Physics Year 9 Combined Science

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/Spring Term | Energy

Students will learn:-

- Energy stores and systems
- Energy changes
- Power
- Conservation and dissipation of energy
- Efficiency
- National and global energy resource
- Energy transfer through heating

What does excellence look like?

- Be able to calculate the changes in energy involved when a system is changed by:
  - heating
  - work done by forces
  - work done when a current flows
- Can recall and manipulate equations for kinetic energy and gravitational potential energy in order to calculate energy transfers in a variety of situations
- Can critically evaluate the limitations of the practical methods used to determine specific heat capacity
- Able to give examples that illustrate the definition of power
- Explain ways of reducing unwanted energy transfers, for example through lubrication and the use of thermal insulation
- Able to recall and manipulate the equations for efficiency and apply them to novel contexts
- Describe the environmental impact arising from the use of different energy resources
- Explain patterns and trends in the use of energy resources

How is homework used to enhance learning?

AQA website https://www.aqa.org.uk/subjects/science
BBC bitesize https://www.bbc.co.uk/bitesize/examspecs/zsc9rdm
Grade gorilla https://gradegorilla.com/
Isaac Physics https://isaacphysics.org/
AES student science website
https://sites.google.com/view/angloscience

Suggested homework tasks

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

Practical activity preparation, simulations and follow-up

Knowledge, understanding & Skills

- Be able to describe all the changes involved in the way energy is stored when a system changes, for common situations. For example:
  - an object projected upwards
  - a moving object hitting an obstacle
  - an object accelerated by a constant force
  - a vehicle slowing down
  - bringing water to a boil in an electric kettle
- How to use the equations for kinetic energy, gravitational potential energy and elastic potential energy
- Determine the specific heat capacity of one or materials experimentally and using the equation for specific heat capacity
- Definition of power and equations to calculate mechanical or electrical power in a variety of contexts
- Describe with examples where there are energy transfers in a closed system, that there is no net change to the total energy
- Describe, with examples, how in all system changes energy is dissipated, so that it is stored in less useful ways
- Investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material
- Efficiency expressed as a fraction or a percentage
- Describe the main energy sources available
- Distinguish between energy resources that are renewable and energy resources that are non-renewable
- Compare ways that different energy resources are used, the uses to include transport, electricity generation and heating
- Understand why some energy resources are more reliable than others

How will we assess impact?

Peer and self-assessment

Previous lesson recap quiz

Land mark tasks

End of topic test

Spring/Summer Term | Forces

Students will learn:-

- Scalar and vector quantities
- Contact and non-contact forces
- Gravity
- Resultant forces
- Work done and energy transfer
- Forces and elasticity
- Describing motion
- Newton's laws
- Forces and braking
- Momentum

What does excellence look like?

- Able to describe the interaction between pairs of objects which produce a force on each object
- Describe examples of the forces acting on an isolated object or system
- Resolve a single force into two components acting at right angles to each other.
- Able to use vector diagrams to illustrate resolution of forces, equilibrium situations and determine the resultant of two forces, to include both magnitude and direction
- Explain how work done against the frictional forces acting on an object causes arise in the temperature of the object.
- Determine the spring constant from a force-extension graph
- Explain qualitatively, with examples, that motion in a circle involves constant speed but changing velocity.
- Determine the speed of an object from a distance time graph
- Determine the acceleration of an object from its velocity-time graph
- Estimate the magnitude of every day accelerations
- Explain how different factors that affect stopping distance either affect thinking distance or braking distance
- Explain methods used to measure human reaction times and recall typical results
- Estimate the forces involved in the deceleration of road vehicles in typical situations on a public road.
- Use the idea of conservation of momentum to calculate momentum changes for two interacting objects

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Land mark tasks

End of topic test

Knowledge, understanding & Skills

- Scale drawings of vectors
- Determining resultant force by use of scale drawings
- Examples of contact forces include friction, air resistance, tension and normal contact force
- Examples of non-contact forces are gravitational force, electrostatic force and magnetic force
- Measure the weight of objects using a spring balance
- Use of the equation linking mass, gravitational force and field strength
- Understand how an object can be considered to act a point called the centre of mass
- Determine the centre of mass of regular and irregular objects experimentally
- Use free body diagrams to describe qualitatively examples where several forces lead to a resultant force on an object, including balanced forces when the resultant force is zero
- Give examples of the forces involved in stretching, bending or compressing an object
- Describe the difference between elastic and inelastic deformation
- Investigate the relationship between applied load and extension of a spring
- Measuring and calculating distance, displacement, speed, velocity and acceleration from graphs and equations
- Recall typical values of speed for a person walking, running and cycling as well as the typical values of speed for different types of transportation systems
- Apply Newton's First Law to explain the motion of objects moving with a uniform velocity and objects where the speed and/or direction changes
- Recall and use the equation for Newton's second law
- Apply Newton's third law to equilibrium situations
- Describe stopping distance and the factors that affect it
- Explain the dangers caused by large decelerations
- Calculate linear momentum
- Describe and explain examples of momentum in an event, such as a collision

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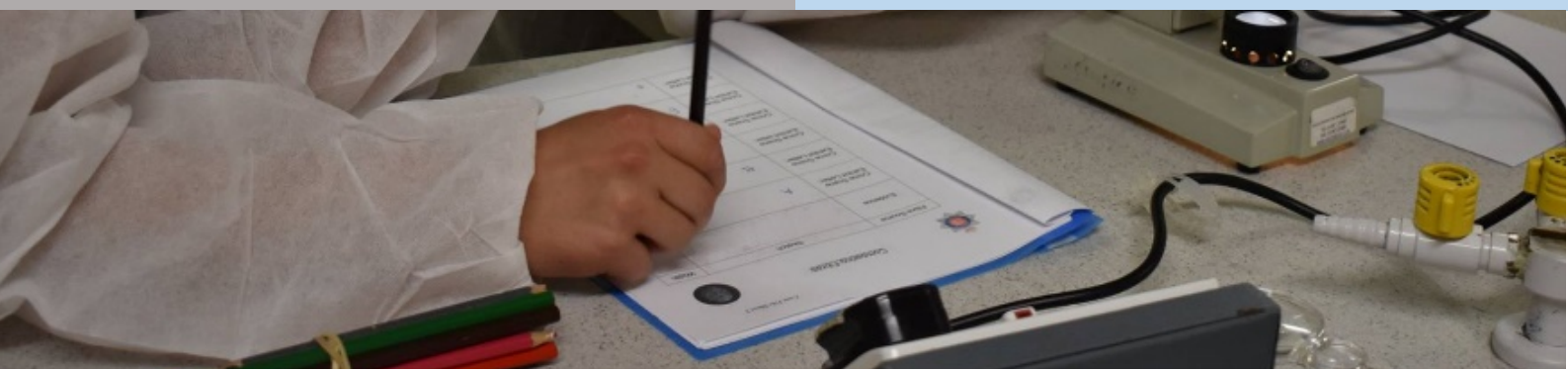

International Opportunities

Visits Programmes

A wide range of exchange visits are available for year 9 students.

Many visits include Science Museum and significant landmarks (eg Alessandro Volta tower, Lake Como)

For up to date information, see visits programme.

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.