, which are oval or egg-shaped and may take millions of years to complete. Asteroids are made of metals and rocky material. There are large numbers of asteroids orbiting the Sun in the asteroid belt between Mars and Jupiter. There are also many in a region beyond Neptune called the Kuiper Belt.

Astrophysics

Space Race

ISS

Moon

Mars

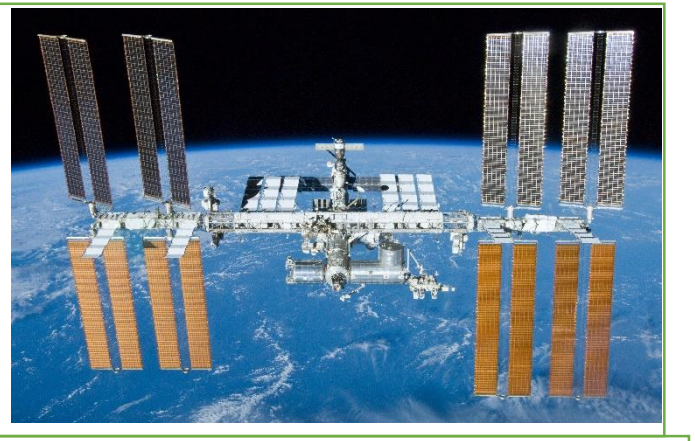
Exoplanet

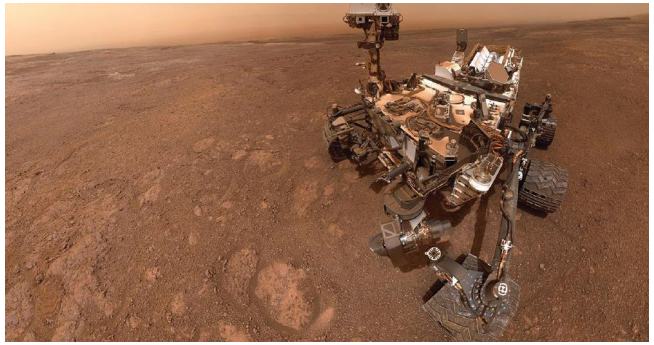
Date	Major events of the Space Race
1957	The USSR launches Sputnik 1 - the world's first telecommunications satellite. Sputnik 2 was launched later that year and carried a small dog named Laika – the first living animal to go into orbit.
1959	The USSR launches Luna 1 - the first man-made object to orbit the sun. The USA then sent Pioneer 4 to do a fly-past of the Moon, prompting the Soviets to launch Luna 2 at the moon.
1960	The USA launches Discovery XIV - the first satellite equipped with a spy camera.
1961	The USSR puts the first man, Yuri Gagarin, into space. The USA responds by launching its own Apollo missions, and Alan Shepard becomes the first American in space. President John F Kennedy challenges America to put a man on the moon by the end of the decade.
1969	The American astronauts, Neil Armstrong and Buzz Aldrin, become the first men to walk on the moon.

The ISS is science lab in orbit 400 km around the Earth.

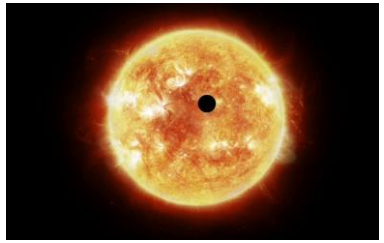
6 people live on it at all times.

It was built by several countries working together. It will be decommissioned in 2031.





Space probes and landers are also looking for extra-terrestrial life. Space probes photograph planets, looking for evidence of life. We have photographs of channels on Mars that may have been created by flowing water. Landers touch down on planets and take a soil sample, which is analysed for evidence of life.

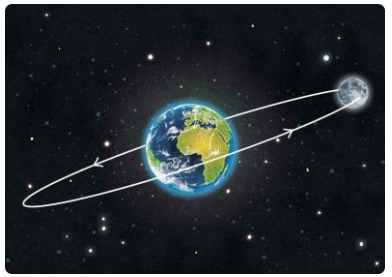


All of the planets in our solar system orbit around the Sun.

Planets that orbit around other stars are called **exoplanets**.

They are very hard to see directly with telescopes as they are relatively small and very far away.

In addition, exoplanets are hidden by the bright glare of the stars they orbit.



The Moon is an example of a natural satellite.

The moon takes 27 days and 7 hours to orbit the Earth.

As the Moon moves around the Earth, its shape appears to change. This is known as phases of the Moon.