BEECHEN CLIFF

A Level Physics

Curriculum Booklet

2025 - 2026

Head of Faculty: Ms R Bala

Head of Subject: Mr A Seal

Subject Curriculum Intent:

"An ***experiment*** is a question which Science poses to Nature, and a ***measurement*** is the recording of Nature's answer".

Max PLANCK

Physics is an incredibly fascinating subject which ultimately seeks to gain a complete understanding of the universe and how everything within it works. At Beechen Cliff we are incredibly passionate about the subject and offer a challenging course with high aspirations for our students. Our intention is that having studied with us our students will;

- develop a deep and comprehensive knowledge of the core concepts within Physics,
- develop strong mathematical and analytical skills,
- be able to apply their knowledge and skills to a wide range of problems,
- develop the necessary practical skills and experiences needed to confidently investigate physical phenomena,
- be able to confidently articulate their understanding,
- develop an awareness of the many interesting and varied career opportunities within the field,
- be fully equipped to continue to study or to work in the field beyond A level at any institution they desire.

In the Lower Sixth our students begin the course by covering a quick skills introduction before moving onto topics which overlap with the content covered in the GCSE Science courses before quickly developing beyond them. Students will learn about Forces and Motion, Mechanics, Materials, Electricity and Circuits before going onto study Waves and eventually Quantum and Medical Physics.

In the Upper Sixth, having developed the necessary knowledge and skills needed to access more advanced ideas, we study Gravity, Circular Motion, Thermal and Kinetic Physics, Ideal Gases, Electric and Magnetic fields, Electromagnetism, Radioactivity, Nuclear Physics, Particle Physics, Stellar Evolution and Cosmology.

It is the intention that practical and analytical skills are developed throughout the course. We have excellent practical facilities and have included a wide range of practical opportunities that exceed the requirements set by exam boards, ensuring that our students have a rich experience working in a physics laboratory with technical equipment.

We are a successful department which attracts a high number of students each year, bucking the national trend. As a mixed Sixth form we cater for both boys and girls who have come from a variety of schools and with a wide ability range and thus we do everything we can to ensure that all are challenged and supported to succeed and that everyone is included.

In 2019, the physics department received an Award for "Outstanding progression and retention of students" from the Institute of Physics. This celebrated the fact that a large number of students continue to choose to study physics at Beechen Cliff and continue to complete the course. More than 60% of the Beechen Physics students go on to study Physics, Engineering, Medicine or Natural Sciences at Oxbridge or Russell Group Universities.

Subject Curriculum Implementation:

At Beechen Cliff, we study the OCR Physics A specification. The course is delivered by experienced Physics teachers and students will have two teachers throughout, each covering one "side" of the course, ensuring that they experience a wide range of skills and expertise. There are 6 Modules of learning as follows.

Module	**Year**
Module 1: Practical Skills Module 2: Foundations of physics	These modules are taught throughout the two years
Module 3: Forces and Motion Module 4: Electrons, Waves and Photons	Covered in L6th, with one teacher taking each module.
Module 5: Newtonian world and Astrophysics Module 6: Particles and Medical Physics	Started in L6th then completed in U6th, with two teachers sharing each module.

The course is divided into topics, each covering different key concepts of physics. Topics are taught in a logical order of increasing difficulty and in such a way that knowledge is developed over time. For example, in the Lower Sixth, students will learn about forces and motion, including how to calculate the acceleration of an object as it moves, and then in the Upper Sixth, students will learn about electric and magnetic fields, applying what they learned about forces and motion to charged particles as they move through particle accelerators, and eventually how these machines have helped us to deepen our understanding of particle physics. Given our wide range of students from a variety of feeder schools, following an introduction to the course, students sit a low stakes early assessment which helps to inform us of the level of knowledge and skills they have arrived with. All students are then challenged and supported according to their needs. All have access to a digital textbook as well as the videos and practice questions available on the 'alevelphysicsonline.com' website. We include stretch and challenge activities which go beyond the A level specification by introducing more demanding content and further reading opportunities. However we also unpackage the learning for those with lower prior attainment by providing support material in the form of student booklets, support sheets and by offering intervention packs and additional revision sessions. We carry out regular low stakes assessments to identify gaps in knowledge and alter teaching plans to ensure these are filled. We have a formal assessment at the end of each term. We have two sets of mock examinations before and after Christmas in the Upper Sixth to ensure students are familiar with the format and demand of the final examinations - assessing content covered until that point. There are three final examinations. Unit 1, Modelling Physics, covers Modules 1, 2, 3 and 5. Unit 2, Exploring Physics, covers modules 1, 2, 4 and 6. Unit 3, Unified Physics, covers everything by asking synoptic questions which draw on knowledge from both sides of the course.

