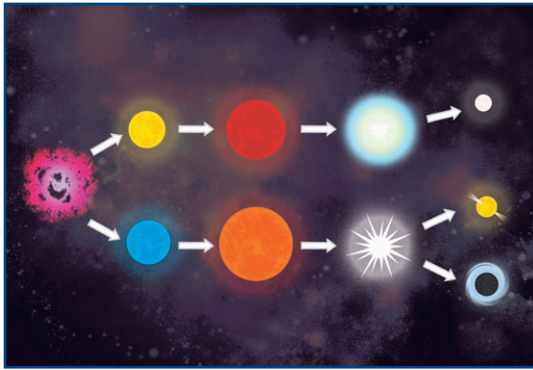
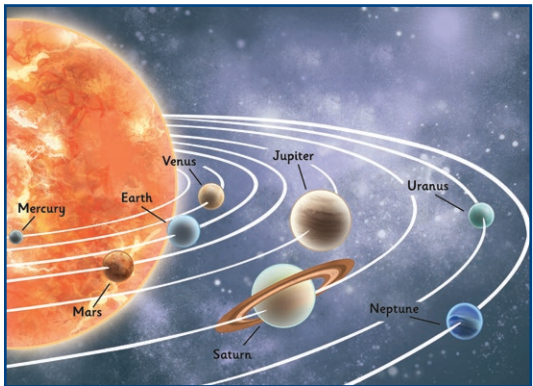


# AQA Physics Unit 8: Space Physics

## Formation of a Star



## The Solar System



The solar system is part of the Milky Way galaxy and is made up of the Sun and anything that goes round it (orbit). There are 8 planets and some dwarf planets, including Pluto.

Planets are objects that orbit a star (the Sun). A dwarf planet will orbit a star but will be too small to be a planet, or not quite fit the pattern of a normal planet. Pluto is an example of a dwarf planet. Moons orbit planets and are also known as natural satellites. Planets are natural satellites of the Sun. Artificial satellites are satellites that humans have built and they mostly orbit the Earth.

## Formation of a Star

1. Stars are made from a cloud of dust and gas – a **nebula**. Gravity pulls the dust and gas together, forming a **protostar**.
2. The more dense the star, the hotter it becomes. Fusion of the hydrogen nuclei starts, emitting a lot of energy.
3. The next stage is the **main sequence star**. This stage will last for a few billion years. This is a stable phase as the force of gravity and fusion of hydrogen are balanced. Hydrogen is fused and forms helium; as this happens, energy is released.
4. Hydrogen begins to run out, turning the star into a **red giant (like the Sun)** or a **red super giant**, depending on the size of the star.
5. A red giant will become a **white dwarf** by getting rid of the outer layers of dust and gas. It will then cool down and become a **black dwarf**.
6. Red super giants will initially glow brightly. Then, they will explode into a **supernova**. The supernova will get rid of its outer layer of dust and gas and will form a black hole.

## Orbits

Gravity is a force that causes planets and satellites to circle an object. It acts towards the centre of the orbit. This occurs in both natural and artificial satellites.

### Higher Tier Only

When an object is in orbit around something, it is constantly changing velocity as the direction constantly changes.

The speed, however, will stay the same.

Examples of satellites include the planets orbiting the Sun and the Moon orbiting Earth.

### Remaining in Orbit

For an orbit to remain stable, the radius must change if the speed changes.

The closer something is to an object, the quicker it has to travel in order to keep in orbit.

If the force is stronger, then the object will have to travel quicker to remain in orbit.

## The Expanding Universe

Evidence suggests that the universe is expanding (getting bigger). Galaxies are moving further away from each other. The redshift provides us with some evidence for the expanding universe and the big bang theory.

When we see light coming from galaxies that are far away from us, the wavelength has increased. The light has shifted towards the red end of the spectrum (**redshift**) and is moving away from us. Galaxies that are more distant have a greater redshift which means they are moving away more quickly.

If you imagine dots on a balloon moving away from each other as the balloon is being blown up, this helps to visualise the expanding universe.

## Dark Mass and Energy

There is so much about the universe that scientists do not fully understand.

Scientists have discovered dark mass and dark energy but they do not know much about it.

## The Big Bang

The big bang is a theory about how the universe began.

In the beginning, matter in the universe took up a very small amount of space. This space was very dense and so became hot. This caused an explosion 13.7 billion years ago – the big bang. After **the big bang**, space then continued to expand as it is now.

Observations of supernovae since 1998 suggest that distant galaxies are moving away faster.

The big bang is a theory and is the best theory that we have at the moment.

