A Level Physics – L6

Curriculum Intent

Physics is the study of energy and matter and their interactions. The A level Physics course provides an interesting and challenging experience to link key physical ideas and understand how they relate to each other.
The course aims for all students to: ·

- develop essential knowledge, understanding and application of different areas of the subject and how they relate to each other
- understand how society makes decisions about scientific issues and how Physics contributes to the success of the economy and society
- develop competence and confidence in a variety of practical, mathematical, and problem-solving skills
- develop and demonstrate a deep appreciation of the skills, knowledge and understanding of scientific methods
- promote students' interest in and enthusiasm for the subject, including an interest in further study and careers associated with the subject.

"Somewhere, something incredible is waiting to be known"

Students will learn: -

Term 1: Physical quantities. S.I. units. Measurements and uncertainties. Scalars and vectors.

Term 2: Newton's equations of motion. Car stopping distances. Freefall and g. Projectile motion. Force, mass, and weight. Drag and terminal velocity. Couples and torques. Archimedes' principle. Conservation of energy. Power and efficiency. Springs and Hooke's law. Young modulus. Newton's laws. Linear momentum and impulse.

Term 3: Charge and current. Kirchhoff's law. Drift velocity. Circuit symbols. Potential difference and EMF. Electron gun. Resistance. IV characteristics. Diodes, thermistors and LDRs. Potential dividers and sensing. Wave properties. Progressive waves. Polarisation. Electromagnetic spectrum. Stationary waves. The photon. The photoelectric effect. Wave particle duality.

What does excellence look like?

- Carrying out practical processes logically, precisely, and accurately.
- Linking ideas together to answer questions logically and sequenced.
- Linking big ideas to answer real life Physics problems.
- Estimate orders of magnitude in a variety of context
- Checking for homogeneity in manipulated equations
- Process uncertainties and present them graphically
- Use qualitative and quantitative data to evaluate precision and accuracy
- Give examples of scalar and vector quantities
- Able to resolve 2 or more coplanar vectors by scale drawing or calculation

Knowledge, understanding & Skills

Term 1: Foundations of physics: - Demonstrate knowledge, application and understanding of: units for physical quantities. S.I. base quantities and units, their symbols, and prefixes. Derived units of S.I. base units and the quantities that use them. Systematic errors and random errors in measurements. Precision and accuracy in measurements and data. Uncertainties in measurements, including when data are combined by addition, subtraction, multiplication, division and raising to powers. Graphical treatment of errors and uncertainties. Scalar and vector quantities. Addition of two vectors with scale drawings and with calculations. Resolution of a vector into two perpendicular components. Calculations involving vectors.

Term 2: Forces and motion: Average and instantaneous speed. Distance- time graphs to determine speed. Displacement and velocity. Distance-time graphs to determine velocity. Acceleration. Velocity-time graphs to determine acceleration and displacement. The equation of motion for acceleration in a straight line. Thinking distance and breaking distance. The equation of motion for falling objects in a uniform gravitational field. Measuring g. The equation of motion for projectiles. Forces, free-body diagrams, and centre of mass. Drag and terminal velocity. Moments and equilibrium. Measuring pressure, density and up thrust. Measuring and describing energy transfers. Power and efficiency of mechanical systems. Hooke's law and elastic vs plastic behaviour. Measuring Young modulus. Conservation of momentum. Elastic and inelastic collisions.

What does excellence look like?

✓Linking ideas from different aspects of the specification to answer real life Biology problems

✓Being able to apply knowledge and understanding to unfamiliar situations

e.g.

- Explain the evidence for the endosymbiotic theory
- Explain why the use of collagen in face creams is unlikely to prevent or reduce skin wrinkles.
- Explain how mutations in genes that code for check

What does excellence look like?

- Translate information between graphical, numerical, and algebraic forms
- Substitute numerical values into algebraic equations using appropriate units for physical quantities
- Solve algebraic equations, including quadratic equations
- Determine the slope and intercept of graphs
- Change the subject of an equation, including non-linear equations
- Apply the concepts underlying calculus by solving equations involving rates of change, e.g., $t \times \Delta \Delta = -\lambda \times$ using a graphical method or spreadsheet modelling.
- Familiar with typical ranges of values of charge and current arising in real-world scenarios
- Can use and manipulate I = nAve and check for homogeneity
- Calculate areas of circles, and surface areas and volumes of rectangular blocks, cylinders, and spheres.
- Explain the difference between EMF and PD using ideas about work done and moving charge
- Interpret logarithmic plots
- Sketch relationships which are modelled by $y = k / x$, $y = k x2$, $y = k / x2$, $y = k x$ as applied to physical relationships.
- Predict and visualise the effect of changing variables in the equation $R = \rho L/A$
- Numerical analysis of circuits with resistors in series and parallel
- Describe and explain applications of potential divider circuits as sensors
- Use of online simulators to model and describe wave behaviour
- Understand the relationship between degrees and radians and translate from one to the other

