CHURCH STRETTON SCHOOL

Triple Science - Physics

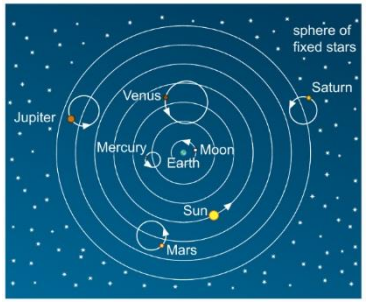
SP7 Knowledge organiser

P7: Astronomy

Lesson sequence

1. The solar system
2. Gravity and orbits
3. Life cycle of stars
4. Red-shift
5. Origin of the Universe

1. The solar system	
Planet	A celestial body moving in an elliptical orbit round a star.
Natural Satellite	Any celestial body in space that orbits around a larger body.
Elliptical orbit	The revolving of one object around another in an oval-shaped path called an ellipse.
Geocentric model	(often exemplified specifically by the Ptolemaic system) is a superseded description of the Universe with Earth at the centre. Under the geocentric model, the Sun, Moon, stars, and planets all orbited Earth.
Heliocentric model	Is a superseded description of the Universe with the Earth and planets revolve around the Sun at the centre of the Solar System.
Telescope	An optical instrument that makes distant objects appear magnified by using an arrangement of lenses or curved mirrors and lenses
Dwarf planet	A celestial body orbiting a star that is massive enough to be rounded by its own gravity. The gravitational field of a dwarf planet is not strong enough to clear the neighbourhood
Asteroids	Comprised of rock and metal, and are smaller than planets.
Comets	Balls of ice and dust in orbit around the Sun. The orbits of comets are different from those of planets - they are elliptical. A comet's orbit takes it very close to the Sun and then far away again.

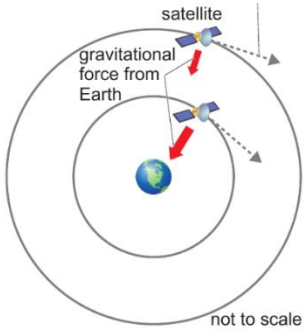


Exam-style question

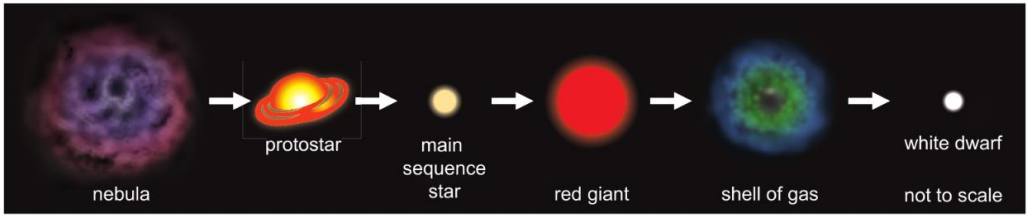
Compare and contrast Ptolemy's and Copernicus' models of the Solar System. *(4 marks)*

2. Gravity and orbits	
Weight	A measure of the size of the pull of gravity on the object. Measured in Newtons (N)
Mass	A measure of how much matter there is in an object. Measured in Kilograms (Kg)
Calculating Weight	Weight = mass x gravitational field strength Weight = Newtons (N) Mass = Kilograms (Kg) Gravitational field strength = N/Kg
Gravitational field strength	Is measured in newtons per kilogram (N/kg). The Earth's gravitational field strength is 9.8 N/kg. This means that for each kg of mass, an object will experience 9.8 N of force.

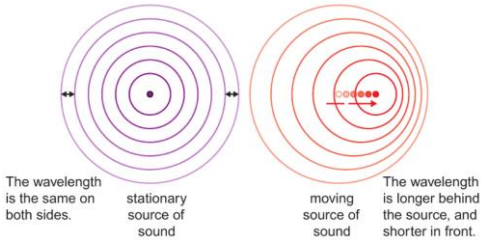
Artificial Satellites	A man-made body placed in orbit round the earth or another planet in order to collect information about it or for communication purposes.
Velocity	Its speed in a particular direction.
Vector Quantity	A vector describes a movement from one point to another. A vector quantity has both direction and magnitude (size).



