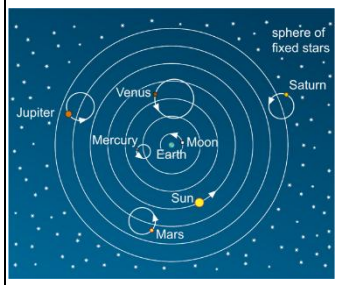
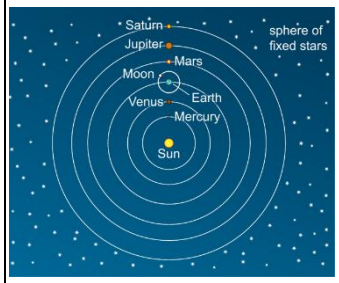
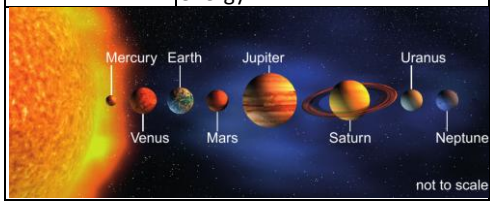
SP7 Astronomy

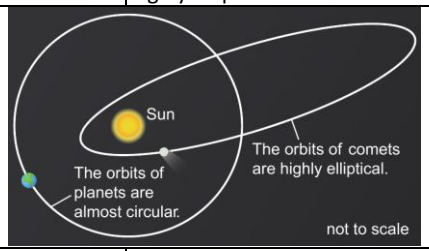
1. The Solar System

Ptolemy	Greek astronomer, his idea put the Earth central to everything.
Geocentric model	 Earth in the centre of everything, planets & the sun orbiting Earth.
Copernicus	Polish astronomer
Heliocentric model	 The sun in centre of the solar system.
Galileo	Invented the telescope. Discovered that 4 moons orbited Jupiter, this supported Copernicus's Heliocentric model.
Comet	A small lump of dirty ice orbiting the Sun. Mostly made of ice.
Asteroid	A small lump of rock orbiting the Sun.
Dwarf planet	A rocky body orbiting the Sun that is not quite big enough to be called a planet. Pluto is a dwarf planet (there are 5 in our solar system).
Orbit	The path taken by a planet around the Sun or a satellite around a planet.
Elliptical orbit	A squashed circle – the shape of the orbit in our solar system.
Natural satellites	Moons. Anything that orbits a planet and has not been made by humans.
Telescope	An instrument that is used to gather light from distant objects and make them look bigger.
Telescopes in orbit	Telescopes in orbit around the Earth produce clearer images than ground telescopes because cloud and dust does not interfere with the images.
Star	A huge ball of gas that radiates energy.

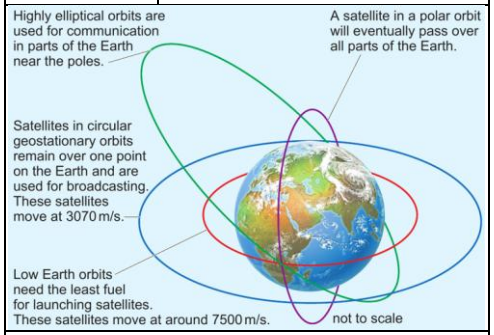


2. Gravity and orbits

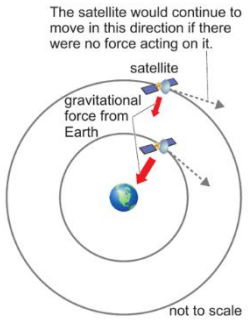
Weight	The force pulling an object downwards. It depends on the mass of the object and the gravitational field strength. The units are newtons (N). Weight is a vector quantity.
Gravitational field strength	A measure of how strong the force of gravity is somewhere. The units are newtons per kilogram. This depends on the mass of the body and the radius. (The greater the mass and the smaller the radius the higher the surface gravitational field strength)
Artificial satellites	A satellite made by humans. Are used for communication. They orbit the Earth.
Shapes of orbits	The shape varies depending on the object. Planets have almost circular orbits and comets have highly elliptical orbits



Vector quantity	A quantity with a magnitude and a direction (for example velocity)
Scalar quantity	A quantity with a magnitude only.
Forces acting on objects in orbit	A moving object will continue to move in a straight line unless there is a force acting on it causing it to change speed or direction. Gravitational force is greater for objects in low orbit compared to objects in higher orbit.



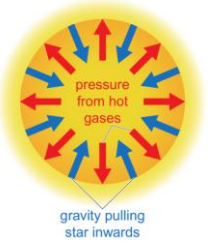
Forces acting on two satellites



3. Life cycles of stars

Life cycle of a star	Varies depending on the size of the star
Fusion reaction	The reaction when the nuclei of light atoms, such as hydrogen, combine to make the nucleus of a heavier atom.
Electromagnetic radiation	A form of energy transfer, including radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays.

