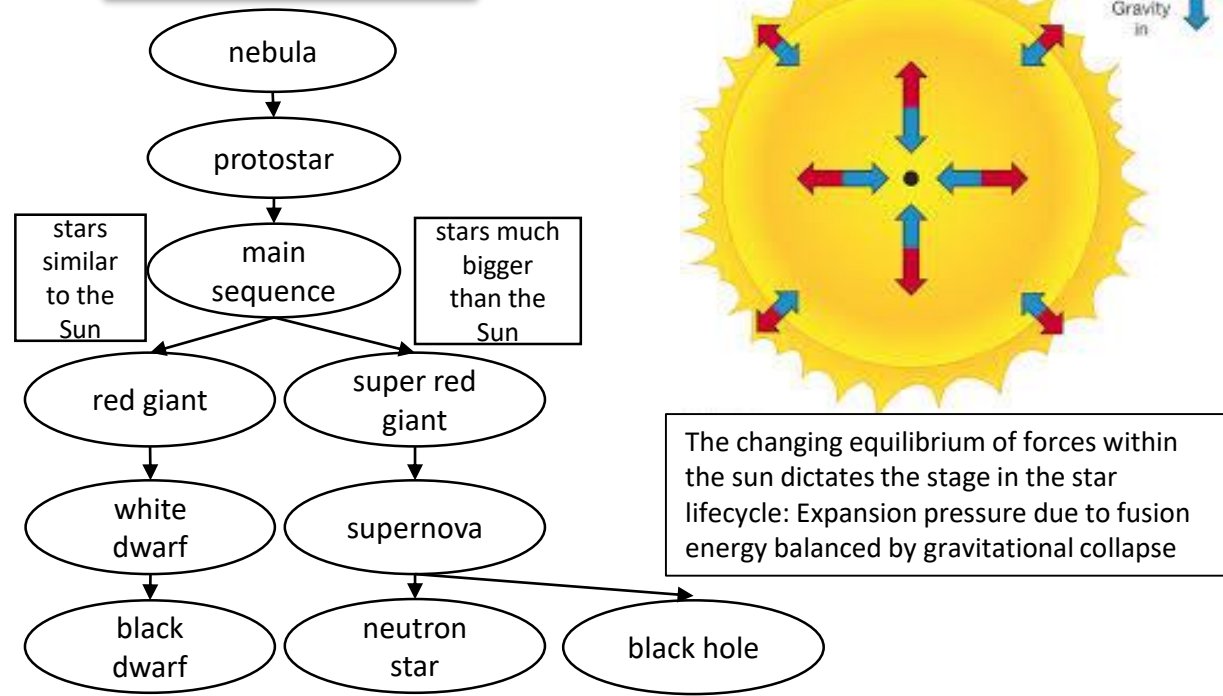


AQA - P8 Space Physics

Triple physics

Lifecycle of a star



Gravity

- Gravity is a non-contact force that acts between objects of mass.
- Gravity is always a pull force and acts towards the centre of mass.
- An object like the moon is held in orbit due to the force of gravity pulling it towards the Earth.
- The force of gravity causes the direction of the moon to change but not its speed.
- Gravity causes moon to orbit planets, planets to orbit stars and stars to orbit the centre of galaxies.

Orbital Motion

- A planet's speed remains constant as it orbits however the Sun's gravity pulls the planet towards it causing it to change direction and velocity.
- Velocity is a vector → magnitude and direction.
- Acceleration is the change in velocity per unit of time.
- Therefore, a planet is accelerating towards the sun even though its speed is constant, because it is the direction that changes.
- If the speed of the orbit is too fast → disappears into space, too slow → falls into the more massive object, just right → steady orbit around the more massive object.
- To calculate the speed of an orbit: distance the object moves in 1 orbit is the circumference of the circle it traces, distance = $2\pi r$, and average speed of orbit = distance ÷ time.
- The force of gravity is much stronger closer to the sun; inner planets orbit quicker than outer planets.

Red Shift

- If an object emitting waves (light/sound) is moving towards the observer the wavelength decrease. If it is moving away the wavelength increases → the sound a siren makes changes depending on the direction of the ambulance.
- Hubble (1929) found that light from distant galaxies is red-shifted (longer wavelength), all galaxies are moving away from each other, the more distant the greater the speed.
- Red-shift provides evidence for universe expansion and that all matter and space expanded from a single point – The Big Bang.

Key word	Definition/description
satellite	Anything that orbits another body of mass – natural → the moon, artificial → man made.
planet	A large body orbiting the Sun, or other stars.
moon	A natural satellite orbiting a planet.
dwarf planet	The gravitational field of a dwarf planet is not strong enough to clear the neighbourhood, so there may be other objects in its orbit around the Sun.
solar (star) system	Object or objects orbiting the Sun.
galaxy	Collection of billions of stars held together by the force of gravity from the black hole at its centre. Our galaxy is the milky way.
Universe	The whole of space and all the stars, planets, and other forms of matter and energy in it.
nebula	A cloud of cold hydrogen gas and dust held together by gravity.
protostar	A contracting mass of gas which represents an early stage in the formation of a star.
star	When the temperature and pressure are high enough, Hydrogen nuclei collide with enough energy for fusion to occur.
main sequence	The stable period of a star. The outwards pressure of fusion and the inward force of gravity are in balance.
red giant	When a main sequence star has used up all of its hydrogen, it becomes unstable. The outward pressure drops and it collapses under gravity. The atoms now closer together fuse increasing the temperature and the core expands to become a red giant.
super red giant	Stars much larger than our own swell greatly because of the large mass.
white dwarf	Red giant cools and the outer material is blown away leaving a white hot solid core.
black dwarf	A white dwarf cools down and no longer emits light → theoretical as the Universe is not old enough yet for these to exist.
supernova	Super red giant collapses under its own gravity, heats to a very high temperature, causing runaway nuclear reactions (elements heavier than iron formed here). Star explodes flinging remnants into space. Large gravitational force collapses the core into a tiny space (very dense)
neutron star	Gravity is so strong electrons and protons are forced together creating a neutron. Extremely dense and made out of only neutrons
black hole	Core is so dense and contains so much mass that the gravitational force is so strong that nothing can escape, not even light