

Science Department

Long-term sequencing KS5 Physics – Year 12

Intent

As a team we have consistent high expectations based on an ambitious constructed curriculum, designed to build confidence through core substantive knowledge and disciplinary skills. The principles of science of learning and sequencing are weaved throughout with links to prior knowledge to ultimately support knowing and remembering more. We wish to develop enquiring minds of students that question the world around them. They should be able to interpret data and information from a range of sources using mathematical techniques and comprehension skills. They will be able to follow methods to get valid results and analyse the results to reach reasoned conclusions. We expect students to be able to manipulate a range of scientific apparatus and work safely to gather their results. They should be able to gather and record results with a suitable degree of accuracy and precision. When representing results we expect pupils to be able to present their information in an appropriate table or graph. As a department we are driven by principles of Catholic faith which means we ensure equity of access through our curriculum planning/design and that students are not disadvantaged because of their socio-economic status or SEND/ additional need. Physics students should develop an understanding of the laws of motion and the interaction of matter and energy on a scale from subatomic particles to supermassive black holes. Students will develop their logical-thinking processes, problem-solving skills, conceptual thinking, and demonstrate competence at completing practical activities, graphical analysis and error analysis. This is aligned with the Institute of Physics' prospectus studies to show the three most common careers are Physics teaching (conceptual understanding), finance (problem solving and data analysis proficiency) and postgraduate research (all skills and knowledge relevant). We aim to encapsulate an enjoyment of our subject through our teaching with the aim to inspire our pupils to continue their scientific education for future learning or employment. Our curriculum enables all pupils to do and be of their best and unlocks opportunity for further education.

HALF TERM 1:

STUDENTS MUST KNOW:

- Majority teacher: Mechanics (except 3.4.1.7 and 3.4.1.8)
 - ❖ Scalars and vectors
 - ❖ Projectile motion
 - ❖ Newton's Laws of Motion
 - ❖ Momentum; impulse; collisions
 - ❖ Moments and couples
- Minority teacher: Materials + 3.4.1.7 and 3.4.1.8 specification of Mechanics
 - ❖ Hooke's Law; elastic and plastic deformation
 - ❖ Tensile stress; tensile strain
 - ❖ Young's Modulus
 - ❖ Interpreting stress-strain curves

HOW THIS WILL BE ASSESSED:

HALF TERM 2:

STUDENTS MUST KNOW:

- Complete the Mechanics and Materials from Aut1
- Majority teacher: Particles and **radiation**
 - ❖ Constituents of the atom; atomic notation; isotopic data
 - ❖ Specific charge (atoms/nuclei/ions)
 - ❖ Unstable nuclei - alpha, beta-, beta+, gamma; existence of the neutrino
 - ❖ Antiparticles and photons; Hadrons and leptons
 - ❖ Strangeness and conservation laws
 - ❖ Quarks and antiquarks; Particle interactions
 - ❖ Photoelectric effect
 - ❖ Wave-particle duality; de Broglie; electron diffraction
- Minority teacher: Continue Mat + 3.4.1.7 and 3.4.1.8

HALF TERM 3:

STUDENTS MUST KNOW:

- Complete the Particles and radiation from Aut2
- Majority teacher: Electricity (begin in late into HT)
 - ❖ Basics of electricity; I-V characteristics
 - ❖ Series - EMF; terminal pd; potential dividers
 - ❖ Parallel - circuit analysis
 - ❖ Semiconductors - LDRs, thermistors, sensing circuits
 - ❖ Superconductors - critical temperature, advantages, issues
- Minority teacher: Waves
 - ❖ Progressive waves - transverse, longitudinal, phase difference, path difference

