



## PHYSICS

### **Why is the study of Physics important?**

Have you ever wondered why the sky is blue? If there are more than 118 elements? Why do the stars appear to move across the sky? What did the Universe look like in the past and what will it look like in the future? 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 Physics.

Answering questions is essentially the whole purpose of Physics 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 ideas, attitudes, and interpretations and not simply acquire a set of skills and knowledge. Throughout our Physics curriculum, you'll see that Science skills and knowledge are important but it's the application of these ideas that lead to the great discoveries. Let's get to discovering...

Physics plays an important role in all the natural Sciences, however, such fields have branches in which physical laws and measurements receive special emphasis, bearing such names as astrophysics, geophysics, biophysics, and even psychophysics. Physics can be defined as the Science of matter, motion, and energy. Its laws are typically expressed with economy and precision in the language of mathematics.

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 21st century. To support this, we have allowed you the opportunity to recreate the investigations of key scientists and encourage you to try out your ideas, where the outcomes are unknown, and to prove the validity of a scientific fact or idea.

Our 5 year Science curriculum (3 years at KS3 and 2 years at GCSE) 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, and 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.

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 every now and again observe 'the perfect silence in stars'. Physics 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

***The 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 experiments.
- Apply experimental procedure and understand that it is a measure of the 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 an understanding of the nature, processes, and methods of physics
- Develop and learn to apply observational, practical, modelling, enquiry, and problem-solving skills, both in the laboratory, in the field, and 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, 8, and 9 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 engage in this fabulous subject. Why not look out for the large range of enrichment clubs on offer? 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 celebrating 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. We have a thriving weekly Science club where students get lots of practical experience and develop their curiosity and creativity.

### **How are you assessed in Physics?**

Throughout the 5-year Physics course, 2.5 years in key stage 2.5 and 2 years in key stage 4, you are assessed using the following assessment objectives, ensuring that you can cumulatively build your subject understanding in preparation for future GCSE and A Level study. For years 7, 8, and 9 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 judgments 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. The very fact that you have been able to study Physics and your analytical thinking and mathematical reasoning will help your future application 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 Carlton 24/25**

	<b>Year 7</b>	<b>Year 8</b>	<b>Year 9</b>	<b>Year 10</b>	<b>Year 11</b>
<b>Autumn 1</b>	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	B2 - Organisation P2- Electricity C2 - Bonding and Structure	P5 - Forces B5 - Homeostasis and Response B6 - Inheritance C6 - Rates of reaction
<b>Autumn 2</b>	Unit 2 - Matter and Energy Unit 3 - Chemical Substances	Unit 7 – Forces Unit 8 - Chemical Reactions	Transitional Unit 1 Chemistry - Atomic structure Transitional Unit 1 Biology - Cells	C3 - Quantitative Chemistry B3 - Infection and Response B4 - Bioenergetics	P6 - Waves B6 - Inheritance C7 - Organic Chemistry C8 - Chemical analysis
<b>Spring 1</b>	Unit 3 - Chemical Substances Unit 4 - Animal Organ Systems	Unit 8 - Chemical Reactions Unit 9 - Cells, Evolution and Inheritance	Transitional Unit 1 Physics - Energy	C4 - Chemical changes P3 - Particle model	P7 - Magnetism and Electromagnetism C9 - Chemistry of the atmosphere C10 - Using Resources
<b>Spring 2</b>	Unit 4 - Animal Organ Systems Unit 5 - Space, Earth and Sustainability	Unit 9 - Cells, Evolution and Inheritance Unit 10 - Waves	C2 - Bonding and Structure	P4 - Atoms and Radiation C5 - Energy Changes Paper 1 Consolidation P5 - Forces C6 - Rates of Reaction (F)	P8 - Space (Triple Science) Paper 2 Consolidation
<b>Summer 1</b>	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	P5 - Forces P7 - Magnetism	Masterclasses, Revision & Exams
<b>Summer 2</b>	Unit 6 - Plants, Ecology and Climate Change	Unit 11 - Electricity and Magnetism Unit 12 - Patterns and Materials	P2 - Electricity	B7 - Ecology	Exams

## Science CURRICULUM PROGRESSION PATHWAY AT OUTWOOD ACADEMY Carlton 25/26

	Year 7	Year 8	Year 9	Year 10	Year 11
<b>Autumn 1</b>	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
<b>Autumn 2</b>	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
<b>Spring 1</b>	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
<b>Spring 2</b>	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
<b>Summer 1</b>	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
<b>Summer 2</b>	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