Knowledge, understanding & Skills - Continued

Term 3: Electrons, waves, and photons: Circuit diagrams. Energy transfers in electric circuits. The difference between PD and EMF. Measuring I-V characteristics of filament lamps, resistors, LDRs, diodes, thermistors, LEDs. Measuring the resistivity of metals. Factors that affect the resistance of components. Power dissipation in circuits. Application of Kirchhoff's first and second law in circuits. Combining resistors. Measuring EMF and internal resistance. Potential divider circuits with variable components and their applications. Graphical representation of transverse and longitudinal waves. Measuring and describing characteristics of waves, like reflection, refraction, TIR, polarisation, diffraction, intensity, critical angle. Polarisation of electromagnetic waves. Constructive and destructive interference. Two source interference using sound and microwaves.: Young double slit experiment. Comparing progressive and stationary waves. Stationary wave pattern, nodes, and anti-nodes. Photon as quanta of energy of electromagnetic radiation. The electronvolt. Measuring and estimating the Planck constant. Einstein's photoelectric equation. The de Broglie hypothesis.

How will we assess impact?

- Peer, self and teacher assessment in lessons
- Previous lesson recap quiz
- Teacher questioning
- Landmark tasks
- End of Topic tests

How can you enhance your learning at home?

- **Kerboodle**
- **A Level physics online**
- **Isaac physics**
- **Physics tube**
- **The Institute of Physics**
- **Physicsandmathstutor**
- **Minute physics**
- **Hyper physics**

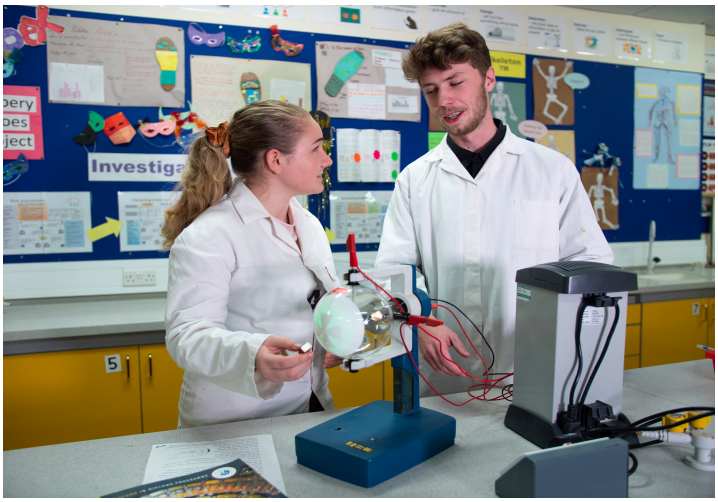
Suggested homework tasks

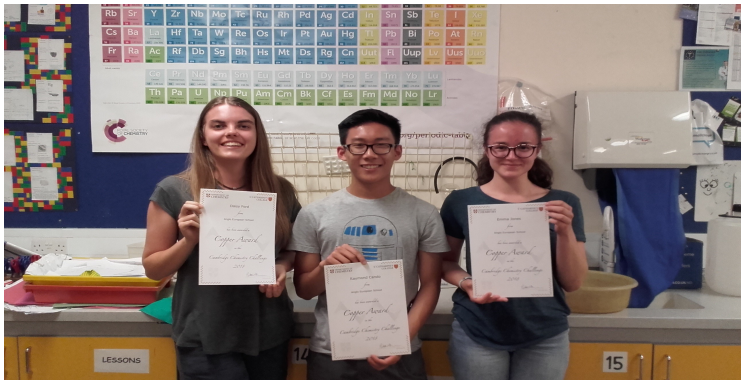
- Learn definitions of key terms.
- Group and independent research projects
- Past examination questions practice
- Practical activity preparation, simulations, and follow-up.

ENYTRY REQUIREMENTS

To study Physics at A-level, you will need:

- A grade 6 in GCSE Physics OR a grade 6-6 in Combined Sciences
- In addition, you will need a grade 6 in Maths
- It is strongly recommended that you also study A-level Maths





International Opportunities

Visits Programme

- Community lectures on International themes
- International day across the school
- Primary research using student cultural diversity

Within the curriculum

The Physics A Level curriculum is designed to deepen understanding and appreciation of how our International society makes decisions about world scientific issues.

Students are encouraged to research each theme beyond lessons and set work to ensure that they can draw on a worldwide knowledge of the skills, techniques and theoretical understanding required for the further study of Physical Sciences at an International level.

"With the gift of awareness comes the realisation of the infinite knowledge awaiting our grasp"