



Science

Why is the study of Science important?

Science influences every part of our lives and is vital to the world's future prosperity. Science education provides the foundations for understanding the world around us through the specific disciplines of biology, chemistry and physics. The Science team strives to ignite and nurture a passion for Science to ensure that we are developing future astronomers, engineers, surgeons, research scientists and veterinarians, as well as preparing students for occupations that don't even exist yet! All students develop an understanding of the nature, processes and methods of science through scientific enquiry and practical work. We equip our students with the ability to answer scientific questions about the world around them and make informed decisions in the future. We ensure that students are armed with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Have you ever wondered why the sky is blue? If there are more than 118 elements? Whether there are more undiscovered species of plant or animal? What would the nearest adult answer if you posed these questions? Could they be answered by the brightest minds in science? The curiosity that lies behind these questions and the drive to find the answers is what makes us human and it lies at the heart of Science.

Answering questions is essentially the whole purpose of science and answering these questions simply brings more questions to the surface. Great scientists, those at the very frontier of what we understand as science knowledge, would still declare that the more we understand about the universe, the more there is to find out. How great is that?

The concise Oxford dictionary defines science as 'systematic and formulated knowledge' that is based on mainly observation, experiment and induction'. Science comprises the interrelated discipline of knowledge and skills- but those of us who have ever questioned the world around us see it as so much more than that. Through science you can learn to develop your own ideas, attitudes and interpretations and not simply acquire a set of skills and knowledge. Throughout our science curriculum you'll see that science skills and knowledge are important but it's the application of these ideas that leads onto the great discoveries.

Understanding the scientific process is a way of thinking and working. Science begins with curiosity and daring to ask questions, seeking answers, working through problems and arriving at conclusions. All of which require logical thought and a systematic way of working. A process that is applicable to most scenarios in life! Want to think like a scientist?

Science is an active process. From Year 7 we have planned a range of relevant and exciting scientific activities that involve the full range of all the aspects of science. We feel that to be able to think like a scientist you must understand the foundations that led us to our current understanding in the 21 century. To support this, we

have created opportunities to recreate the investigations of key scientists and to encourage you to try out your own ideas, where the outcomes are unknown and to prove the validity of a scientific fact or idea.

Our 5 year Science curriculum focuses on thinking, interpreting and evaluating rather than simply memorising scientific facts. It is our conviction that this will make science accessible for all. It is not enough to simply recall facts, it is more important to understand and appreciate how that knowledge was derived, how it came to be discovered and accepted by the scientific community. In science, knowledge is power. With it you can unlock scientific thinking and processes.

I challenge you to describe your journey today to the point where you are reading these words. Within seconds of waking up you have benefited from several products developed as a result of someone's curiosity. Science has provided the solutions to a huge number of curiosities and problems, some with great importance (medicine, smart materials) , some abstract (relativity, atomic theory) and some controversial (GM foods, radioactivity).

If you read the poem *The Learn'd Astronomer* by Walt Whitman, you'll appreciate that whilst celebrating the contribution that science has made to our lives, we should never be lost in facts, data and results. We must never lose sight of the beauty of our world beyond the analysis and to every now and again observe 'the perfect silence in stars'. Science provides us with answers. Whilst these answers can be useful in feeding our curiosity they should also make us realise that the world around us is far more complex and beautiful than our imaginations could ever conceive.

'Not only is the universe stranger than we think, it is stranger than we can think' Werner Heisenberg

Many would argue that understanding the beauty of the universe is akin to a magician revealing their tricks. But by following our science curriculum you will appreciate understanding these phenomena makes them even more awe-inspiring. We teach a combined science approach in Year 7 to 11 however there is also opportunity to study separate sciences at GCSE. We believe that each science has wonder and importance and so we have shared how we study each science discipline in our science curriculum.

