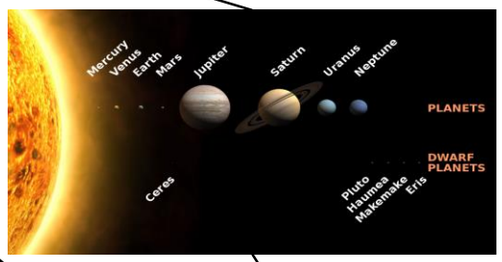
EDEXCEL TOPIC 7 ASTRONOMY (PHYSICS ONLY).

Solar system

- Distance increases further away from the Sun.
- Milky Way our galaxy.

Solar System	*The Sun, 8 planets, moons, dwarf planets, asteroids and comets*	Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.



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

Geocentric Aristotle (ancient Greek)	*Earth at centre, everything orbits Earth in circles*	Greeks used visual observations with naked eye. Saw Sun, moon, stars move across the sky in the same direction.
Heliocentric Copernicus (1473 - 1543)	*Sun at centre, everything orbits Sun in circles*	Galilei (1610) used a telescope to discover 4 moons going around Jupiter. Supported Copernicus's heliocentric idea.
Modern	*Everything orbits Sun in elliptical orbits*	Newer technology has refined our information and view.

Gravity and orbits

- Each Kg has a gravitational pull of 9.8N.

Gravitational field strength	*Gravity exerted around an object.*	Earth's gfs = 9.8N/kg.

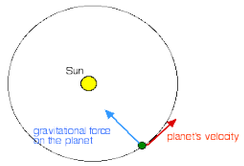
Weight	*Force acting upon an object due to gravity*	Newton (N).

Mass	*How much matter an object has*	Kilograms (Kg).

The Earth is larger than the moon, so an object weighs more on Earth than the moon.

Gravitational field strength		
	Depends on the mass of the body creating the field	The larger the mass, the stronger the gravitational force.
	Depends on the distance from the body creating the field	Closer to the body, the stronger the gravitational force.

Stable orbits	*If the orbital speed changes, the radius will change.*	Faster moving objects in a stable orbit have a smaller radius than a slower moving object.

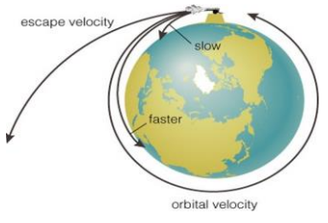


- Due to the Sun's gravity, planets accelerate towards the Sun and so changes direction.
- A planet's velocity changes but speed remains constant.
- Planets further away from the Sun, gravity pull is weaker. So speed of planet is slower.
- Planets close to the Sun, gravity pull is strong. Planets move quickly.

Changing orbits	*If the direction changes, velocity will change. (As velocity is a vector).*	Moving objects go in a straight line unless a force acts on it.
		An object in orbit, the gravitational force is at right angles to the direction of movement, so force changes direction not speed.

Circular motion	*Velocity constantly changes.*	Velocity is both speed and direction..
		An object travelling in a circle at a constant speed, is accelerating . (It is constantly changing direction so changing velocity).

Centripetal force	*Force acting towards the centre of a circle.*	Resultant force acts upon an object moving in a circular motion.



- Too fast = disappears into Space.
- Correct speed = steady orbit around Earth.
- Too slow = falls to Earth.

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.
		Due to the Sun's gravity, planets accelerate towards the Sun and so changes direction.

Orbit descriptions		
	Moon	Circular orbit.
	Planets	Mostly circular orbit.
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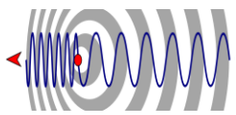
EDEXCEL TOPIC 7 ASTRONOMY (PHYSICS ONLY).

Redshift



Frequency of sound wave decreases, wavelength increases.

When a wave source moves relative to an observer, the frequency and wavelength changes.

Red-shift	*The observed increase in wavelength of light from most distance galaxies. Light moves towards the red end of the spectrum.*
Hubble (1929)	*He studied light from distant galaxies; found as frequency decreases, wavelength increases.*

Light from star in our galaxy.

Light from star in nearby galaxy.

Light from star in distant galaxy.

Provides evidence for expansion.

Galaxies are moving away from us in all directions.

Greater the red-shift, the further away a galaxy is so the faster it is moving.

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

Origin of Universe

More evidence supports The Big Bang theory so it is the current accepted model for the origin of the Universe.

Steady State theory	*Universe has always existed and is expanding. New matter continuously created as expansion occurs.*
Big Bang theory	*The whole Universe and all matter started out as s tiny point of energy. Universe expanded from this point and is still expanding.*

Evidence supporting	
Steady State theory.	Red-shift.
Big Bang theory.	Red-shift and CMBR.

CMBR
Cosmic Microwave Background radiation
Huge amounts of radiation released at Big Bang. As universe expands, wavelength of radiation has increased. Detected now as microwave radiation.

Looking into space

Reflecting telescope.

Refracting telescope.

Optical telescope	*Uses light to help to see distant objects clearly.*	For clearer images use a higher quality of objective lens and increase the aperture (increase the diameter of objective lens to allow more light in).

