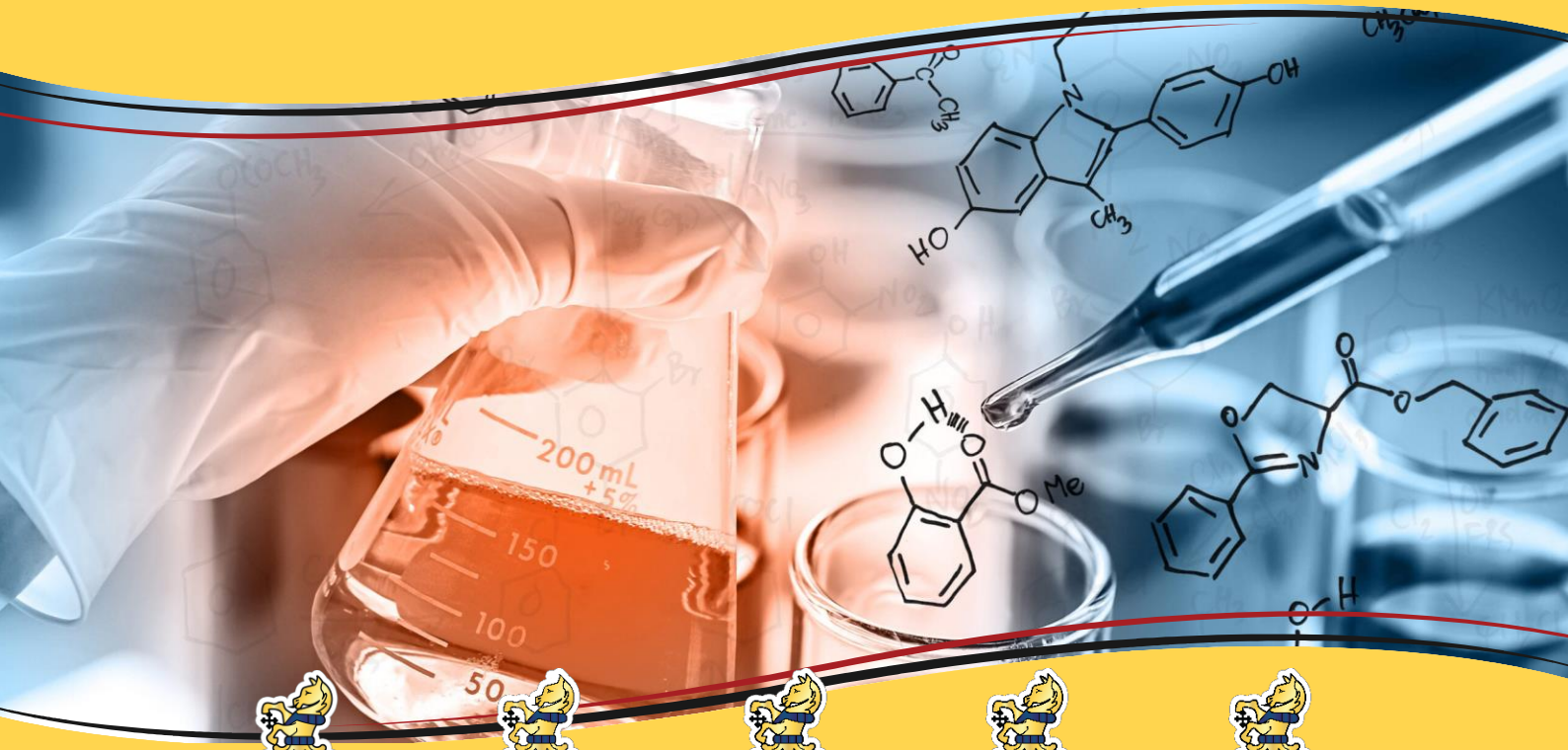
2nd Edition

The Crossley Heath Science Newsletter

June 2025



By: Lakshya, Will, Chaarvik and all Scientists at Crossley Heath

A warm introduction...

What is the Crossley Heath Science Newsletter?
It is a termly newsletter that is run by sixth formers: Will, Chaarvik and Lakshya to help encourage students - and teachers too - at Crossley's to write about anything science related that they're interested in. We want to provide a platform for year 12 and 11's to help publish any research that they've done so they can put it in their personal statement in year 13 but also to provide the younger years, a voice in the scientific community at school .

What to expect?
This edition of The Newsletter contains 9 articles from years 7 and 8. We have a range of articles from climate change and our home, to the great depths of outer space and its mysterious black holes...

