PHYSICS

A-Level Course Information

Qualification: Advanced Level Physics A
Exam Board: OCR
Subject Leader: Mr S. Winter

Entry Requirements:

Minimum Entry Requirements:
5 x 5s
4 in English and Maths

Subject Specific Entry Requirements:
6 in GCSE Physics if doing single sciences
or 6,7 in GCSE Double Science
6 in GCSE Maths

Why study Physics?

Do you enjoy learning about modern and interesting applications of physics alongside more traditional concepts? Do you enjoy developing your practical, investigative and research skills? If so, then Physics is for you. The Physics course develops knowledge and understanding of physics and an appreciation of the link between theory and experiment. You will learn how physics has developed and is used in present day society and appreciate physics as a human endeavour which has historical, social, philosophical, economic and technological connections. Importantly, you will sustain and develop your enjoyment of, and interest in, physics.

What can I do with Physics after A-Level?

Physics A-Level is an excellent preparation for a broad range of higher education study. Many students follow this course with a physics related degree. The course also has clear links with a range of other subjects which are popular degree courses such as mathematics, medicine, computing, engineering (electronics, mechanical) and architecture. Other students find the skills and knowledge gained from the A-level physics course useful when pursuing degree courses or careers in other areas including business, finance and management.

Physics Extras

Physics offers a range of opportunities both locally (Cambridge University) and further afield (CERN, Geneva). Links with the Institute of Physics and Cambridge University will enable students to attend twilight lectures given by leading physicists and to visit laboratories such as the Cavendish and the Engineering department. Our yearly trip to CERN allows students to see cutting edge research and applications of physics in the real world.

What will I study?

The A-Level Physics course is made up of 6 modules:

Module 1: Development of Practical Skills in Physics
Module 2: Foundations of Physics
Module 3: Forces and Motion
Module 4: Electrons, Waves and Photons
Module 5: Newtonian World and Astrophysics
Module 6: Particles and Medical Physics

Module 1: Development of Practical Skills in Physics

Physics is a practical subject. The development and acquisition of practical skills is fundamental. The Physics A course provides learners with the opportunity to develop experimental methods and techniques for analysing empirical data. Skills in planning, implementing, analysing and evaluating, are taught throughout the course.

Module 2: Foundations of Physics

The aim of this module is to introduce important conventions and ideas that permeate the fabric of physics. Understanding of physical quantities, S.I. units, scalars and vectors helps physicists to effectively communicate their ideas within the scientific community.

Module 3: Forces and Motion

The term force is generally used to indicate a push or a pull. It is difficult to give a proper definition for a force, but in physics we can easily describe what a force can do. A resultant force acting on an object can accelerate the object in a specific direction. The subsequent motion of the object can be analysed using equations of motion. Several forces acting on an object can prevent the object from either moving or rotating. Forces can also change the shape of an object. There are many other things that forces can do. In this module, learners will learn how to model the motion of objects using mathematics, understand the effect forces have on objects, learn about the important connection between force and energy, appreciate how forces cause deformation and understand the importance of Newton's laws of motion.

Module 4: Electrons, Waves and Photons

The aim of this module is to ultimately introduce key ideas of quantum physics. Electromagnetic waves (e.g. light) have a dual nature. They exhibit both wave and particle-like behaviour. The wave–particle dual nature is also found to be characteristic of all particles (e.g. electrons). Before any sophisticated work can be done on quantum physics, learners need to appreciate what electrons are and how they behave in electrical circuits. A basic understanding of wave properties is also required. In this module, learners will learn about electrons, electric current, electrical circuits, wave properties, electromagnetic waves and, of course, quantum physics. Learners have the opportunity to appreciate how scientific ideas of quantum physics developed over time and their validity rested on the foundations of experimental work.

Module 5: Newtonian World and Astrophysics

The aim of this module is to show the impact Newtonian mechanics has on physics. The microscopic motion of atoms can be modelled using Newton's laws and hence provide us with an understanding of macroscopic quantities such as pressure and temperature. Newton's law of gravitation can be used to predict the motion of planets and distant galaxies. In the final section we explore the intricacies of stars and the expansion of the Universe by analysing the electromagnetic radiation from space. As such, it lends itself to the consideration of how the development of the scientific model is improved based on the advances in the means of observation. In this module, learners will learn about thermal physics, circular motion, oscillations, gravitational field, astrophysics and cosmology.

Module 6: Particles and Medical Physics

In this module, which is one of the largest, learners will learn about capacitors, the electric field, electromagnetism, nuclear physics and medical imaging. This module provides knowledge and understanding of the atom, nucleus, fundamental particles, radioactivity, fission and fusion. Nuclear power stations provide a significant fraction of the energy needs of many countries. They are expensive; governments have to make difficult decisions when building new ones. This module also provides knowledge and understanding of X-rays, CAT scans, PET scans and ultrasound scans. The module shows how the developments in medical imaging have led to a number of valuable non-invasive techniques used in hospitals. Not all hospitals in this country are equipped with complex scanners. Learners have the chance to discuss the ethical issues in the treatment of humans and the ways in which society uses science to inform decision making.