Physics Year 11 Triple 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 Term | Particle Model and Atomic Structure

Students will learn:-

- Density
- Changes of state
- Internal energy
- Temperature changes and specific heat capacity
- Specific latent heat
- Particle model and pressure
- The structure of an atom
- Mass number, atomic number and isotopes
- Development of the model of the atom
- Radioactive decay and nuclear radiation
- Nuclear equations
- Half life
- Radioactive contamination
- Hazards and uses of background radiation
- Nuclear fission and fusion

What does excellence look like?

- Explain the differences in density between the different states of matter in terms of the arrangement of atoms or molecules
- Able to use and accurately read the scales on Vernier callipers and micrometers
- Explain how and when heating will either change state of raise temperature
- Manipulate the equation for specific heat capacity to calculate mass and temperature changes
- Extract information from a power time graph to calculate the energy required to change state
- Explain the relationship between pressure and temperature of a gas at constant volume
- Explain why atoms have no overall electrical charge
- Relate differences between isotopes to differences in conventional representations of their identities, charges and masses
- Apply knowledge to the uses of radiation and evaluate the best sources of radiation to use in a given situation
- Calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives
- Describe the factors that could affect the background radiation in a given place
- Explain why the hazards associated with radioactive material differ according to the half-life involved
- Be able to compare and evaluate fission and fusion reactions

Knowledge, understanding & Skills

- Recall and apply the equation linking density, mass, and volume
- Draw simple diagrams to model the difference between solids, liquids and gases
- Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids
- Describe how, when substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved
- Use the equation for specific heat capacity to calculate energy changes
- Use the equation for specific latent heat to calculate the energy required to change state
- Interpret cooling and heating graphs to measure energy transfers
- Calculate the change in pressure or volume of a gas by applying the gas equation
- Describe the structure of an atom and the arrangement of protons, neutrons and electrons within it
- Use mass number and atomic number to determine the number of neutrons in different isotopes
- The electron arrangements may change with the absorption of electromagnetic radiation or by the emission of electromagnetic radiation
- Describe why evidence from the Rutherford scattering experiment lead to a change in the model of the atom
- Describe the difference between the Plum Pudding model and the nuclear model of an atom
- Describe the properties of alpha particles, beta particles and gamma rays is limited to their penetration through materials, their range in air and ionising power
- Use the names and symbols of common nuclei and particles to write balanced equations that show single alpha (α) and beta (β) decay.
- Explain the concept of half-life and how it is related to the random nature of radioactive decay
- Determine the half-life of a radioactive isotope from given information
- Students should be able to compare the hazards associated with contamination and irradiation and suggest appropriate precautions
- Describe background radiation and its sources

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

- Describe and evaluate the uses of nuclear radiations for exploration of internal organs, and for control or destruction of unwanted tissue
- Evaluate the perceived risks of using nuclear radiations in relation to given data and consequences
- Describe the process of fission and fusion and their applications
- Interpret diagrams representing nuclear fission and how a chain reaction may occur

How will we assess impact?

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

Spring Term | Electromagnetism & Space

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. 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 stars 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 lead to the Big Bang Theory

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

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Land mark tasks

End of topic test

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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

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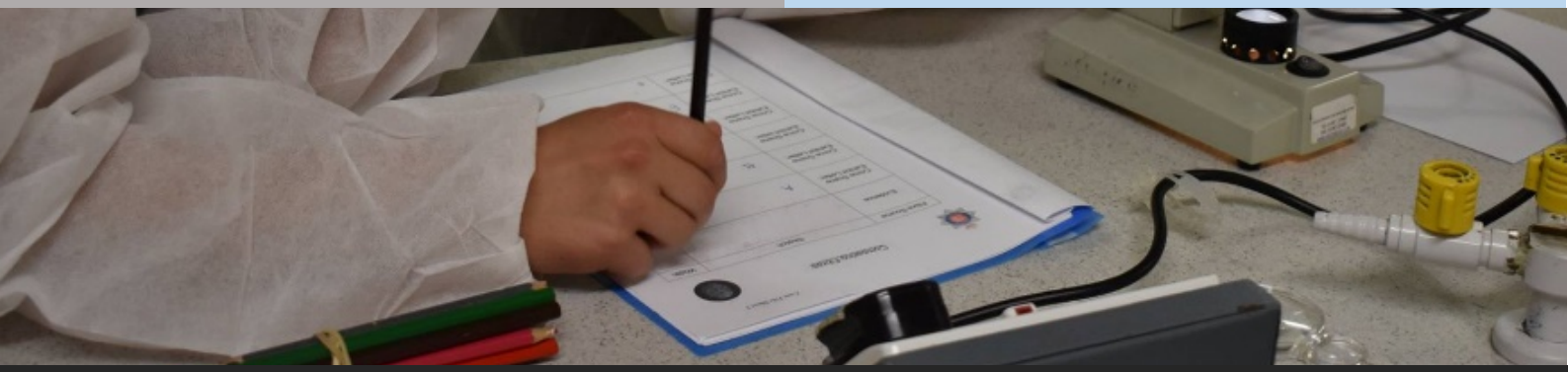

International Opportunities

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.