Contents:

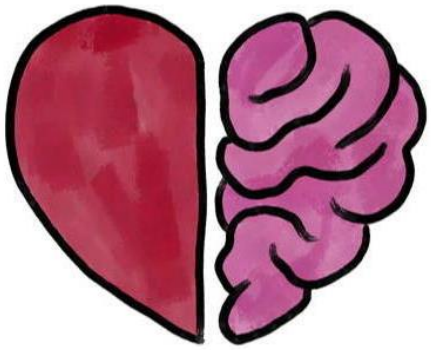
The Heart and The Brain, Part 1

Dhruvan Karthik, 8A

The heart and the brain are both vital organs in the human body that we depend on for our survival. But did you know that there are many incredible animals that don't need these organs to live?

Flatworms lack a circulatory system and a heart; they instead distribute oxygen and the necessary nutrients through direct diffusion across their skin. Another example of an organism surviving without a heart is the tapeworm, that lives in their hosts' intestines and absorbs nutrients directly from their environment. Some unusual animals, like the jellyfish, don't need a heart or a brain for survival! Jellyfish have thin skin that allows them to absorb the necessary nutrients from the water. As for not having a brain, jellyfish rely on their instincts, sort of like an autopilot system, having a series of decentralised nerves that respond to light, touch and food. Another creature without either of these organs is the starfish. Similar to jellyfish, starfish use decentralised nerves to function. However, their arms can act semi-independently and can regenerate, almost like an animal with multiple brains! They also use a water vascular system which eliminates the need for a heart, as the water is pumped around the body by muscles. So why do humans need a heart and a brain?

The heart is at the centre of the circulatory system, pumping blood around the body. The oxygenated blood travels from the lungs to the heart through the pulmonary vein, and then distributed around the body through arteries. Deoxygenated blood travels from around the body back to the heart through the veins, and then through the pulmonary artery to the lungs, where it is oxygenated again. The heart beats around 100,000 times a day, continuously pumping around 5 litres of blood around the body. There are 4 chambers in the heart, two on the right side, which receive and pump blood that is low in oxygen, and two on the left side, which receive and pump blood that is high in oxygen. The two upper chambers are called the left atrium and the right atrium and primarily receive blood. The lower chambers are called the left ventricle and the right ventricle, which primarily pump blood. The heart is made up of 3 layers of tissue - pericardium: the thin, outer lining that protects the heart; myocardium: the thick, muscular, middle layer that contracts to pump blood; and endocardium: the thin, inner layer that makes up the lining of the chambers. The circulatory system ensures that vital nutrients, such as oxygen and glucose, reaches every cell and tissue in the body.



The Heart and the Brain, Part 2

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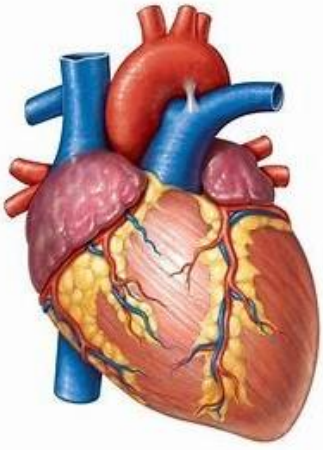
The brain is also an essential organ for life. It is extremely complex and is the primary organ in the central nervous system, which controls all aspects of the human body, from thoughts and feelings to memory and movement. The brain has 3 main functions- receiving sensory information, processing the information it receives, and responding appropriately. After the brain processes the data collected by sensory neurons, it sends an electrical signal through the spinal cord to the muscles, which react to this signal and respond with a motor output. The brain also manages things that we generally don't think about, such as digesting food and breathing. It contains nerve cells called neurons and blood vessels and. There are 3 main parts of the brain- the cerebrum, the brainstem and the cerebellum. The largest, the cerebrum, is in the upper part of the cranial cavity. It is mainly responsible for intelligence and memory, but has lots of other functions such as vision, hearing, touch and other senses. The brainstem connects the brain to the spinal cord. It is made up of the midbrain and the medulla. The brainstem is vital for survival as it regulates many involuntary activities like breathing and heart rhythm. It also produces reflexes including sneezing, coughing and swallowing. Finally, the cerebellum is located at the back of the skull and coordinates voluntary muscle movements and balance. The cerebrum also has 4 lobes. The frontal lobe is involved in personality, decision-making, and movement; the parietal lobe helps a person identify objects and understand spatial awareness; the occipital lobe helps with vision; and the temporal lobe is involved with short-term memory, speech and musical rhythm. In conclusion, the human brain and the human heart are incredibly complex organs, and we wouldn't be able to live and function without them.