Biology

Biology is the branch of science which endeavours to explore and gain understanding of the complex and diverse wonders of living organisms within the natural world, looking at origin, morphology, physiology, anatomy, behaviour and distribution. It is one of the three sciences that underpins most, if not all, scientific understanding. The lines between the three sciences can cross and with this are 'bridging' sciences such as biophysics, biochemistry and bioengineering

The key focus of Biology is achieving an understanding of a wide range of what scientists describe as 'phenomena'. In developing an understanding of these phenomena, Biology has led to the discovery and production of materials, structures, processes and devices. The contribution that Biology has made has led to the manufacture of life-saving and life-improving devices such as artificial heart valves, intraocular devices, dental implants and hip replacements as well as diagnostic aids such as DNA probes that can determine the species of bacteria that has caused infection to looking at controlling hormone production to aid growth of specific plant species.

Across your study you will explore cell structure, organisation, infection and response, bioenergetics, homeostasis ecology, inheritance selection and evolution. You will develop an appreciation of how these topics are essentially interlinked. Lessons will provide a wide range of opportunities for practicals, demonstrations and modelling of complex theories that surround us in our everyday lives. Your science classroom will be brimming with practicals where you will learn to formulate hypotheses, analyse data and write conclusions. You will engage with ideas such as the scientific process and how throughout history this process has led to some of the greatest scientific discoveries.

Chemistry

Chemistry is the branch of science which endeavours to explore and gain understanding of the composition, behaviour and properties of matter, and of the elements of the Earth and its atmosphere. Of the three sciences Chemistry is the one that underpins the conceptual framework and methodology of biochemistry, molecular medicine and is at the heart of most, if not all scientific understanding. It is hard to imagine any product of modern times which has not required the efforts of a chemist at some point in its development. The lines between the three sciences can cross and chemistry is the subject which forms the bridge between the three.

The key focus of Chemistry is achieving an understanding of the basic principles with the ultimate goal of developing a greater understanding of the how and the why. In developing an understanding of this phenomenon Chemistry has led to the discovery and production of materials, structures, processes and devices some of which can have productive ends, or some that can be catastrophically destructive. Chemistry's contribution to our modern world is immense. It has changed how we use medicines, materials, fuels and chemicals to form the backbone of industry, commerce and life itself.

Across your study you will explore atomic structure, quantitative structure, organic chemistry, chemical analysis, rate of chemical change and chemistry and the atmosphere. You will develop an appreciation of how these topics are essentially interlinked. Lessons will provide a wide range of opportunities for practical experiments, demonstrations and modelling of complex theories that surround us in our everyday lives. Your Science classroom will be brimming with practical experiments where you will learn to formulate hypotheses, analyse data and write conclusions. You will engage with ideas such as the scientific process and how throughout history this process has led to some of the greatest scientific discoveries.

Physics

Physics is the branch of science which endeavours to explore and gain understanding of the very large (Universe) right down to the very small (quantum behaviour) and everything in between! These extremes of scale such as the structure of stellar systems right down to the constituents of the elementary particles can be understood by applying theories, models and mathematical reasoning.

Physics is one of the three sciences that underpin most if not all scientific understanding. The lines between the three sciences can cross and with this are 'bridging' sciences such as biophysics, biochemistry and chemical physics. On a larger scale, even at a terrestrial level we have meteorology and then at a stellar scale we have astronomy and astrophysics yet further and grander still we have the study of cosmology.

The key focus of physics is achieving an understanding of a wide range of what scientists describe as 'phenomena' with the ultimate goal of developing a grand theory of everything (still yet to be achieved!), for example a basic understanding of how a light bulb works can lead to a comprehensive understanding of how stars form.

In developing an understanding of this phenomena Physics has led to the discovery and production of materials, structures, processes and devices some of which can have productive ends, or some that can be catastrophically destructive. The contribution that physics has had has created our modern world such as communications, transport, electronic devices has been the backbone to industry and commerce.

Across your study you will explore energy, space physics, electricity, atomic structure, forces and waves. You will develop an appreciation of how these topics are essentially interlinked. Lessons will provide a wide range of opportunities for practical experiments, demonstrations and modelling of complex theories that surround us in our everyday lives. Your Science classroom will be brimming with practical experiments where you will learn to formulate hypotheses, analyse data and write conclusions. You will engage with ideas such as the scientific process and how throughout history this process has led to some of the greatest scientific discoveries. Seems challenging - you are going to love it! Physics will expand, and at times blow-your mind!

