Curriculum Progression Pathway

PHYSICS

Why is the study of Science important?

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 in 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 consists of 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 lead onto the great discoveries. Let's get to discovering…

Understanding the scientific process is a way of thinking and working. Science begins with curiosity and daring to ask questions, seek answers, work through problems and arrive 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 Year7 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 allowed the opportunity 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 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 the phenomena makes it 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.

Why is the study of Physics important?

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 are formed.

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.

Physics will be taught in a way to develop curiosity about the natural and modern world. The curriculum will develop insight into how science works and a full appreciation of its relevance to our everyday lives. The scope and nature of studying physics 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.

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 hypothesise, 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!

Big Questions : How does the light bulb work? How does it switch on so fast? What can this tell us about elementary particles?

How can an understanding of magnets lead to a further understanding of how a motor works or how we link our home to power stations?

How can an understanding of atomic structure lead to some of the most advanced medical techniques whilst at the same time lead to catastrophic contamination and hazards?

What skills will the study of Physics 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 Physics?

- Develop scientific knowledge and conceptual understanding of physics
- Develop understanding of the nature, processes and method of physics
- 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 physics through critical analysis of the methodology evidence and conclusions, both qualitatively and quantitatively.

How does your study of Physics support your study in other subjects?

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. As a science Physics relies 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.

Across the teaching of subjects, teachers will make reference to your learning in other areas such as mathematics, Biology and Chemistry 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.

How can you deepen your understanding of Physics?

Our Science departments offer lots of great opportunities for you to really engage with this fabulous subject. Why not look out for the large range of enrichment clubs on offer such as our astronomy club and KS3 Science club. We have fantastic links with STEM and provide students with the opportunity to meet with a range of STEM ambassadors linking clearly to industry. Throughout KS4 we offer bespoke Physics Study Support sessions to deepen our students' understanding and enjoyment of Physics.

How are you assessed in Physics?

Throughout the 5 year Science course you are assessed in Physics 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 Physics 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 procedures.

How can Physics support your future?

Physics is offered at most prestigious universities either as a single honours or a joint honours subject studied alongside other disciplines e.g. can name some courses. The very fact that you have been able to study Physics, your analytical thinking and mathematical reasoning will help your future application be they for colleges, universities, apprenticeships or employment.

Careers that the study of Physics supports include:

- Teaching!
- Medicine
- Engineering (electrical, software, medical, civil, mechanical)
- Geophysics
- Scientific research and development
- Product design
- Aeronautical engineering
- Construction
- Architecture
- Civil or medical engineer,
- Astrophysics
- Astronomer

	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 5 - Space, Earth and Sustainability	Unit 5 - Space, Earth and Sustainability Unit 6 - Plants, Ecology and Climate change	Unit 6 - Plants, Ecology and Climate change
8	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 Unit 11 – Electromagnetism	Unit 11 – Electromagnetism Unit 12 – Patterns and Materials
9	Unit 11 Electromagnetism KS3 Review & Assessments	B1 - Cell Biology	C1 - Atomic Structure & the Periodic Table P1 - Energy	P1 – Energy C2 - Bonding	C2 - Bonding B2 - Organisation	B2 - Organisation P2 - Electricity
10	B3 - Infection and Response B4 – Bioenergetics C3 - Quantitative Chemistry C4 - Chemical Changes P2 - Electricity	B4 – Bioenergetics B5 – Homeostasis and Response C4 - Chemical Changes P3 - Particle Model of Matter P4 - Atomic Structure	B5 – Homeostasis and Response C5 – Energy Changes C6 – Rates of Reaction P5 - Forces	B6 – Inheritance, Variation and Evolution C6 – Rates of Reaction C7 – Organic Chemistry P5 - Forces	B6 – Inheritance, Variation and Evolution C7 – Organic Chemistry C8 - Chemical Analysis P5 - Forces	Revision & Y10 Exams B7 – Ecology C9 - Chemistry of the Atmosphere P6 - Waves
11	B5 – Homeostasis and Response B6 – Inheritance, Variation and Evolution C6 - The Rate and Extent of Chemical Change C7 – Organic Chemistry P5 – Forces	B6 – Inheritance, Variation and Evolution B7 - Ecology C7 – Organic Chemistry C8 – Chemical Analysis C9 - Chemistry of the Atmosphere P5 – Forces P6 – Waves Nov - Revision & Paper 1 Exams	B7 – Ecology C9 – Chemistry of the Atmosphere (Combined) C10 - Using Resources P6 - Waves (Combined) P7 - Magnetism and Electromagnetism Triple: B7, C9, C10, P6, P7	C10 - Using Resources (Triple) B7 – Ecology (Triple) P7 - Magnetism and Electromagnetism (Triple) P8 - Space (Triple) Masterclasses, Revision and Mock Exams	Masterclasses, Revision and Final Exams	Revision and Final Exams