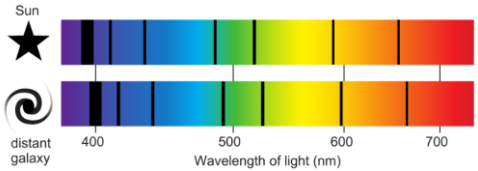
3. Life cycle of stars	
Nebula	A massive cloud of dust and gas in space
Protostar	A contracting mass of gas which represents an early stage in the formation of a star, before nucleosynthesis has begun.



Fusion reactions	A process where two or more nuclei combine to form an element with a higher atomic number (more protons in the nucleus). Fusion releases energy
Electromagnetic radiation	A wave of the electromagnetic field, propagating (radiating) through space, carrying electromagnetic radiant energy.
Main sequence	Most of the stars in the Universe are in the main sequence stage of their lives, a point in their stellar evolution where they're converting hydrogen into helium in their cores and releasing a tremendous amount of energy.
Red giant	A very large star of high luminosity and low surface temperature. Red giants are thought to be in a late stage of evolution when no hydrogen remains in the core to fuel nuclear fusion.
White dwarf	Is formed when a low-mass star has exhausted all its central nuclear fuel and lost its outer layers as a planetary nebula.

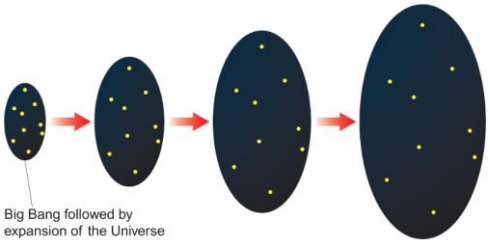


Red supergiant's	A red supergiant is an aging giant star that has consumed its core's supply of hydrogen fuel.
Supernova	A star that suddenly increases greatly in brightness because of a catastrophic explosion that ejects most of its mass.
Black hole	A region of space having a gravitational field so intense that no matter or radiation can escape.
Neutron star	A celestial object consisting of an extremely dense mass of neutrons, formed at the core of a supernova, where electrons and nuclei are compressed together so intensely by the force of gravity that protons and electrons merge together into neutrons.



4. Red-shift

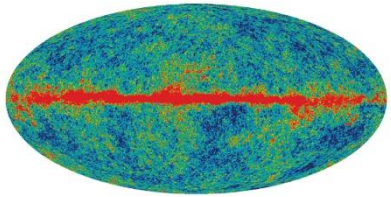
Doppler effect	An increase (or decrease) in the frequency of sound, light, or other waves as the source and observer move towards (or away from) each other.
Pitch	The quality of a sound governed by the rate of vibrations producing it;
Red shift	the displacement of spectral lines towards longer wavelengths (the red end of the spectrum) in radiation from distant galaxies and celestial objects.
Red-shifted	the wavelength of the light is stretched, so the light is seen as 'shifted' towards the red part of the spectrum.
Blue-shift	the displacement of the spectrum to shorter wavelengths in the light coming from distant celestial objects moving towards the observer.
Universe	all existing matter and space considered as a whole; the cosmos.



5. Origin of the Universe

Big bang theory	It is the idea that the whole Universe and all the matter in it started out as a tiny point of concentrated energy about 13.5 billion years ago. The universe expanded from this point and is still expanding.

Steady state theory	States that the Universe has always existed, and that the Universe is expanding and constantly creating matter as the Universe expands.
Cosmic microwave background (CMB) radiation	This comes from all directions in space and has a temperature of about -270 °C. The CMBR is the remains of the thermal energy from the Big Bang, spread thinly across the whole Universe.



Exam-style question

Compare and contrast the Big Bang and Steady State theories. *(3 marks)*