



## 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 own 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 onto the great discoveries. Let's get to discovering...

Physics plays an important role in all the natural sciences and all 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 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 (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, 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 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

### **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, 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?**

Students have resources uploaded to google classroom on a regular basis. Staff are happy to answer queries within the real life classroom or within the virtual classroom. All years can explore key female influences through our regular Science enrichment club. Students are introduced to key scientific figures, explaining their contribution to science and the time they were alive. Students are then quizzed on their new knowledge in a fun and interactive way. 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. These involve both practical and theoretical sessions, alongside other fun revision sessions such as themes quizzes and problem solving challenges. Get involved!

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

Throughout the 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. There are assessment points each year that we term Praising Stars©. For KS3 these are termly and for KS4 these are every half term. 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 in years 10 and 11 we make informed predictions informed by our holistic assessment of their progress against the key assessment objectives and their aspirational GCSE targets.

#### **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 REDCAR

	Year 7	Year 8	Year 9	Year 10	Year 11
<b>Autumn 1</b>	Unit 1 - Introduction to Science Bridging the gap between KS2 and KS3 Unit 2 - Matter and Energy	Unit 6 - Plants, Ecology and Climate change	Unit 10 - Waves Unit 11 - Electricity and Magnetism	B1 - Cell Biology C1 - Atomic Structure P1 - Energy	B6 - Inheritance C2 - Bonding and Structure C3 - Quantitative Chemistry P5 - Forces
<b>Autumn 2</b>	Unit 2 - Matter and Energy Unit 3 - Chemical Substances	Unit 7 – Forces	Unit 12 - Patterns and Materials	B1 - Cell Biology P2 - Electricity and Magnetism C2 - Bonding and Structure	B6 - Inheritance C7 - Organic Chemistry P6 - Waves
<b>Spring 1</b>	Unit 3 - Chemical Substances Unit 4 - Animal Organ Systems	Unit 8 - Chemical Reactions	Unit 13 - Health and Disease	B2 - Organisation C3 - Quantitative Chemistry P2 - Electricity and Magnetism P3 - Particle Model of Matter	C8 – Chemical Analysis C9 – Chemistry of the Atmosphere P7 - Magnetism and Electromagnetism
<b>Spring 2</b>	Unit 4 - Animal Organ Systems	Unit 8 - Chemical Reactions	Unit 14 - Sustainability	B3 - Infection and Response C4 - Chemical Changes	C10 – Using Resources P8 - Space Triple Science only Masterclasses and Revision
<b>Summer 1</b>	Unit 4 - Animal Organ Systems Unit 5 - Space, Earth and Sustainability	Unit 9 - Cells, Evolution and Inheritance	End of KS3 assessments and consolidation	C4 - Chemical Changes C5 - Energy Changes P4 - Atomic Structure	Masterclasses and Revision
<b>Summer 2</b>	Unit 5 - Space, Earth and Sustainability	Unit 10 - Waves	Transition	B4 - Bioenergetics B5 - Homeostasis and Response P5 - Forces	Revision