Allocated Curriculum Time:

	Lower Sixth	**Upper Sixth**
Fortnightly lesson allocation	8	8
Silent study lesson allocation	1	1

Course Information

Exam Board: OCR Physics
Specification: Physics A H556

Lower Sixth

	Curriculum Foci Areas		
Term	**Teacher A**	**Teacher B**	**Assessment**
1	**Module 2** **Chapter 2 Basic Maths skills** 2.1 Quantities and units 2.2 Derived units. **Maths skills assessment.** **Module 3** **Chapter 3 Motion** 3.1 Distance and speed 3.2 Displacement and velocity 3.3 Acceleration 3.4 Velocity–time graphs 3.5 Equations of motion 3.6 Car stopping distances 3.7 Free fall and g 3.8 Projectile motion	**Module 4** **Chapter 11 Waves 1** 11.1 Progressive waves 11.2 Wave properties 11.3 Reflection and refraction 11.4 Diffraction and polarisation 11.5 Intensity 11.6 Electromagnetic waves 11.7 Polarisation of electromagnetic waves 11.8 Refractive index 11.9 Total internal reflection	**Term 1 Assessment 1 - Maths Skills** **Term 1 Assessment 2 - Waves 1**
2	**Chapter 4 Forces in action:** 4.1 Force, mass, and weight 4.2 Centre of mass 4.3 Free-body diagrams 4.4 Terminal velocity 4.5 Moments 4.6 Couples and torques 4.7 Triangles of forces 4.8 Density and pressure 4.9 Pressure in fluids and Archimedes' principle	**Chapter 12 Waves 2** 12.1 Superposition of waves 12.2 Interference 12.3 The Young double-slit experiment 12.4 Stationary waves 12.5 Harmonics 12.6 Stationary waves in air columns **Chapter 13 Quantum Physics** 13.1 The photon model 13.2 The photoelectric effect 13.3 Einstein's photoelectric effect equation 13.4 Wave-particle duality	**Term 2 Assessment 1 - Waves 2** **Term 2 Assessment 2 - Motion & Equilibrium**
3	**Chapter 5 Work, energy and power** 5.1 Work done and energy	**FINISH Chapter 13 Quantum Physics** 13.1 The photon model	**Term 3 Assessment - Mid Year assessment (covering all content taught to date)**