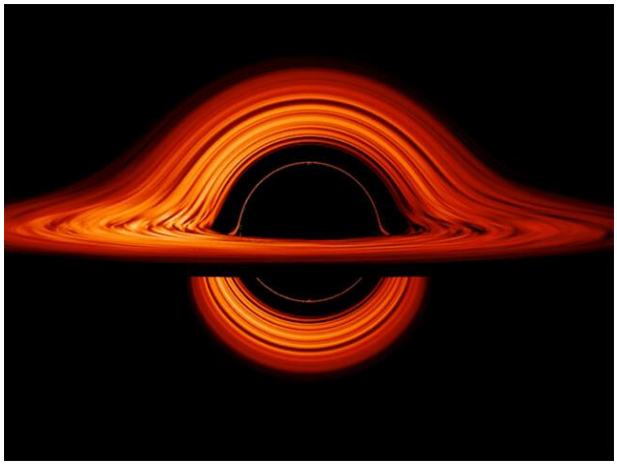


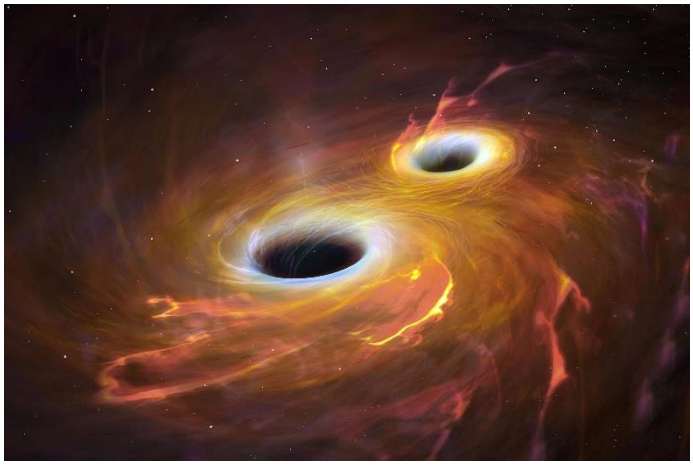
Black Holes

Reuben Hayre, 7C

What Are Black Holes?

A black hole is a region in space where gravity is so strong that nothing, not even light, can escape. This happens because a massive amount of matter is compressed into an incredibly small space, creating a singularity. The boundary around this point is called the event horizon, beyond which nothing can return. Black holes are detected by their effects on nearby stars or light.





Why Are They So Fascinating?

Black holes are fascinating because they challenge our understanding of physics. They warp space and time in ways that are difficult to imagine, pushing the limits of our knowledge. The idea of a singularity, where gravity becomes infinite, and the event horizon, where nothing can escape, raises intriguing questions about the nature of reality. Black holes also provide a unique environment to study the extreme effects of gravity and could reveal secrets about quantum mechanics, space-time, and the universe's origins. Their mysterious nature and potential for new discoveries make them a captivating subject of study.

Black Holes

Sara Noor, Year 7

What is a black hole?

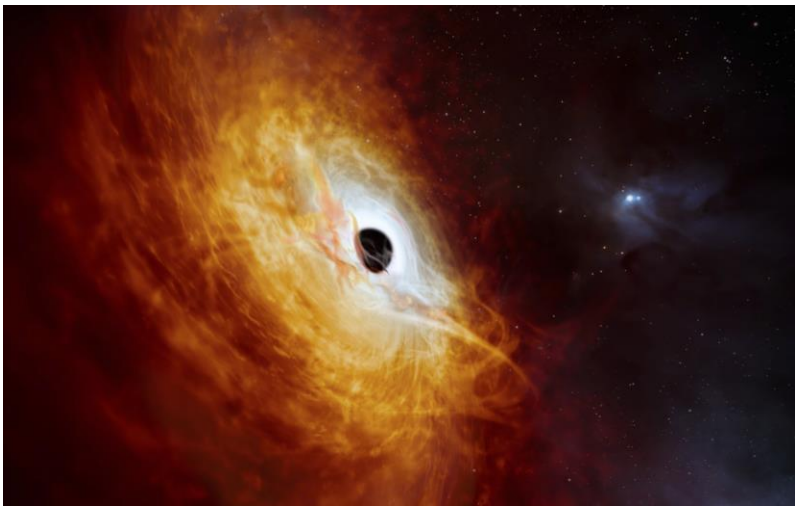
A black hole is a place in space where gravity pulls so strongly that nothing can escape from it, not even light. Therefore, a black hole is 'black' because no light can escape from it.