On Earth	Earth's atmosphere reflects and absorbs light coming from space. Light pollution makes it hard to see dim objects.
In space	Avoids atmosphere, so better images obtained.

Using EM waves	*Allows us to 'see' parts of the Universe not emitting light.*	Telescopes using all parts of EMS have been developed (1940s).

X-ray telescopes detect high temperature events ie: exploding stars.

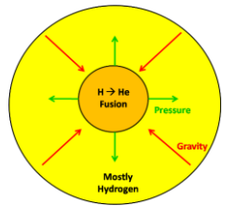
Modern telescopes often connected to computers for sharper, clearer images.

Bigger telescopes provide better resolution, and gathers more light.

See fainter objects, further in space.

Life cycle of stars

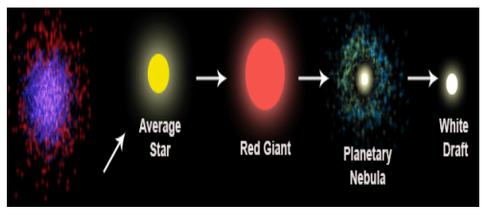
Nebula	*A cloud of hydrogen gas and dust*	Particles pulled together by own gravity. Cloud contracts becoming denser. Hydrogen becomes hotter as it spirals inwards, starts to glow.
Protostar	*The large ball of gas contracts to form a star*	More mass is attracted, clouds gravitational pull gets stronger and temperature rises. A star is 'born'.
Main sequence	*Stable period of star*	Temperature and pressure become high enough forcing Hydrogen nuclei to fuse to form Helium.



Outward pressure from hot gases balances compression due to gravity.

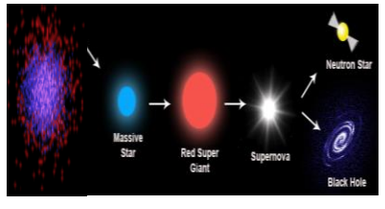
Stars the same size as our Sun.

Red giant	*Most of Hydrogen has been fuse, outer layers expand, star swells*	Core is not hot enough to withstand gravity and it collapses.
White dwarf	*Star pulled inwards by gravity and collapses*	Nuclear fuel runs out, fusion stops, dense very hot core which cools to become a black dwarf.



Stars larger than our Sun.

Red super giant	*Fuel used faster, undergo more fusion making heavier elements.*	Expand and contract more times, as balance between gravity and thermal expansion shifts.
Supernova	*Gigantic explosion due to run away fusion reactions*	Outer layers of dust and gas flung into space. Large gravitational forces collapse the core into a tiny space.
Neutron star	*Very dense star*	Matter pulled back in due to gravity.



Huge Stars.

Black hole	*Gravity pulls remains in.*	Gravitational pull so strong not even light escapes.

EDEXCEL TOPIC 7 ASTRONOMY (PHYSICS ONLY).

Solar system

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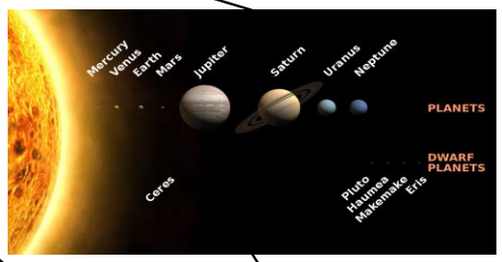

	A large body orbiting the Sun
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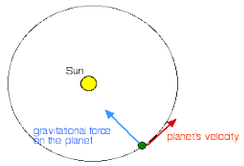

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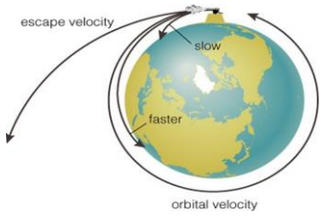

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EDEXCEL TOPIC 7 ASTRONOMY (PHYSICS ONLY).

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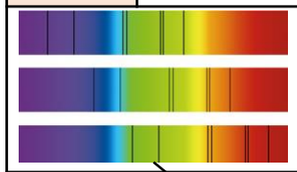

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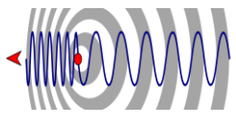

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Life cycle of stars

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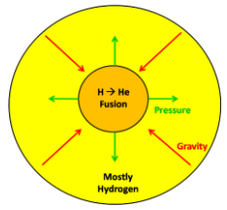

Outward pressure from hot gases balances compression due to gravity.

Stars the same size as our Sun.

	Most of Hydrogen has been fuse, outer layers expand, star swells	Core is not hot enough to withstand gravity and it collapses.
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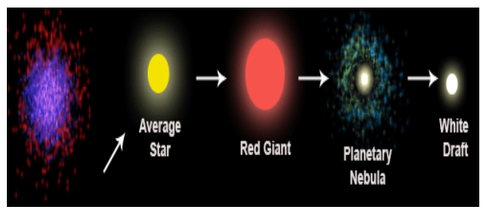

Stars larger than our Sun.

