



Milky Way our galaxy.

Planet	<i>A large body orbiting the Sun</i>
Moon	<i>A natural satellite orbiting a planet</i>
Dwarf planet	<i>A body large enough to have its own gravity which caused a spherical shape</i>
Solar system	<i>Any object orbiting the Sun due to gravity</i>
Galaxy	<i>Collection of billions of stars</i>
Universe	<i>Collection of galaxies</i>



Comets, asteroids, satellites.
Other objects.

Solar system

Effect of gravity.
Gravity causes moons to orbit planets, planets to orbit the Sun, stars to orbit galaxy centres.
Force of gravity changes the moon's direction not its speed.
Gravity pulls objects towards the ground.

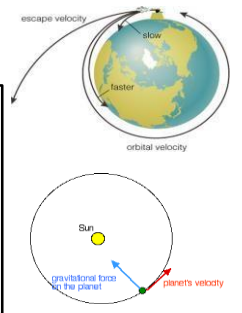
Orbital motions

Speed of Orbit.

Too fast = disappears into Space.
Correct speed = steady orbit around Earth.

Too slow = falls to Earth.

To calculate speed of Orbit: distance object moves in 1 orbit, Distance = $2\pi r$, then average speed = distance ÷ time.



HIGHER: Circular orbits.

HIGHER:
Velocity = a vector.
A planet's velocity changes but speed remains constant.
Due to the Sun's gravity, planets accelerate towards the Sun and so changes direction.

Planets close to the Sun, gravity pull is strong. Planets move quickly.

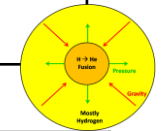
Planets further away from the Sun, gravity pull is weaker. So speed of planet is slower.

When ambulances go past the sound changes from a high pitch to a low pitch.

Frequency of sound wave decreases, wavelength increases.

The life cycle of a star.

Nebula	<i>A cloud of cold gas and dust</i>	The gas is mainly hydrogen
Protostar	<i>The large ball of gas contracts</i>	Cloud begins to collapse due to gravity the cloud gets smaller and the temperature increases.
Main sequence	<i>Stable period of star</i>	Eventually the temperature is hot enough for Hydrogen nuclei get close enough for nuclear fusion to begin. A star is 'born'. Gravity tries to collapse the star but the enormous outward pressure of fusion energy balances the inward force keeping the star stable



Stars the same size as our Sun.

Red giant	<i>A large star that fuses Helium into heavier elements</i>	Hydrogen runs out, so the outward pressure due to fusion decreases. Gravity collapses the star more, this causes an increase in temperature, enough so helium and other larger elements fuse together. Star swells in size.
White dwarf	<i>Star collapses</i>	Nuclear fuel runs out, fusion stops, outer layers drift away leaving a dense very hot core.
Black dwarf	<i>Cold dark star</i>	White dwarf cools down over millions of years.

Stars larger than our Sun.

Red super giant	<i>Star swells greatly</i>	Nuclear fuel begins to run out and star swells (more matter = bigger size).
Supernova	<i>Gigantic explosion due to run away fusion reactions</i>	Star collapses due to large gravity, causing a huge explosion flinging remnants of star out into space. The energy of this event is large enough to form elements larger than iron. Large gravitational forces collapse the remaining core into a tiny space.
Neutron star	<i>Very dense star</i>	Made out of neutrons. Extremely dense and small

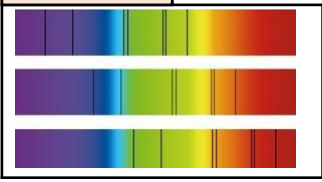
OR if star was large enough

Black hole *No light escapes* Gravitational forces so strong everything is pulled in.

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Red shift

Understanding models.

Red-shift	<i>The observed increase in wavelength of light from most distant galaxies. Light moves towards the red end of the spectrum.</i>
Hubble (1929)	<i>He studied light from distant galaxies; realised that all galaxies were moving away</i>
	Light from star in our galaxy. Light from star in nearby galaxy. Light from star in distant galaxy.
The Big Bang	<i>Universe began 13.8 billion years ago</i>
All matter and space expanded violently from a single point.	Red—shift provides evidence for expansion.

Galaxies are moving away from us in all directions.

Light from distant galaxies is red-shifted, so galaxy is moving away from us.

Galaxies further away have bigger red-shift so are moving faster away.

Aristotle (ancient Greek)	<i>Earth at the centre, other heavenly bodies move around the Earth.</i>
Copernicus (1473 - 1543)	<i>Sun at the centre, other heavenly bodies move around the Sun.</i>
Galileo (1610)	<i>Made a telescope, looked at Jupiter, found four moons rotating around planet.</i>

Planets and moons moved at different speeds to stars = reason for different positions.