How do black holes form?

Black holes usually form from the collapse of a star. Stars are giant balls of gas that burn incredibly hot, and when they run out of fuel (hydrogen), they can no longer hold up against the force of gravity. If a star is big enough, it can collapse in on itself and form a black hole.

What happens inside a black hole?

Inside a black hole, there's a point called the singularity. This is where all the star's mass is packed into a tiny, super dense point. The gravity near this point is so powerful that it pulls everything in and keeps it trapped. No matter how fast something moves, it can't escape once it crosses a boundary called the event horizon. Think of it like an invisible point, once something enters the black hole, it will never return.



What happens to things near a black hole?

If a star or something else in space gets too close to a black hole, the gravity will start pulling harder and harder. If it's close enough, it will get stretched out and torn apart.

Can black holes be visibly seen?

Although black holes cannot be seen directly, scientists can detect them by looking at how they affect things around them. For example, if a black hole is pulling in a lot of gas and dust, it might get very hot and glow. These glow signs can help scientists understand where the black holes are.

Black Holes

Oscar Richardson-Horn, 7C

What is a Black Hole?

A black hole isn't an actual hole. They are called "black" holes because they absorb light and don't reflect any, making them have a black body. They are a region in space where a massive amount of matter is packed into a small space. They contain a point where matter is crushed into infinite density. This is a single point with no extent in any directions. There is no way to surviving a black hole, however if one came to earth we would go through a process called 'spaghettification'. This is where your body would stretch vertically and compress horizontally. It is the tidal effect caused by strong gravitational fields.

I bet you're wondering 'What are the chances of a black hole coming to earth?'. There is a 1 in 100 billion chance of a black hole hitting earth. The closest black hole to us is Gaia BH1, which is 1,560 light-years away. However, it has no threat of coming to earth. One black hole has been observed travelling at around 5 million mph (miles per hour). If you were able to stand in a black hole for 1 minute, 700 years would have passed in the time. This is because their intense gravity distorts the fabric (a metaphorical way to visualise the universe's structure) of spacetime. Stellar black holes are extremely cold and have an absolute zero temperature, the equivalent to zero Kelvin.

Is time travel possible? Part 1

Eliza Ravat, 7E

Definition: Time travel refers to the idea of moving between different points in time. Many people think that one day people will be able to travel through time and will be able to change what they did in the past. Many scientists believe this is possible and we will be able to travel in time. There are many theories made by many different scientists like Albert Einstein and Stephen Hawking. Einsteins theory is called Einstein's Theory of Relativity suggests that time is not fixed and can be influenced by speed and gravity. Whereas Stephen Hawking's theory is called Hawking's Chronology Protection Conjecture. He suggested that the laws of physics may prevent time travel, due to the paradoxes and changes it could create in the world. Many people also believe that there are wormholes which are hypothetical passages through space-time could let you travel to different time periods but, their existence remains unproven. Around 30% of people in the UK believe in the possibility of time travel and time travel is a popular concept in science fiction and often sparks curiosity and imagination. These are the pros and cons of travelling through time:

pros	***cons***
• ***Exploration of History**: You could explore different places in history.* • ***Scientific Discoveries**: you could see if religion is real.* • ***Correcting Mistakes**: you can correct any mistakes you have done.*	• ***Paradoxes**: you could change the outcomes of what you do.* • ***Historical interference:** Altering events could be highly questionable.* • ***Future risks:** Traveling to the future might expose you to unknown dangers*

Is Time Travel Possible? Part 2

Continued…

Theories / recent research

Recent studies explore the possibility of "time loops" in space-time, where an object could theoretically return to its starting point in both space and time. These loops might happen near spinning black holes. Physicist Ronald Mallett has a theory where a circulating beam of laser light could twist space-time into a loop and could allow time travel. However, this would only enable travel back to the point when the machine was first turned on. New research suggests that time travel might be possible in certain conditions, like resetting memory are met within a closed system. This could theoretically allow a spaceship to travel back in time while maintaining consistency. While these theories are exciting, they often face significant practical and theoretical hurdles, such as paradoxes (e.g., the grandfather paradox) and the immense energy required to manipulate space-time.

