Physics Knowledge Organiser
Space (Triple Science)

The solar system

Type of object	What is it	Examples
Planets	Large objects which orbit a star	Mercury, Venus, Earth, Mars Jupiter, Saturn, Uranus, Neptune
Moons	**Natural satellites** that orbit planets	Moon, Io, Europa, Phobos, Deimos
Satellites	Artificial objects that orbit planets	ISS, Hubble Space Telescope
Dwarf Planets	Planet-like objects which are too small to have cleared their neighbourhood (orbit) of other objects.	Pluto

Trends in the solar system

In general, the further away the planet is from the sun, the lower its the surface temperature.

The further away the planet is from the sun, the longer it takes to complete its orbit around the sun.

Our Galaxy

Our solar system orbits our galaxy.
Our galaxy is called the milky way.
It consists of billions of stars and planets.

Formation of stars

Stars, like the Sun, start off as a cloud of dust and gas floating in space called a **nebula.**

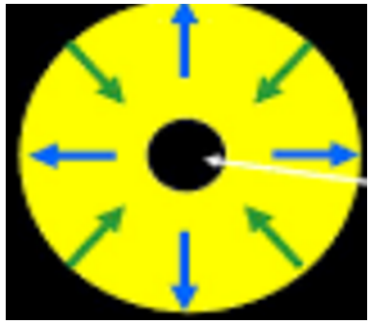
This cloud is pulled closer together due to **gravitational forces.**

Collisions between the particles in the cloud cause the temperature to increase and cause it to glow. This is called a **protostar.**

Eventually temperature and pressure increase enough to allow nuclear fusion to start. This is called a **main sequence star.**

Life cycle of stars

Stars spends most of these lives in the main sequence stage where inwards force of gravity is in equilibrium with the outwards force of radiation pressure caused by nuclear fusion.

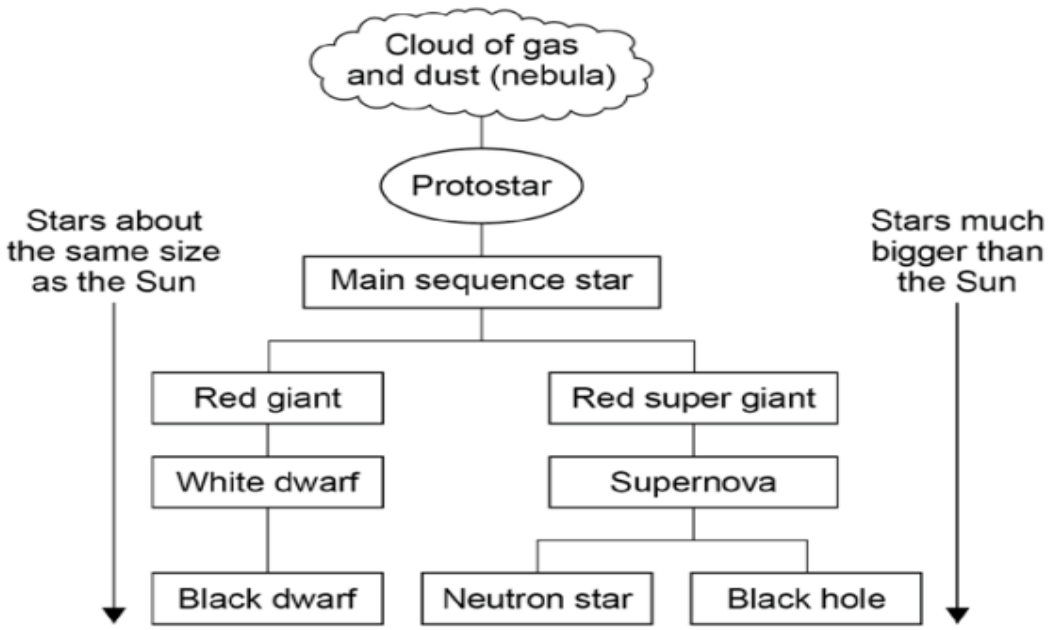


Blue arrows = outwards force of radiation pressure

Green arrows = inwards force of gravity

When stars have stopped fusing hydrogen in helium in the main sequence stage, they become a red giant or red super giant depending on their mass.

