

KS5 Curriculum Overview: Physics

Rationale:

In Key Stage 5 we expand on the content covered in Key Stage 4 with the OCR A Physics course. The students work towards earning the Advanced General Certificate of Education.

During Year 12, we explore three themes: foundations of physics, which explores the fundamental units and skills required for physics; forces, energy and matter, which explores forces and motion, as well as energy transfers and looking further into density; and finally waves and electricity, which explores the phenomena behind electricity as well as waves.

During Year 13, we explore: oscillations and fields, which covers thermal physics, SHM and the three types of force fields; and nuclear physics, which explores inside the nucleus and covers the fundamental particles.

Over the course of both years, students will work practically to achieve a standalone accreditation called the Common Practical Assessment Criteria (CPAC). This is achieved by showing competence in five areas of investigation skills, over the course of 12 required practicals/research tasks.

At Key Stage 5 we follow the OCR A Scheme of Learning, in common with Biology and Chemistry. This was selected from a number of different courses as we felt it had the most logical sequence to support both sequential development of knowledge as well as the best strategy to approach the CPAC assessment.

Reading in the Curriculum: Physics offers opportunities to develop and extend students' literacy skills. Across the Physics curriculum students will explore new scientific vocabulary and will have the chance to deduce and perfect their own definitions of scientific keywords. Literacy also appears in the investigations aspect of our curriculum, particularly the PAGs, as students must be able to read methods carefully in order to generate valid results, and also carry out research and referencing to evaluate their results. Students will use texts to find out information for themselves, using the functional layout of such texts, including index, contents and glossary sections of text books used in class, and also at home and in an online format. Students will also review and connect information, as part of writing university-style essays to consolidate higher level synoptic knowledge and expand the curriculum to prepare them for higher education.

Connected Learning: Topics in Physics do not stand alone. Each topic connects to prior knowledge from GCSE, and also in the outside world. Connected knowledge is discussed in class, starting with the Context Summary which is shared with students at the start of each topic.

Diversity: Science belongs to everyone, regardless of background, and people from all walks of life contribute to its development and reap its benefits. This is reflected in the examples used in lessons and the Scientists whose work we consider.

Purple denotes Teacher 1
Black denotes Teacher 2

Term / Length of Unit	Outline	Assessment	Home Learning	Resources	Knowledge/Skills End Points
Year 12 Autumn Term 1 Teacher 1	<p><u>Module 2: Foundations of Physics</u></p> <p>Students learn about the fundamentals of physics including base units, derived units and vectors.</p>	End of topic test	Kerboodle resources and Exam questions	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> What are the base and derived units? What are scalar and vector quantities? <p><u>Skills</u></p> <ul style="list-style-type: none"> Adding vectors Resolving vectors into components
Year 12 Autumn Term 2 Teacher 1	<p><u>Module 3: Chapters 3 + 4</u></p> <p>Students learn about motion and the forces in action of objects in motion. They cover topics such as speed, acceleration, free-fall, projectile motion, forces, moments and equilibrium. They also explore density and Archimedes' principle.</p> <p>Students will also use investigative techniques to find g by free-fall.</p>	End of topic test	Kerboodle resources and Exam questions	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> Compare speed and velocity Describe free-fall and projectile motion Define moments, couples and torques <p><u>Skills</u></p> <ul style="list-style-type: none"> Calculate using <i>suvat</i> Draw free-body diagrams Graph skills for free-fall and projectile motion Vector addition
Year 12 Autumn Term Teacher 2	<p><u>Module 4: Chapters 11, 12, 13</u></p> <p>Students learn about the theory of energy transfer by waves and by photons. They will cover wave properties, including interference as well as looking at stationary waves. In quantum physics students look at the photon model of energy transfer and explore wave-particle duality.</p>	End of topic test	Kerboodle resources and Exam questions	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> What are the different types of waves? Illustrate interference in a range of scenarios Justify the photon model of EM radiation

	<p>Students will also use investigative techniques to find the wavelength of a laser beam using diffraction gratings and then compare to the known wavelength.</p> <p>Students will also use investigative techniques to determine Planck's constant using LED's and compare with the known value.</p>				<p><u>Skills</u></p> <ul style="list-style-type: none"> ● Find Planck's constant ● Investigate the GLE idea ● Recall and rearrangement of equations
<p>Year 12 Spring Term Teacher 1</p>	<p><u>Module 3: Chapters 5, 6, 7</u></p> <p>Students learn about work and energy as well as explore materials and the laws of motion and momentum. Students will look at work done, Young modulus and momentum of collisions.</p> <p>Students will also use investigative techniques to find the Young modulus of a material and compare to the known values.</p>	<p>End of topic test</p>	<p>Kerboodle resources and Exam questions</p>	<p>SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> ● Understand that energy is conserved ● Link elasticity to Young modulus <p><u>Skills</u></p> <ul style="list-style-type: none"> ● Determining Young modulus ● Graph skills for Required Practical, particular focus on lines of best fit and their importance ● Calculate collisions in two dimensions
<p>Year 12 Spring Term Teacher 2</p>	<p><u>Module 4: Chapters 8, 9, 10</u></p> <p>Students learn about direct current electricity. They will explore Kirchhoff's laws, resistance and IV characteristics.</p> <p>Students will also use investigative techniques to find the resistivity of a metal and compare to its known value. They will also explore potential divider circuits.</p>	<p>End of topic test</p>	<p>Kerboodle resources and Exam questions</p>	<p>SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> ● Understand Kirchhoff's laws ● Define resistance and resistivity ● Describe the uses of thermistors and LDR's <p><u>Skills</u></p> <ul style="list-style-type: none"> ● Determine the resistivity of a metal ● Construct electric circuits