My opinion

There are many possible theories in the world about time travel but I think that we will be able to enable time travel many centuries into the future and we would only be able to go forwards or backwards in time for a few seconds but we would eventually be able to go back in time. But if I was chosen to time travel, I would go to the past and see what really happened in the history of our Earth. What would you do? Would you go into the past, future or stay in the present?

Why do you need sleep?

Hana Akhtar - 8C

We all know that sleep is important, but it is quite easy to forget how much it affects our lives. When we sleep, our bodies are hard at work repairing muscles, strengthening the immune system, and resetting for the next day !And, at the same time, our brains organise memories and process everything we've learned! After all , a good night's sleep does make you feel stronger and ready to take on anything. On the flip side, when you don't get enough rest, even the simplest tasks can feel hard to do. You can't focus, you're irritable, and everything feels like it takes double the effort. Over time, lack of sleep can really start to burden you – both mentally and physically.

For athletes, sleep is very important. It's during rest that your body will recover from hard workouts, rebuild muscle and restore energy for the next day. Without enough sleep, performance can dramatically change , and injuries might take longer to heal. But it's not just athletes who need sleep – students need sleep too, especially when exams or deadlines are very close by. A rested brain can think more clearly, remember more, and helps you to stay calm. Sleep might not seem like a big deal , but it is essential for staying healthy & feeling good.

Climate change

Annaiya Khanum, Year 7

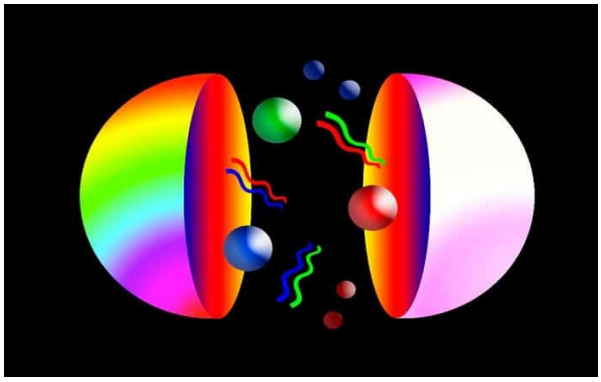
Climate change refers to long-term changes in the Earth's climate, particularly the rise in global temperatures and shifting weather patterns. This is mainly caused by human activities, such as burning fossil fuels (coal, oil, and gas) for energy and clearing forests. These activities release green house gases, like carbon dioxide, into the atmosphere, which trap heat from the sun, warming the planet. As a result, we are seeing more extreme weather events, like heatwaves, stronger storms, and rising sea levels. Climate change also affects ecosystems, food production, and water resources. It's a serious issue that requires global efforts to reduce emissions and find ways to adapt to its impacts.

Climate change needs to be prioritised because its effects are already being felt around the world. For example, extreme heat can affect people's health, and more frequent storms can destroy homes and livelihoods. Climate change also impacts food and water supplies, making it harder to grow crops and access clean water. Additionally, the damage to biodiversity could disrupt ecosystems that are vital for the planet's balance. If we don't take action to reduce emissions and adapt to these changes, the consequences will be more severe for future generations. Prioritising climate change helps protect the planet, safeguard vulnerable communities, and ensure a stable and sustainable future for everyone.

All About: Quarks!

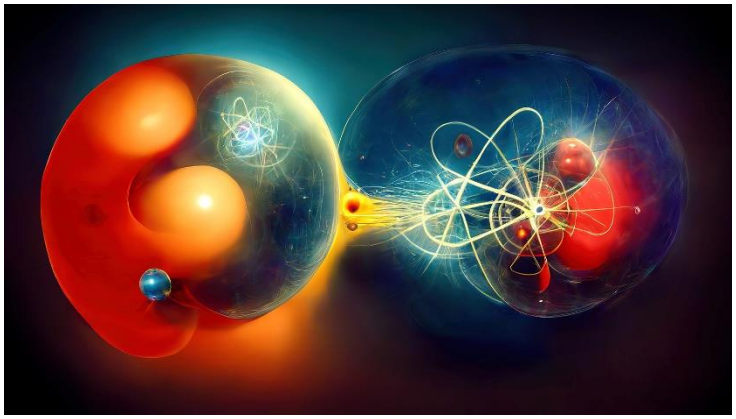
Arthur Cooper, 7C

Quarks. A silly name for a (VERY MUCH) not silly thing. Quarks are tiny particles that make up protons and neutrons (protons and neutrons are found in the nucleus of an atom). There are six different types of quarks, but the most important/common ones are “up” and “down” quarks (the others are “charm” , “strange” “top” and “bottom”).



