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 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 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!

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 department offers 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, with a different theme each term for Years 7 & 8. We offer STEM events and activities that may include opportunities to visit local colleges and universities and visitors to the academy offering extra enrichments. There may be visits to science museums and events that celebrate great scientists and discoveries. We offer after school, support sessions for GCSE students and work with other departments to enhance learning such as maths in science and geography in science. Get involved!

How are you assessed in Physics?

Throughout the 5 year Physics 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. For younger years we base our assessment on our subject mapping of the age related expectations across the curriculum, assessing students' performance at their current stage of study against expectation. At GCSE we make informed predictions informed by our holistic assessment of their progress against the key assessment objectives and their aspirational GCSE targets. These are also the basis for any appropriate support and intervention.

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 and 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

SCIENCE CURRICULUM PROGRESSION PATHWAY AT OUTWOOD ACADEMY NORMANBY 24/25					
	Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Autumn 1	Unit 1 - Introduction to Science Unit 2 - Matter and Energy	Unit 6 - Plants, Ecology and Climate change Unit 7 – Forces	Unit 11 - Electricity and Magnetism Unit 12 - Patterns and Materials Unit 13 - Health End of KS3 assessments and consolidation	P1- Energy P2- Electricity C2 - Bonding and Structure C3 - Quantitative Chemistry B2 - Organisation	P5 - Forces B5 - Homeostasis and Response B6 - Inheritance C6 - Rates of reaction C7 - Organic Chemistry
Autumn 2	Unit 2 - Matter and Energy Unit 3 - Chemical Substances	Unit 7 – Forces Unit 8 - Chemical Reactions	C1 - Atomic Structure B1 - Cell Biology	B2 - Organisation C3 - Quantitative Chemistry C4 - Chemical changes P3 - Particle model B3 - Infection and Response (F)	P6 - Waves B6 - Inheritance C8 - Chemical analysis C9 - Chemistry of the atmosphere (excluding Triple) P7 - Magnetism and Electromagnetism (F)
Spring 1	Unit 3 - Chemical Substances Unit 4 - Animal Organ Systems	Unit 8 - Chemical Reactions Unit 9 - Cells, Evolution and Inheritance	B1 - Cell Biology	B3 - Infection and Response C4 - Chemical changes P4 - Atoms and Radiation B4 - Bioenergetics (F)	P7 - Magnetism and Electromagnetism B7 - Ecology C10 - Using Resources
Spring 2	Unit 4 - Animal Organ Systems Unit 5 - Space, Earth and Sustainability	Unit 9 - Cells, Evolution and Inheritance Unit 10 - Waves	P1 - Energy C2 - Bonding and Structure	B4 - Bioenergetics B5 - Homeostasis and Response C5 - Energy Changes P5 - Forces (F) C6 - Rates of Reaction (F)	P8 - Space (Triple science) Paper 2 Consolidation
Summer 1	Unit 5 - Space, Earth and Sustainability Unit 6 - Plants, Ecology and Climate Change	Unit 10 - Waves Unit 11 - Electricity and Magnetism	C2 - Bonding and Structure B2 - Organisation	B5 - Homeostasis and Response C6 - Rates of Reaction P5 - Forces Paper 1 Consolidation	Masterclasses, Revision & Exams
Summer 2	Unit 6 - Plants, Ecology and Climate Change	Unit 11 - Electricity and Magnetism Unit 12 - Patterns and Materials	B2 - Organisation P2 - Electricity	Paper 1 Consolidation and Revision P5 - Forces C7 - Organic Chemistry (F)	Exams

SCIENCE CURRICULUM PROGRESSION PATHWAY AT OUTWOOD ACADEMY NORMANBY 25/26					
	Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Autumn 1	Unit 1 - Introduction to Science Unit 2 - Matter and Energy	Unit 7 – Forces	Unit 13 Health End of KS3 assessments and consolidation	B3 - Infection and Response P2 - Electricity	B6 - Inheritance C6 - Rates of reaction P6 - Waves
Autumn 2	Unit 2 - Matter and Energy Unit 3 - Chemical Substances	Unit 7 – Forces Unit 8 - Chemical Reactions	C1 - Atomic Structure B1 - Cell Biology	P3 - Particle Model of Matter C3 - Quantitative Chemistry	B7 - Ecology C7 - Organic Chemistry P7 - Magnetism and Electromagnetism
Spring 1	Unit 3 - Chemical Substances Unit 4 - Animal Organ Systems	Unit 8 - Chemical Reactions Unit 9 - Cells, Evolution and Inheritance	B1 - Cell Biology P1 - Energy	B4 - Bioenergetics P4 - Atomic structure and radiation	B7 - Ecology C8 - Chemical Analysis C9 - Chemistry of the Atmosphere P8 - Space Triple Science only
Spring 2	Unit 4 - Animal Organ Systems Unit 5 - Space, Earth and Sustainability	Unit 9 - Cells, Evolution and Inheritance Unit 10 - Waves	P1 - Energy C2 - Bonding and Structure	C4 - Chemical Changes C5 - Energy Changes	C10 - Using resources Masterclasses and Revision
Summer 1	Unit 5 - Space, Earth and Sustainability Unit 6 - Plants, Ecology and Climate change	Unit 10 - Waves Unit 11 - Electricity and Magnetism	B2 - Organisation	P5 - Forces B5 - Homeostasis and Response Paper 1 Consolidation	Masterclasses, Revision & Exams
Summer 2	Unit 6 - Plants, Ecology and Climate change	Unit 12 - Patterns and Materials	B2 - Organisation P2 - Electricity	C6 - Rates of reaction B5 - Homeostasis and Response P5 - Forces End of year exams	Exams