	5.2 Conservation of energy 5.3 Kinetic energy and gravitational potential energy 5.4 Power and efficiency **Chapter 6 Materials** 6.1 Springs and Hooke's law 6.2 Elastic potential energy 6.3 Deforming materials 6.4 Stress, strain, and the Young modulus	13.2 The photoelectric effect 13.3 Einstein's photoelectric effect equation 13.4 Wave-particle duality **Chapter 8 Charge and current** 8.1 Current and charge 8.2 Moving charges 8.3 Kirchhoff's first law 8.4 Mean drift velocity	
4	**Chapter 7 Laws of motion and Momentum** 7.1 Newton's first and third laws of motion 7.2 Linear momentum 7.3 Newton's second law of motion 7.4 Impulse 7.5 Collisions in two dimensions	**Chapter 9 Energy, power and resistance** 9.1 Circuit symbols 9.2 Potential difference and electromotive force 9.3 The electron gun 9.4 Resistance 9.5 I-V characteristics 9.6 Diodes 9.7 Resistance and resistivity 9.8 The thermistor 9.9 The LDR 9.10 Electrical energy and power 9.11 Paying for electricity	**Term 4 Assessment 1 - Charge, Current & Resistance** **Term 4 Assessment 2 - Work, Energy & Power, Forces in Action**
5	**Module 5 (U6th content)** **Chapter 16 Circular motion** 16.1 Angular velocity and the radian 16.2 Angular acceleration 16.3 Exploring centripetal forces	**Chapter 10 Electrical circuits** 10.1 Kirchhoff's laws and circuits 10.2 Combining resistors 10.3 Analysing circuits 10.4 Internal resistance 10.5 Potential divider circuits 10.6 Sensing circuits	**Term 5 assessment - pre-mock exposure (a full AS Physics Paper covering Modules 1 to 4)**
6	**Module 5** **Chapter 18 Grav fields** 18.1 Gravitational fields 18.2 Newton's law of gravitation 18.3 Gravitational field strength for a point mass 18.4 Kepler's laws 18.5 Satellites 18.6 Gravitational potential 18.7 Potential energy **SUMMER WORK** Practical assessment task 12. Research report task.	**Module 5 (U6th content)** **Chapter 14 Thermal Physics** 14.1 Temperature 14.2 Solids, liquids and gases 14.3 Internal energy 14.4 Specific heat capacity 14.5 Specific latent heat **Chapter 15 Ideal Gases** 15.1 The kinetic theory 15.2 Gas laws 15.3 Root mean square speed 15.4 The Boltzmann constant	**Term 6 -** **Lower Sixth Mock (a full AS Physics Paper covering Modules 1 to 4)**

Upper Sixth

	Curriculum Foci Areas		
Term	**Teacher A**	**Teacher B**	**Assessment**
1	**Chapter 19 Stars** 19.1 Objects in the universe 19.2 The life cycle of stars 19.3 The Hertzsprung-Russell diagram 19.4 Energy levels in atoms 19.5 Spectra 19.6 Analysing starlight 19.7 Stellar luminosity **Chapter 20 Cosmology** 20.1 Astronomical distances 20.2 The Doppler effect 20.3 Hubble's law 20.4 The Big Bang theory 20.5 Evolution of the Universe **End of paper 1**	**Chapter 16 recap** **Chapter 17 Oscillations** 17.1 Oscillations and simple harmonic motion 17.2 Analysing simple harmonic motion 17.3 Simple harmonic motion and energy 17.4 Damping and driving 17.5 Resonance **End of paper 1** **Module 6 (Paper 2)** **Chapter 21 Capacitance** 21.1 Capacitors 21.2 Capacitors in circuits 21.3 Energy stored by capacitors **Chapter 22 Electric fields** 22.1 Electric fields 22.2 Coulomb's law 22.3 Uniform electric fields and capacitance 22.4 Charged particles in uniform electric fields 22.5 Electric potential and energy	**Term 1 Assessment 1 - Gravity, Stars & Cosmology** **Term 1 Assessment 2 -**
2	**Module 6** **Chapter 24 Particle Physics** 24.1 Alpha-particle scattering experiment 24.2 The nucleus 24.3 Antiparticles, hadrons, and leptons 24.4 Quarks 24.5 Beta decay **Chapter 25 Radioactivity** 25.1 Radioactivity 25.2 Nuclear decay equations 25.3 Half-life and activity	21.4 Discharging capacitors 21.5 Charging capacitors 21.6 Uses of capacitors **Chapter 23 Magnetic fields** 23.1 Magnetic fields 23.2 Understanding magnetic fields 23.3 Charged particles in magnetic fields 23.4 Electromagnetic induction 23.5 Faraday's law and Lenz's law 23.6 Transformers	**Mock Exam 1 - Full Paper 1 exam on Modules 3 & 4**

3	25.4 Radioactive decay calculations 25.5 Modelling radioactive decay 25.6 Radioactive dating **Chapter 26 Nuclear Physics** 26.1 Einstein's mass-energy equations 26.2 Binding energy 26.3 Nuclear fission 26.4 Nuclear fusion	**Module 6** **Chapter 27 Medical imaging** 27.1 X-rays 27.2 Interaction of X-rays with matter 27.3 CAT scans 27.4 The gamma camera 27.5 PET scans 27.6 Ultrasound 27.7 Acoustic impedance 27.8 Doppler imaging	**Term 3 Assessment 1 - Particles & Nuclear Physics**
4	**Revision** **Complete practical work**	**Revision** **Complete practical work**	**Mock Exam 2 - Full Paper 2 exam on Modules 5 & 6**
5	**Revision** **Final Exams**	**Revision** **Final Exams**	

Careers in Physics

The Physics A Level curriculum has many links to careers, throughout the two years. There are numerous examples where the content has a direct link to real-world applications, and so to potential careers. Some of these examples are listed below. Rather than having stand-alone careers activities, these links are interwoven into our teaching of the course.

