Your notes

GCSE Physics: revision notes

The solar system and the life cycle of stars

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Our solar system

- Our **solar system** has one star (the Sun), eight planets, dwarf planets such as Pluto, and the natural satellites (moons) that orbit planets. Artificial satellites also orbit the Earth.
- Our **solar system** is a small part of the Milky Way **galaxy**.
- The Sun formed from a cloud of dust and gas (a **nebula**) that was pulled together by gravitational attraction.

The life of a star

- A star forms when a **nebula** is pulled together by gravity to form a **protostar**. As it gets hotter and denser, nuclear fusion of hydrogen begins and it becomes a **main sequence star**.
- A **main sequence star** is stable for billions of years, because the inward force of gravity is balanced by the outward pressure from the energy released by fusion.
- When the hydrogen runs low, a star about the size of the Sun swells into a **red giant**, then collapses into a **white dwarf**, which cools to a black dwarf.
- A star much bigger than the Sun becomes a red supergiant, then explodes as a **supernova**, leaving a **neutron star** or, for the largest stars, a **black hole**.

Making the elements

- Fusion in stars produces all the naturally occurring elements. Elements up to iron are made during the life of a star.
- Elements heavier than iron are made in supernovae.
- The explosion of a massive star (a **supernova**) distributes the elements throughout the universe, where they can form new stars and planets.

Orbits

- Gravity provides the force that keeps planets orbiting the Sun and moons and satellites orbiting planets, in circular orbits.
- (Higher) In a circular orbit, the object's speed stays the same but its direction keeps changing, so its velocity changes: it is accelerating towards the centre.
- (Higher) For a stable orbit, the radius must change if the speed changes: an object in a smaller orbit must move faster.

Key terms

Solar system	The Sun and everything that orbits it.
Galaxy	A huge group of billions of stars; ours is the Milky Way.
Nebula	A cloud of dust and gas in space where stars form.
Protostar	A hot, dense ball of gas that is becoming a star.
Main sequence star	A stable star fusing hydrogen into helium.
Red giant	A large, cooler star that forms when a Sun-sized star runs low on hydrogen.
White dwarf	The hot, small, dense remains of a Sun-sized star.
Supernova	The explosion of a massive star.
Neutron star	The very dense core left after some supernovae.
Black hole	A region where gravity is so strong that nothing, not even light, can escape.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. How many planets are in our solar system?
2. What galaxy is our solar system in?
3. What did the Sun form from?
4. Why is a main sequence star stable?
5. What will the Sun become after the red giant stage?
6. What happens to a star much more massive than the Sun at the end of its life?
7. Where are elements heavier than iron made?
8. What force keeps the Moon in orbit around the Earth?

Answers

1. Eight
2. The Milky Way
3. A cloud of dust and gas pulled together by gravity
4. Gravity inwards is balanced by pressure from fusion outwards
5. A white dwarf

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6. It explodes as a supernova
7. In supernovae
8. Gravity

What to do next

Practise 10 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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