



## Curriculum Intent

Physics is the study of energy and matter and their interactions. The GCSE 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

## Autumn Term | Waves

### Students will learn:-

Transverse and longitudinal waves  
Wave properties  
Reflection of waves  
Sound waves  
Waves for detection and exploration  
Electromagnetic waves  
Lenses  
Visible light  
Blackbody radiation

### What does excellence look like?

Recall and apply the wavespeed equation  
Manipulate the wavespeed equation in complex problems involving converting units  
Recall and apply the relationship between frequency and time period  
Explain why such processes only work over a limited frequency range and the relevance of this to human hearing.  
Explain in qualitative terms, how the differences in velocity, absorption and reflection between different types of wave in solids and liquids can be used both for detection and exploration of structures which are hidden from direct observation.  
Explain how different substances may absorb, transmit, refract or reflect electromagnetic waves in ways that vary with wavelength.  
Use wave front diagrams to explain refraction in terms of the change of speed that happens when a wave travels from one medium to a different medium.  
Explain why each type of electromagnetic wave is suitable for particular practical applications.  
Explain how the colour of an object is related to the differential absorption, transmission and reflection of different wavelengths of light by the object  
Explain the colour of opaque objects  
Explain how the temperature of the Earth depends on many factors including: the rates of absorption and emission of radiation, reflection of radiation into space.

### How will we assess impact?

- Peer and self-assessment
- Previous lesson recap quiz
- Land mark tasks
- End of topic test

### Knowledge, Understanding & Skills

Describe the difference between longitudinal and transverse waves.  
Students should be able to describe evidence that, for both ripples on a water surface and sound waves in air, it is the wave and not the water or air itself that travels.  
Describe wave motion in terms of their amplitude, wavelength, frequency and period.  
Identify amplitude and wavelength from given diagrams  
Describe a method to measure the speed of sound waves in air  
Describe a method to measure the speed of ripples on a water surface.  
Identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements.  
Construct ray diagrams to illustrate the reflection of a wave at a surface.  
Students should be able to describe the effects of reflection, transmission and absorption of waves at material interfaces.  
Investigate the reflection of light by different types of surface and the refraction of light by different substances.  
Describe, with examples, processes which convert wave disturbances between sound waves and vibrations in solids.  
Demonstrate awareness that the study of seismic waves provided new evidence that led to discoveries about parts of the Earth which are not directly observable.  
Recall the regions of the electromagnetic spectrum.  
Give examples that illustrate the transfer of energy by electromagnetic waves.  
Construct ray diagrams to illustrate the refraction of a wave at the boundary between two different media.  
Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.  
Construct ray diagrams to illustrate the similarities and differences between convex and concave lenses.  
Apply the equation for magnification to problems involving lenses  
Investigate the magnification produced by a range of convex lenses.  
Recall the regions of the visible spectrum and describe the effect of colour filters on white light  
Explain that all bodies (objects) emit radiation and that the intensity and wavelength distribution of any emission depends on the temperature of the body.

### How is homework used to enhance learning?

AQA website <https://www.aqa.org.uk/subjects/science/gcse/physics-8463/specification-at-a-glance>  
BBC bitesize <https://www.bbc.co.uk/bitesize/examspecs/zsc9rdm>  
Grade gorilla <https://gradegorilla.com/>  
Isaac Physics <https://isaacphysics.org/>  
Physics tube <http://physicstube.org/>  
Minute physics <https://www.youtube.com/user/minutephysics>  
Hyperphysics <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html>  
Suggested homework tasks

- Learn definitions of key terms.
- Group and independent research projects
- Past examination questions practice

Practical activity preparation, simulations and follow-up.

## Students will learn:-

Poles of a magnet  
Magnetic fields  
The Motor Effect  
Fleming's Left Hand Rule  
Electric motors  
Loudspeakers  
Induced potential, transformers and the National Grid  
Solar System  
Orbital Motion  
Satellites  
Life cycle of a star  
Red Shift

## What does excellence look like?

Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic.  
Explain how a solenoid arrangement can increase the magnetic effect of the current.  
Manipulate and apply the equation for magnetic force.  
Explain how the force on a conductor in a magnetic field causes the rotation of the coil in an electric motor.  
Explain how a moving-coil loudspeaker and headphones work.  
Explain how the generator effect is used in an alternator to generate ac and in a dynamo to generate dc  
Apply the equation linking the p.d.s and number of turns in the two coils of a transformer to the currents and the power transfer involved, and relate these to the advantages of power transmission at high potential differences.

Explain how a star's properties affect its life cycle with reference to nuclear fusion

Explain qualitatively how for circular orbits, the force of gravity can lead to changing velocity but unchanged speed  
Explain how for a stable orbit, the radius must change if the speed changes.  
Explain the evidence that led to the Big Bang Theory

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Suggested homework tasks

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## Knowledge, understanding & Skills

Describe the attraction and repulsion between unlike and like poles for permanent magnets  
Describe the difference between permanent and induced magnets.  
Describe how to plot the magnetic field pattern of a magnet using a compass  
Draw the magnetic field pattern of a bar magnet showing how strength and direction change from one point to another  
Describe how the magnetic effect of a current can be demonstrated  
Draw the magnetic field pattern for a straight wire carrying a current and for a solenoid  
Show that Fleming's left-hand rule represents the relative orientation of the force, the current in the conductor and the magnetic field.  
Recall the factors that affect the size of the force on the conductor.  
Recall the factors that affect the size of the induced potential difference/induced current.  
Recall the factors that affect the direction of the induced potential difference/induced current.  
Draw/interpret graphs of potential difference generated in the coil against time.  
Explain how a moving-coil microphone works.  
Explain how the effect of an alternating current in one coil in inducing a current in another is used in transformers  
Explain how the ratio of the potential differences across the two coils depends on the ratio of the number of turns on each  
Calculate the current drawn from the input supply to provide a particular power output

Describe the bodies that make up our Solar System  
Describe how stars, including the Sun were formed  
State the stages in the life cycle of a star  
Describe the similarities and distinctions between the planets, their moons, and artificial satellites.  
Explain qualitatively the red-shift of light from galaxies that are receding  
Explain how the change of each galaxy's speed with distance is evidence of an expanding universe  
Explain how red-shift provides evidence for the Big Bang model

## How will we assess impact? (3D)

- Peer and self-assessment
- Previous lesson recap quiz
- Land mark tasks
- End of topic test



## International Opportunities

### Within the curriculum

The GCSE Physics curriculum is designed to deepen understanding and appreciation of how the International scientific society collaborates and makes decisions about world scientific issues.

Students are encouraged to research each theme beyond lessons, exploring topical international scientific examples. Classwork and homework is designed to ensure that they can draw upon a worldwide knowledge of skills, techniques and theoretical understanding required for their examinations and the potential further study of Physics at an International level at global universities.