<p>Year 12 Summer Term 1 Teacher 1</p>	<p><u>Module 5 Chapters 19 + 20</u></p> <p>Students learn about stars and cosmology. They will explore how stars are formed and how the big bang occurred. They will also look at various effects that affect our understanding of the universe.</p>	<p>End of topic test</p>	<p>Kerboodle resources and Exam questions</p>	<p>SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> • Illustrate the life cycle of stars • Define astronomical distances • Define Hubble's law • Describe the evolution of the universe <p><u>Skills</u></p> <ul style="list-style-type: none"> • Calculate the age of stars • Calculate the distances of stars from Earth
<p>Year 12 Summer Term 1 Teacher 2</p>	<p><u>Module 5 Chapters 14 + 15</u></p> <p>Students learn about thermal and gas physics. They will explore specific heat capacity and latent heat. They will also explore kinetic theory of gases.</p> <p>Students will also use investigative skills to determine an estimate of absolute zero using experiments with gases and apply their knowledge of ideal gas assumptions.</p>	<p>End of topic test</p>	<p>Kerboodle resources and Exam questions</p>	<p>SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> • Define internal energy • Calculate SHC and SLH • Recall the kinetic theory <p><u>Skills</u></p> <ul style="list-style-type: none"> • Apply kinetic theory to gases • Determine absolute zero • Calculating velocities from rms speed.
<p>Year 13 Autumn Term 1 Teacher 1</p>	<p><u>Module 6 Chapters 21, 22, 23</u></p> <p>Students learn about electric and magnetic fields, including capacitors. Students will explore the uses of capacitors and logarithmic equations used. Students will also explore the laws surrounding electric and magnetic fields and will compare the two.</p> <p>Students will also use investigative skills to determine the time constant for a capacitor and then use the known values to calculate the theoretical time constant and compare the two.</p>	<p>End of topic test</p>	<p>Kerboodle resources and Exam questions</p>	<p>SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book</p>	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> • Define a capacitor and its uses • Define Coulomb's law • Explain how charged particles behave in an electric field • Define Faraday's law and Lenz's law <p><u>Skills</u></p> <ul style="list-style-type: none"> • Calculate time constant using logarithms • Graphical skills

					<ul style="list-style-type: none"> Calculating transformer variables
Year 13 Autumn Term 1 Teacher 2	<p align="center"><u>Module 5 Chapter 16, 17</u></p> <p>Students will learn about objects in circular motion and simple harmonic motion. They will explore the forces and factors involved in circular motion as well as the rule of SHM.</p> <p>Students will also use investigative skills to determine the factors affecting the period of a simple oscillator.</p>	End of topic test	Kerboodle resources and Exam questions	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> Describe objects in circular and SH motion Explain centripetal force by linking to Newton's 2nd law Describe the conditions needed for resonance <p><u>Skills</u></p> <ul style="list-style-type: none"> Calculating variables using quadratic equations Graphical skills with oscillation graphs
Year 13 Autumn Term 2 Teacher 2	<p align="center"><u>Module 6 Chapter 24, 25</u></p> <p>Students will learn about sub-atomic particles and radioactivity. They will explore the fundamental particles in the universe and their antiparticles. Students will also explore nuclear decay using knowledge from particle physics.</p> <p>Students will also use investigative skills to determine the radiation emitted from a source using absorption.</p>	End of topic test	Kerboodle resources and Exam questions	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<p><u>Knowledge</u></p> <ul style="list-style-type: none"> Recall the types of radiation and their properties Identify particles and antiparticles and their laws Illustrate decay using equations <p><u>Skills</u></p> <ul style="list-style-type: none"> Observational skills using background radiation and GM tubes Model radioactive decay
Year 13 Spring Term Teacher 1	<p align="center"><u>Revision</u></p> <p align="center">Year 13 Revision</p> <p>PAG 11 Investigation Task – Students will complete a full independent investigation task on determining the SHC of a metal.</p>	PAG assessment			

Year 13 Spring Term 1 Teacher 2	<u>Module 6 Chapter 26, 27</u> Students will learn about nuclear physics and medical physics. They will explore fission and fusion including its applications. They will also explore medical imaging such as x-rays and CAT scans.	End of topic test	Homework question booklets	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<u>Knowledge</u> <ul style="list-style-type: none"> • Describe fusion and fission in terms of binding energy • Describe the use of medical scanners • Describe the use of ultrasound in scanning
Year 13 Spring Term 2 Teacher 2	Revision				
<i>Year 13 Summer Term Both</i>	<u>Revision</u>			Students will be subjected to regular testing on topics to prepare them for their exams.	