Year	Careers Education in Science
12	• The importance of understanding vectors when piloting an aeroplane, or driving a tugboat. • Designing aerodynamic vehicles to increase top speed and reduce fuel consumption. • Engineering - numerous links are covered, including to bridge and building design, understanding hydraulics, the behaviour of materials under tensile forces and safety features in vehicles. • Electrical engineering - how circuits are designed and optimised to perform a function. • Communications and geophysical surveying careers are discussed whilst teaching about waves.
13	• Constant-volume flow heating in the manufacture of showers and dishwashers and design of nuclear reactors and car engines. • Use of centrifuges in medicine and industry to separate components in a mixture. • Centripetal force in sports such as NASCAR, velodrome cycling and hammer-throwing, and in fairground rides • Resonance and damping in relation to bridge construction, MRI, musical instruments and clock mechanisms. • Mining and oil exploration using gravimetry. • Studying extrasolar planets, stars and cosmology using astrophysics • Use of satellites for communication, navigation and surveying • Use of weather radar and the Doppler effect for aerial navigation. • the importance of capacitors in the manufacture of touch screens. • Applications of physics in medical imaging, diagnostics and treatment.

Careers links

- https://www.iop.org/careers-physics/your-future-with-physics/career-paths - This webpage has links to a wide range of careers that an A Level in Physics can lead you to.
- This careers booklet gives a comprehensive guide to pathways you could take with an A Level in Physics.

Reading List

- A level Physics for OCR Physics A - by Oxford University Press.
  Author: Graham Bone,Gurinder Chadha ; ISBN: 9780198352174 ; Publisher: Oxford University Press
  You have free access to a digital version of this textbook.

None of the following are compulsory, however you will find it useful to read more widely around the subject and so the following are suggestions:

- New Scientist (Weekly Journal)
- A Brief History of Nearly Everything - Bill Bryson
- The Martian - Andy Weir
- Project Hail Mary - Andy Weir

Studying/Revision Information

It is important that you regularly read over the content and familiarise yourself with the ideas. Use the online Kerboodle Textbook and spend an hour between lessons looking at the content of the next lesson and reviewing previous lessons.

Revision and wider study

- Kerboodle digital textbook. This is your own personalised editable textbook.
  https://www.kerboodle.com/users/login?user_return_to=%2Fapp

- Isaac Physics. This includes thousands of auto marked practice questions as well as hints, guides and videos explaining how to apply your knowledge to solve problems.
  https://isaacphysics.org/

- A Level Physics Online. The school has a subscription so you can access high quality videos and tuition which covers the entire A level Physics syllabus.
  https://www.alevelphysicsonline.com/

- Phet interactive simulations for Science. Use these free simulations to carry out investigations.
  https://phet.colorado.edu/

- Minute Physics. This is a youtube channel which has a vast wealth of videos covering a wide range of content which goes well beyond the course. Use it to deepen your knowledge and broaden your horizons.
  https://www.youtube.com/user/minutephysics

- Vsauce. This is another youtube channel which explores the physics concepts behind some of the biggest questions!
  https://www.youtube.com/channel/UC6nSFpj9HTCZ5t-N3Rm3-HA

Final Assessment Structure:

Component	Weighting (%)	Content	Proposed Examination Date
H556/01	37	**Modelling Physics** ● Forces and motion ● Newtonian world and astrophysics	May/June
H556/02	37	**Exploring Physics** ● Electrons, waves and photons ● Particles and medical physics	May/June
H556/03	26	**Unified Physics** ● All modules, with more in depth answers and example practical data analysis.	May/June