Life cycle of a star like the Sun

Nebula	A cloud of gas in space. Some objects that look like nebulae are actually clusters of stars or other galaxies. The plural is nebulae.
Protostar	A cloud of gas drawn together by gravity that has not yet started to produce its own energy.
Main sequence star	A star during the main part of its life cycle, when it is using hydrogen fuel. Nuclear fusion reactions start to happen (when hydrogen nuclei are fused). A lot of energy is released in the form of electromagnetic radiation. Outward pressure from gases balances the force of gravity. Our sun is in this stage. 

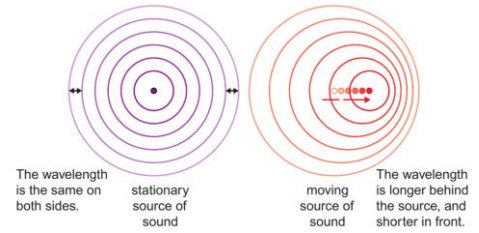
Red giant	Stars remain stable for around 10 billion years. A star that has used up all the hydrogen in its core and is now using helium as a fuel. It is bigger than a normal star. They then enter the red giant phase if they are small enough. The core, no longer hot enough to withstand gravity & collapses. Outer layers expand.
Shell of gas	The star remains in this phase for 1 billion years. Helium fuses. A shell of gas is then thrown off.
White dwarf	The rest of the star is pulled together and collapses to form a white dwarf. A very dense star that is not very bright. A red giant turns into a white dwarf. Gradually cools over a billion years – black dwarf.

Life cycle of a massive star (differs after main sequence star)

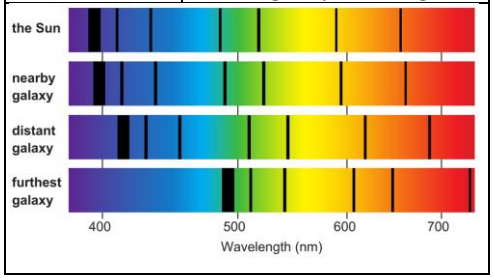
Super red giant	A star that has used up all the hydrogen in its core and is now using helium as a fuel. It has a mass much higher than the Sun.
Supernova	An explosion produced when the core of a red supergiant collapses. The plural is supernovae.
Neutron star	Core of a red supergiant that has collapsed. Neutron stars are formed if the remaining core has a mass less than three or four times the mass of the Sun.
Black hole	Core of a red supergiant that has collapsed. Black holes are formed if the remaining core has a mass more than three or four times the mass of the Sun.

4. Red-shift

Doppler effect	The change in the pitch of a sound heard when the source of sound is moving relative to the observer. As emergency vehicle moves away, the pitch gets lower. Sound waves behind a moving sound source become "stretched" which makes their wavelength longer.



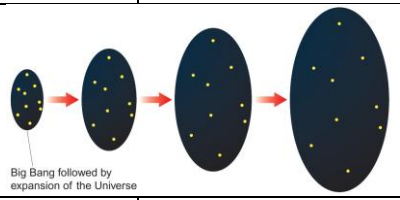
Red-shifted	The visible spectrum of light from stars contains a pattern of dark lines. If these lines shift towards the red end of the spectrum this is evidence that the star is moving away from Earth. The further the lines have shifted, the quicker the star/galaxy is moving.



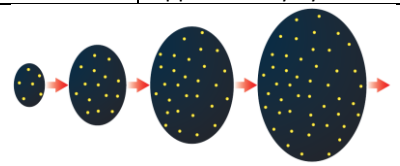
Edwin Hubble (1889-1953)	Edwin Hubble compared the patterns of lines for 50 different galaxies compared to the Sun. He discovered that they were almost all red-shifted. This allowed us to draw a conclusion that the universe is expanding.

5. Origin of the Universe

Big bang theory	The whole Universe and all its matter in it started out as a tiny point of concentrated energy around 13.5 billion yrs ago. The universe expanded from this point and is still expanding. Gravity caused matter to clump as stars. Supported by CMB and red shift.



CMB – Cosmic Microwave Background Radiation	Microwave radiation detected all over the sky. This was predicted energy from the big bang theory. Due to expansion of wave length the energy now only detected as microwaves.
Steady state theory	Suggested in 1948 as an alternative theory to the Big Bang. The universe has always existed and is expanding. New matter is constantly being created as it expands. Supported only by red shift.



Lesson	Memorised?
1. The Solar System	
2. Gravity and orbits	
3. Life cycles of stars	
4. Red-shift	
5. Origin of the Universe	