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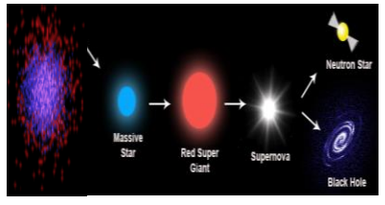

Huge Stars.

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EDEXCEL TOPIC 7 ASTRONOMY (PHYSICS ONLY).

Solar system

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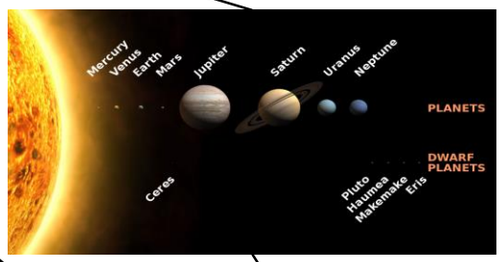

Planet	
Moon	
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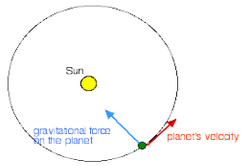

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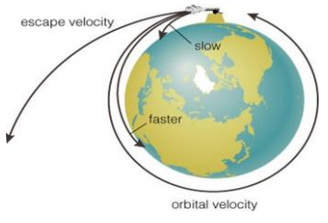

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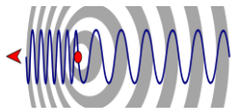
Redshift



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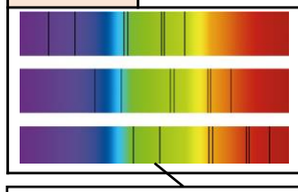
Red-shift	
Hubble (1929)	



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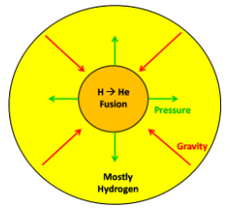

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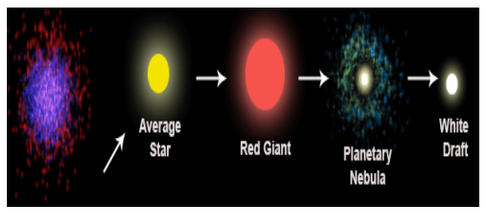

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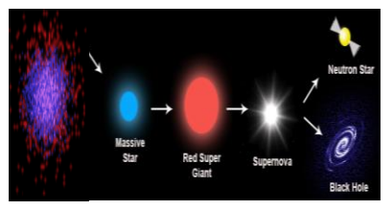

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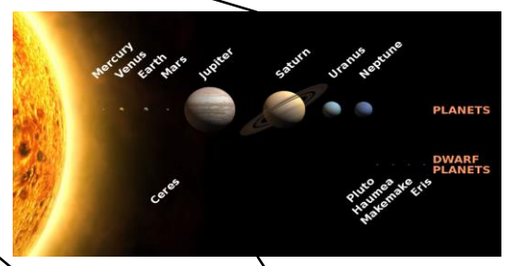
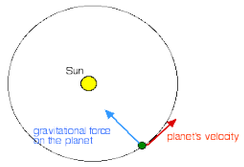
EDEXCEL TOPIC 7 ASTRONOMY (PHYSICS ONLY).

Solar system

Distance increases





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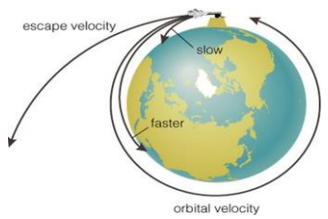
Gravity and orbits

Each Kg

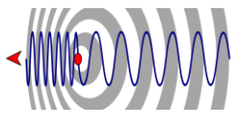


The Earth is larger

EDEXCEL
TOPIC 7 ASTRONOMY (PHYSICS ONLY).

Origin of Universe

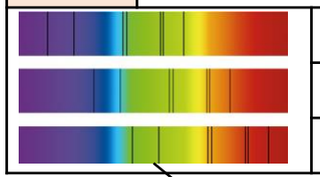
Redshift



Frequency of sound wave

When a wave source

More evidence supports



Provides evidence

Galaxies

Greater the red-shift,

Light

Looking into space

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X-ray telescopes

Modern telescopes

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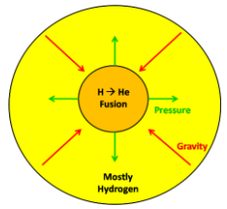
Bigger telescopes

See fainter

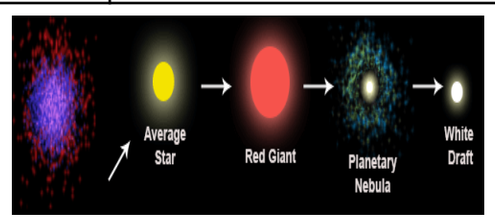
.

Life cycle of stars

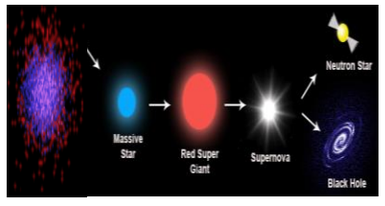


Outward pressure

Stars the same size as our Sun.



Stars larger than our Sun.



Huge Stars.