Science will be taught in a way to develop curiosity about the natural and modern world. Our curriculum develops insight into how science works and a full appreciation of its relevance to our everyday lives. The scope and nature of studying Science will be broad, practical and relevant. It is our vision to encourage students to be inspired, motivated and challenged by science and its contribution to society.

What skills will the study of Science teach you?

You are a citizen in this world and you need to know how the natural and modern world works. It will teach you to:

- Understand theories that explain phenomena
- Apply basic ideas and models that support understanding
- Evaluate models and theories
- Present theories in mathematical form
- Recall quantitative relationships
- Derive quantitative relationships between various measured quantities
- Explain how theories are borne out by experiment.
- Apply experimental procedure and understand that it is a measure of success of a theory
- Present, interpret and evaluate experimental data
- Apply mathematical skills to solve problems
- Develop a deeper understanding of everyday experiences including the natural world and modern devices.

What will you know and understand from your study of Science?

- Develop scientific knowledge and conceptual understanding of science
- Develop understanding of the nature, processes and method of science
- Develop and learn to apply observational, practical, modelling, enquiry and problem-solving skills, both in the laboratory, in the field and in other learning environments.
- Develop their ability to evaluate claims based on science through critical analysis of the methodology evidence and conclusions, both qualitatively and quantitatively.

How does your study of Science support you in other subjects?

The study of any subject in our curriculum takes full advantage of links with other subject areas; we term these as interdisciplinary links and we make the most of them because we know that deep learning requires the transference of knowledge and skills from one topic of learning to another. Once you can transfer your learning across topics and subject areas then you are really mastering what you know and how to apply your understanding and skills.

Across the teaching of subjects, teachers will refer to your learning in other areas, such as Mathematics, and this will help you to develop your understanding. There are even opportunities to apply this learning in Y7 and 8 when interdisciplinary study days are organised to deepen your understanding across the curriculum such as when our STEM departments work together to solve a common problem.

Biology touches on so many other subjects such as physiology and health care. Chemistry touches on so many other subjects such as Mathematics, Applied Mathematics, Music, Construction and Design. Physics touches on so many other subjects such as mathematics, applied mathematics, chemistry, biology, music, construction and design. You will learn methods of thinking and research that are widely applicable to other subject areas helping your thinking in all subjects. All the sciences rely heavily upon evidence to test predictions and theories. Through developing mathematical techniques as well as applying reasoning your skills to present and justify information can be applied to most careers and further education.

How can you deepen your understanding of Science?

Our Science department offers lots of great opportunities for you to really engage with this fabulous subject. Look out for our science clubs, such as our STEM club, which offer a range of fun, interesting topics to stimulate enthusiasm for the subject, including the chance to engineer programmable robots, study astronomy and build rockets!. We also provide opportunity for other STEM events and activities to raise the aspirations of pupils and broaden their horizons that may include visiting local colleges and universities, as well entering regional and national STEM competitions such as the Lego Robotics Challenge (in recent years we have won the regional competition and we were close to winning in the national final). There may be visits to science museums and events that celebrate great scientists and discoveries. We also offer after school support sessions for GCSE students of all abilities, including grade 7-9 masterclasses, and we work with other departments to enhance cross curricular learning skills, such as maths in science and geography in science.

How are you assessed in Science?

Throughout the 5 year Science course you are assessed using the following assessment objectives which ensure that you can cumulatively build your subject understanding in preparation for future GCSE and A Level study. There are 6 assessment points each year that we term Praising Stars©. We assess how students at their current stage of study are on track to reach their end of stage targets which are formulated on aspirational expectation from their KS2 starting points. We make an informed prediction from our holistic assessments based on our subject mapping of expectation across the Science curriculum.

Key Assessment Objectives

AO1: Demonstrate knowledge and understanding of:

- Scientific ideas
- Scientific techniques
- Scientific procedures

AO2: Apply knowledge and understanding of:

- Scientific ideas
- Scientific enquiry
- Scientific techniques and procedures

AO3: Analyse information and ideas to:

- Interpret and evaluate
- Make judgements and draw conclusions
- Develop and improve experimental procedure.