Protons are constructed of two “up” quarks and one “down” quark, while neutrons are made from one “up” quark and two “down” quarks. Quarks are never alone, as they are always stuck together in groups by a special force called the strong force (sort of like an invisible glue that holds all the quarks together. It’s quite alike to the electromagnetic force, if this helps you understand it). A simple way to think of quarks is like Lego bricks that build EVERYTHING (even you!).

Did you know that there is a phenomenon called quark confinement? It occurs if anything attempts to separate them. The more you try to separate them, the stronger the strong force gets!



Another cool fact is how quarks go their name; it was inspired by James Joyce’s 1939 book named “Finnegans wake”, in which the phrase “three quarks for Muster Mark” appears.

Quantum Mechanics

Kirtan Patel, 7C

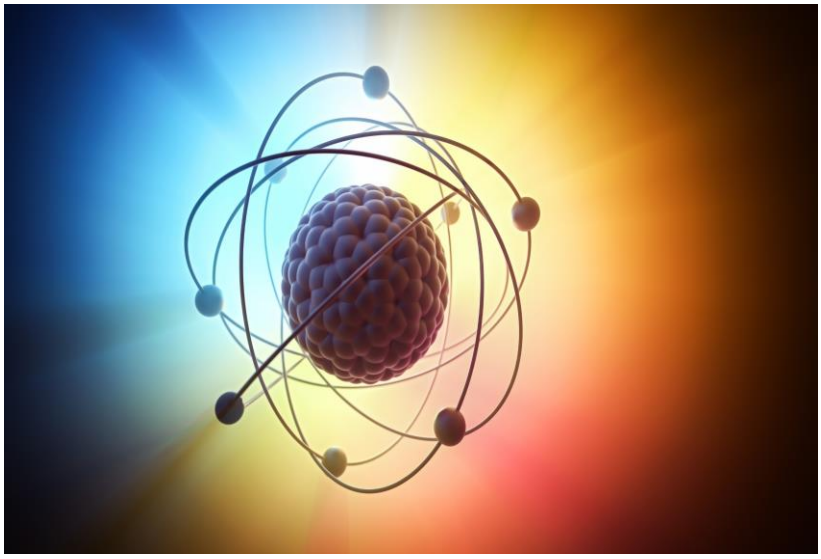
Quantum Mechanics or theory is an elementary part of physics. It describes the behaviour of atoms at a microscopic size, such as atoms, electrons and photons. This field of science reveals astonishing ways the universe operates at microscopic levels, defying our classical intuitions.

There are five key principles of quantum mechanics:

-Wave and Particle duality: Particles such as photons and electrons have wave-like and particle properties. For example, light can behave as a wave and as a particle form.

-Quantisation: Certain properties can only contain discrete values. For example, electrons in an atom can only contain discrete values of energy.

-Uncertainty Principle: Formulated by Werner Heisenberg (a German theoretical physicist), the principle states that it is scientifically impossible, to precisely and accurately track the exact both the momentum and position of a particle.



-Superposition: Particles can have multiple states. For example, imagine a coin. When you flip it, it will be either heads or tails. But in quantum mechanics, the coin is both, head and tails, before we observe the coin to get the answer.

-Entanglement: When the particles become entangled. When one particle instantly corresponds to another particle, regardless of the distance between them. This phenomenon puzzled even Einstein, who called it ‘a spooky action at a distance’.

Fun Fact:

Did you know that quantum mechanics isn’t just a theory, but has been verified by experiments with incredible precision?

Many technologies that are extremely important today are based on quantum principles, like MRI machines, lasers and GPS systems.

In this document, we have learnt that quantum mechanics are an elementary part of physics. Also, we know that it is based on five key principles: Wave and Particle duality, Quantisation, the Uncertainty principle, superposition and Entanglement. Additionally, many essential items for health and safety are based on quantum principles.

A Final Message...

A big thank you to everyone who wrote for this edition of our science newsletter! Your articles have really brought this issue to life, and we hope you had as much fun writing them as we did reading them. Special shout-out to Form 7C for sending in the most articles—your hard work and creativity are definitely noticed! We hope you all enjoyed reading about the latest science happenings, discoveries, and cool facts. If you're feeling inspired and want to share your own article in the next issue, just shoot an email to Will at **wiisaacbarker19@crossleyheath.org.uk**. We'd love to see more of your amazing work in future editions!