

## Key Stage Four Curriculum Overview for Physics

### Curriculum Intent and Rationale for Exam Boards (for examined subjects)

Our ambition is for all students to understand Physics as the science of energy, forces, and matter, that everything that happens is the result of energy being stored and transferred in its various forms. Students who can effectively propose and investigate a hypothesis are scientists by definition. Through investigation students learn how to make sense of the natural world. They are able to marvel at the beauty of nature and the elegance of its laws and apply this understanding to solve real world problems

### How does the KS4 curriculum build on that from KS3?

It is important to note that we cannot assume the KS3 science curriculum has been effectively delivered; Covid-19 remote learning implications are evident in student's cumulative disfluency. In KS3 we reinforce macroscale ideas and then push students beyond KS3 by considering how microscopic (in biology) or nanoscopic (in chemistry and physics) processes act as drivers for the macroscopic observations. Linking what they can see to the theory of what they can't see is accepting the explanation proposed.

### What do students do with their acquired knowledge and skills?

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We are increasingly looking for students to be able to carry out full scientific investigations. Over time students should increasingly be able to:

- propose a hypothesis
- design an experiment
- select suitable apparatus
- identify a variable to change, measure and explain how all others will be controlled
- select a suitable method to record and present data and any relationships therein, followed by a sensible conclusion
- write an honest evaluation of the validity of the method and the reliability of the data

## How does the KS4 curriculum align to and go beyond the National Curriculum?

In Year 10 students explore circuits and analyse the motion of objects applying laws including Newton's, Energy and Momentum. The final chapters of the GCSE curriculum are designed to summarise and apply many chapter's student's knowledge from the previous years; Biology interaction of organisms, Chemistry macroscopic atmosphere and cycles and Physics electrical energy and forces.

## What new knowledge are students taught?

Term	Year 10	Year 11
Autumn	<p><b>Atomic Structure</b></p> <ul style="list-style-type: none"> <li>Atoms are made of protons, neutrons, and electrons</li> <li>Some atoms release radiation in the form of alpha, beta, or gamma emissions. Each of these differs in its properties.</li> </ul> <p>Separate only</p> <ul style="list-style-type: none"> <li>Nuclear fusion is the process during which lighter nuclei fuse together to create heavier nuclei. Nuclear fission is the process of splitting unstable nuclei producing smaller nuclei as well as huge amounts of energy</li> </ul> <p><b>Energy</b></p> <ul style="list-style-type: none"> <li>Types of energy store and ways in which energy can be transferred</li> <li>No machine is 100% efficient and some energy is transferred in less useful ways</li> <li>Energy resources can be classified as renewable and non-renewable. All energy resources have advantages and disadvantages</li> </ul>	<p><b>Forces</b></p> <ul style="list-style-type: none"> <li>Vector is a physical quantity with magnitude (size) and direction. Scalars only have magnitude.</li> <li>Terminal velocity is a maximum speed an object can move with.</li> <li>The stiffness of a spring can be investigated and is described by a spring constant. Spring constant is the force needed to extend the spring by 1m.</li> <li>Pressure is force acting on an area</li> </ul> <p>Separate only; Pressure in fluids is caused by the collisions of particles with a surface and depends on depth (or height of the column) density of the fluid and gravitational attraction.</p>
Spring	<p><b>Electricity</b></p> <ul style="list-style-type: none"> <li>Resistance is a property of material, which reduces the flow of current. Different materials have different electrical resistance.</li> <li>Series circuit is only one loop, and parallel circuits has branches. There are separate rules for Voltage, current and resistance in each of the circuits.</li> <li>Mains electricity is an alternating (AC) voltage and voltage in a battery is Direct (DC).</li> </ul>	<p><b>Electromagnetism</b></p> <ul style="list-style-type: none"> <li>Induced magnetism is magnetism created in objects made of steel, iron, cobalt, or nickel. Magnetic field has a shape which can be found using iron filings or plotting compass.</li> <li>Wire carrying electric field in a magnetic field is exposed to a force. This is the Motor Effect.</li> <li>Flemings left hand rule tells you the direction of the motor effect force. HT</li> </ul>

		<ul style="list-style-type: none"> <li>Force of magnetic field can be calculated <math>F = B \times I \times L</math>, where F is force, B is magnetic flux density and L is the length of conductor in the magnetic field. HT</li> <li>Generator effect is the effect of moving magnetic field around a wire which generates/ induces voltage which results in electric current flow. HT</li> </ul> <p><b>Space (Separate only)</b> The life cycle of a star explains the development of the Universe and our Solar System and Milky Way. Force of gravity keeps satellites and the moon in orbit.</p>
Summer	<p><b>Waves</b></p> <ul style="list-style-type: none"> <li>Speed of wave can be calculated as: <math>v = f \times \lambda</math>, where v is velocity, f is frequency and <math>\lambda</math> is wavelength.</li> <li>Speed in solids is the fastest, measured using a string and a signal generator.</li> <li>Electromagnetic waves carry information and are used to produce images.</li> </ul> <p>Separate only Lenses are uniform pieces of very carefully shaped material and can magnify or diminish image. We classify lenses into Converging (Convex) or diverging (Concave).</p>	GCSE external examinations

### How and where do students build knowledge through KS4?

Students will spend most of the Year 10 learning the subject content for their GCSE science course; combined or separate.

The focus of the end of Year 10 assessment will be on the content for the paper 1 examinations. Students will finish learning the subject content for the paper 2 in Year 11. The focus then becomes a targeted revision programme to review all content for paper 1 and paper 2 assessments, with paper 2 assessments in the Spring of Year 11. The focus will then be to preparing the students for their GCSE examinations in the Summer. All the subject content will be reviewed, and the key skills will be practiced. A variety of structured revision activities will be used to allow students to identify areas for development and subsequently improve their substantive and disciplinary knowledge.