Life cycle of stars summary diagram



Life cycle of a low mass star (about the same size as our Sun)

In the main sequence stage, a star will fuse hydrogen into helium in its core.

Once all of the hydrogen fuses into helium, the outer layers of the star expands and it becomes a red giant star.

Once nuclear fusion stops, the red giant star will let off its outer layers and become a white dwarf star.

Over billions of years, this star will cool and slowly emit energy at a lower rate. Eventually, it becomes a black dwarf star.

Life cycle of a high mass star (bigger than our Sun)

After the main sequence stage it expands into a super red giant.

This is where nuclear fusion of elements from helium to iron takes place. When this nuclear fusion stops, the star then goes supernova. Elements heavier than iron are fused in this stage.

After the supernova stage, the stars collapses in on itself becoming a very dense star called a neutron star.

For very heavy star, gravity causes the star to completely collapse on itself and become a black hole.

Orbits

<u>The force of gravity causes objects to orbit around larger bodies in circular orbits.</u>

In circular orbits, an object's speed is constant but its velocity keeps changing (as its direction keeps changing).

Therefore, the object is constantly accelerating

An object's speed is only affected if its radius changes.

The smaller the radius of its orbit, the greater its speed.

Redshift

As a galaxy moves away from the earth, the light's wavelength become stretched, making it appear more red.

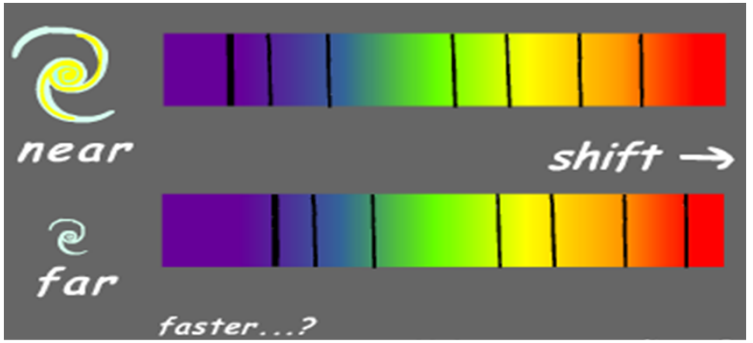
This is called red shift.

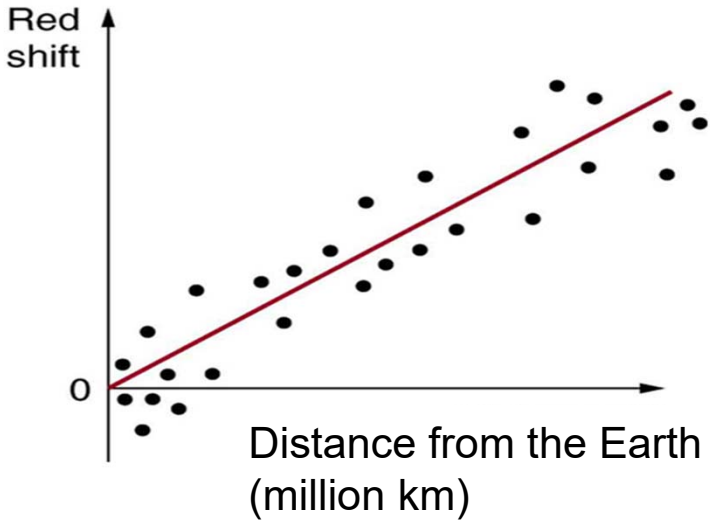
The amount of redshift tells us how quickly a galaxy or star is moving away from us.

The greater the redshift, the faster the object.

Light or spectra from distant galaxies can be compared to our sun to show different amounts of redshift.

The results showed that the greater the distance of a galaxy from the Earth, the greater the redshift of the galaxy.





The Big Bang

Most galaxies are redshifted. Therefore, this suggests that most galaxies are moving away from each other.

The distance between galaxies is increasing and the universe itself is expanding.

Evidence from redshift suggests that the universe began from a very small hot dense.

It also suggests it expanded since then, rather than existing forever.

This is the big bang theory.