8 Space

The order of the planets:
My **V**ery **E**asy **M**ethod **J**ust **S**peeds **U**p **N**aming (**p**lanets)
- **M**ercury
- **V**enus
- **E**arth
- **M**ars
- **J**upiter
- **S**aturn
- **U**ranus
- **N**eptune
- (**P**luto is now a dwarf planet)

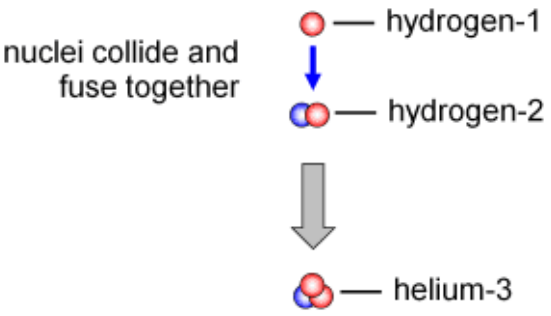
Did you know?
- Our sun is part of the **milky way** galaxy.
- Our sun is a relatively **small** star.
- The length of a star's life cycle is affected by the size of the star.

Definitions
Solar system – A star and the objects the orbit it

The birth of a star
- The Sun was formed from dust and gas **(nebula)** pulled together by gravitational attraction.
- The star gets bigger by combining with the particles that are attracted to it.
- Collisions between particles caused the **temperature** to increase enough for hydrogen nuclei to fuse together forming helium.
- The star gets hotter due to the **kinetic energy** transferred from the impacting particles to the developing star.
- The star starts to fuse hydrogen atoms together in a process called **nuclear fusion** when the temperature of the **protostar** becomes high enough.
- The energy released by nuclear fusion processes keeps the core of the Sun hot.

Life of a star
- The Sun is in the '**main sequence**' period of its lifecycle and is stable.
- It is stable because the force of gravity acting inwards and trying to collapse the Sun is in equilibrium with outward force due to the fusion energy trying to expand the Sun.

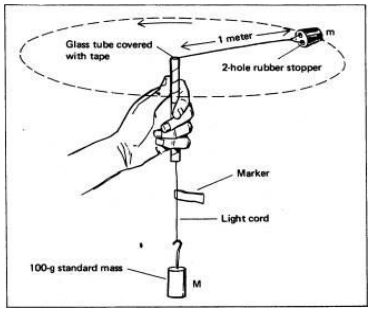
Death of a star
- Fusion processes in stars produce all of the naturally occurring elements.
- Elements heavier than iron are produced in a **supernova**
- The explosion of a massive star (supernova) distributes the elements throughout the universe.
- A small star like our sun expands to becomes a **Red Dwarf** star, then loses mass (elements) and cools and shrinks to becomes a **White Dwarf** then cools further to form a **Black Dwarf**.



Satellites

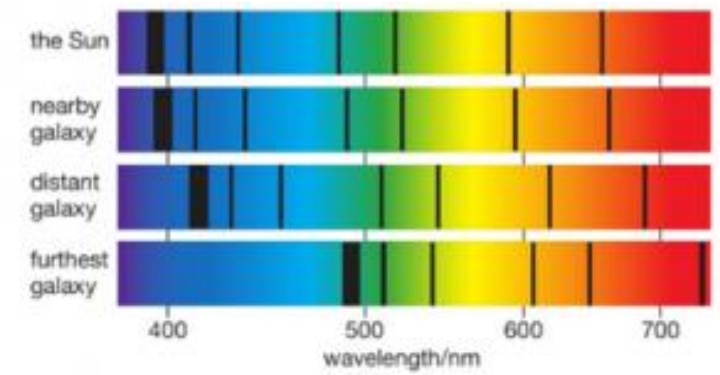
•Planets orbit the Sun and a **moon** orbits a planet.
•Artificial satellites orbit the Earth.
• **Gravity** provides the force that allows planets and satellites (both natural and artificial) to maintain their circular orbits.

•The force of gravity acts towards the centre of the circular orbit and causes **acceleration** in that direction. The acceleration results in a changing velocity (because the direction changes) but unchanged speed. **(HT)**
•To stay in a stable orbit at a particular distance the smaller body, the planet or satellite, must move at a particular speed around the larger body it orbits. If the speed changes then the radius of the orbit must also change. **(HT)**



Red shift

•There is an observed increase in the **wavelength** of light from most distant galaxies.
•The **further** away the galaxies, the **faster** they are moving and the **bigger** the observed increase in wavelength.
•This effect is called **red-shift**.
•The observed red-shift provides evidence that space itself (the universe) is expanding and supports the **Big Bang theory**.
•The red-shift of distant stars and galaxies shows that they are moving away from us. This is evidence of the universe starting off from a **small point** in space and expanding outwards.
•The red-shift of light from distant stars and galaxies gives evidence of the stars and galaxies moving away from us as the space between the stars and galaxies is expanding – not as the galaxies themselves getting bigger.
• The further away the light source is from us, the greater the amount of space between, that is expanding, and the faster the light source is moving away from us.



The big bang theory

•The Big Bang theory suggests that the universe began from a very small region that was extremely **hot and dense**.
•Since 1998 onwards, observations of supernovae suggest that distant galaxies are receding ever faster.
•There is still much about the universe that is not understood, for example **dark mass and dark energy**.