How can Science support your future?

All of the Sciences are offered at most prestigious universities either as a single honours or a joint honours subject studied alongside other disciplines, e.g. Physics with Astrophysics, Physics with Mathematics and Engineering, chemical engineering, veterinary sciences and medicine, Biochemistry, Biomedical Engineering or even Biology with English. The very fact that you have been able to study Science means your analytical thinking and mathematical reasoning will help your future applications, be they for colleges, universities, apprenticeships or employment.

Careers that the study of Science supports include:

- Teaching
- Medicine
- Veterinary Science
- Dentistry
- Physiotherapist
- Marine Biology
- Geneticist/Genomicist
- Engineering (electrical, software, medical, civil, mechanical)
- Geophysics
- Scientific research and development
- Product design
- Aeronautical engineering
- Construction/Architecture
- Civil or medical engineer,
- Astrophysics
- Astronomer
- Chemist/Chemical engineer
- Pharmacist
- Forensic Scientist
- and many more!

Curriculum Progression Pathway

	Term 1: Autumn 1	Term 1: Autumn 2	Term 2: Spring 1	Term 2: Spring 2	Term 3: Summer 1	Term 3: Summer 2
7	Unit 1 - Introduction to Science (Bridging the gap between KS2 and KS3) Unit 2 - Matter and Energy	Unit 2 - Matter and Energy Unit 3 - Chemical Substances	Unit 3 - Chemical Substances Unit 4 - Animal Organ Systems	Unit 4 - Animal Organ Systems	Unit 4 - Animal Organ Systems Unit 5 - Space, Earth and Sustainability	Unit 5 - Space, Earth and Sustainability
8	Unit 6 - Plants, Ecology and Climate change	Unit 6 - Plants, Ecology and Climate change Unit 7 - Forces	Unit 7 - Forces Unit 8 - Chemical Reactions	Unit 8 - Chemical Reactions Unit 9 - Cells, Evolution and Inheritance	Unit 9 - Cells, Evolution and Inheritance Unit 10 - Waves	Unit 10 - Waves
9	Unit 11 – Electromagnetism	Unit 12 – Patterns & Materials Unit 13 – Health & Disease	Review & Assessments	Atomic Structure & the Periodic Table	Energy Cell Biology	Cell Biology
10	B1 - Cell Biology C2 - Bonding and Structure P2 - Electricity Triple: B1, B2, C2, P2	B2 - Organisation C3 - Quantitative Chemistry P2 - Electricity Triple: B2, C3, P2, P3	B2 – Organisation B3 - Infection and Response C3 - Quantitative Chemistry C4 - Chemical Changes P3 - Particle Model of Matter Triple: B3, C4, P3	B3 - Infection and Response B4 - Bioenergetics C4 - Chemical Changes P3 - Particle Model of Matter P4 - Atomic Structure Triple: B3, B4, C5, P4	B4 - Bioenergetics B5 - Homeostasis & Response C4 - Chemical Changes C5 - Energy Changes P4 - Atomic Structure P5 - Forces Triple: B4, B5, C5, P5	Revision & Y10 Exams B5 - Homeostasis and Response P5 - Forces Triple: B5, C9, P8
11	B5 – Homeostasis and Response B6 – Inheritance, Variation and Evolution C6 - The Rate and Extent of Chemical Change C7 – Organic Chemistry P5 – Forces P6 - Waves (Triple)	B6 – Inheritance, Variation and Evolution B7 - Ecology (Combined) C7 – Organic Chemistry C8 – Chemical Analysis C9 - Chemistry of the Atmosphere (Combined) P5 – Forces (Part 2) P6 – Waves Revision & Nov Exams	B7 – Ecology C9 – Chemistry of the Atmosphere (Combined) C10 - Using Resources P6 - Waves (Combined) P7 - Magnetism and Electromagnetism	B7 – Ecology (Triple) Masterclasses, Revision and Mock Exams	Masterclasses, Revision and Final Exams	Revision and Final Exams