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<p>Low stakes quizzing, questioning, retrieval practice and recall, mid point knowledge check through each unit, end of topic test at the end of every unit.</p>	<ul style="list-style-type: none"> ❖ Work done; power; efficiency of energy transfers ❖ Applications of conservation of energy (KE, GPE, EPE, work done against resistive forces) <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall, mid point knowledge check through each unit End of topic test at the end of every unit..</p>	<ul style="list-style-type: none"> ❖ Stationary waves - superposition, fundamental frequency, harmonics, phase difference between loops ❖ Interference, diffraction - single slit, double slit, diffraction grating ❖ Refraction at a planar surface - Snell's Law, refractive index, critical angle, TIR ❖ Optical fibres - modal, material dispersion, pulse broadening, absorption <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall, mid point knowledge check through each unit End of topic test at the end of every unit..</p>
<p>HALF TERM 4: STUDENTS MUST KNOW:</p> <ul style="list-style-type: none"> ● Majority teacher: Complete Electricity ● Minority teacher: Complete Waves <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recallMid point knowledge check through each unit. End of topic test at the end of every unit.</p>	<p>HALF TERM 5: STUDENTS MUST KNOW:</p> <ul style="list-style-type: none"> ● Majority teacher: Further mechanics <ul style="list-style-type: none"> ❖ Circular motion - angular velocity, centripetal acceleration, centripetal force ❖ Deriving centripetal force from horizontal bob on string, vertical bob on string, car over curved bridge, motorcyclists inside Globe of Death ● Minority teacher: Thermal physics <ul style="list-style-type: none"> ❖ Heating and work done - internal energy; SHC; SLH; power ❖ Defining absolute temperature (Kelvin) <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall. Mid point knowledge check through each unit End of topic test at the end of every unit..</p>	<p>HALF TERM 6: STUDENTS MUST KNOW:</p> <ul style="list-style-type: none"> ● Majority teacher: Further mechanics (SHM, resonance, damping) <ul style="list-style-type: none"> ❖ Simple harmonic motion - algebraic; x-t, v-t, a-t graphs; simple pendulum; mass-spring system; effects of damping ❖ Free and forced vibrations - conditions for resonance; resonance curves. ● Minority teacher: Continue thermal physics <ul style="list-style-type: none"> ❖ Ideal gas laws - ideal gas equation; equation of state, molar mass ❖ Kinetic theory of gases - derivation; assumptions; average molecular kinetic energy <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recallMid point knowledge check through each unit. End of topic test at the end of every unit..</p>
<p>Home learning set will consist of a combination of: past paper questions, recap and retrieval questions, multiple choice question banks, SENECA, and ramped worksheets.</p>		

Science Department

Long-term sequencing KS5 Physics – Year 13

<p><u>HALF TERM 1:</u> STUDENTS MUST KNOW;</p> <ul style="list-style-type: none"> ● Fields and their consequences <ol style="list-style-type: none"> i. G-fields (force field; Newton’s Law; field strength; potential; orbits and kinematics) ii. E-fields (force field; Coulomb’s law; field strength; potential; radial and uniform) iii. Capacitors (capacitance; energy stored; charging and discharging; time to halve; time constant; parallel-plate; dielectrics; relative permittivity) iv. B-fields ($F=BIL$, $F=Bqv$; magnetic flux and flux linkage) <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall</p> <p>Mid point knowledge check through each unit</p> <p>End of topic test at the end of every unit.</p>	<p><u>HALF TERM 2:</u> STUDENTS MUST KNOW:</p> <ul style="list-style-type: none"> ● Fields and their consequences <ol style="list-style-type: none"> v. Electromagnetic induction (Faraday’s Law; Lenz’s Law; induced emf) vi. Transformers (root-mean square; average power; efficiency - issues and calculations) ● Nuclear physics <ol style="list-style-type: none"> i. Estimating nuclear radius ii. Ionising radiation iii. Background radiation and intensity iv. Exponential decay and half life <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall</p> <p>Mid point knowledge check through each unit</p> <p>End of topic test at the end of every unit.</p>	<p><u>HALF TERM 3:</u> STUDENTS MUST KNOW:</p> <ul style="list-style-type: none"> ● Nuclear physics <ol style="list-style-type: none"> i. Mass defect and binding energy ii. Nuclear fission and fusion ● Astrophysics <ul style="list-style-type: none"> ❖ Stellar evolution - low-mass and high-mass stars ❖ Parallax; definition of parsec; trigonometry ❖ Classification - apparent mag; absolute mag; Wien’s Law; Stefan’s Law; spectral class; Hertzsprung-Russel diagrams ❖ Cosmology - Doppler effect; cosmological principle; cosmological redshift; Hubble’s Law; Hubble constant; age of universe; CMBR; dark energy; primordial helium ❖ Exoplanet detection and quasars ❖ Telescopes + imaging - refracting telescopes in normal adjustment; Cassegrain reflecting telescopes; issues with telescopes; comparing eye and CCD <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall. Mid point knowledge check through each unit. End of topic test at the end of every unit.</p>
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<p>HALF TERM 4:</p> <p>STUDENTS MUST KNOW:</p> <ul style="list-style-type: none">● Astrophysics (continued)● Paper 3 – Section A: Practical skills and data analysis● Course content complete (subject to teacher's discretion) <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall</p> <p>Mid point knowledge check through each unit</p> <p>End of topic test at the end of every unit.</p>	<p>HALF TERM 5:</p> <p>STUDENTS MUST KNOW:</p> <ul style="list-style-type: none">● Targeted revision based upon pupil performance and QLA <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall</p> <p>Mid point knowledge check through each unit</p> <p>End of topic test at the end of every unit.</p>	<p>HALF TERM 6:</p> <p>STUDENTS MUST KNOW:</p> <ul style="list-style-type: none">● Targeted revision based upon pupil performance and QLA <p>HOW THIS WILL BE ASSESSED:</p> <p>Low stakes quizzing, questioning, retrieval practice and recall</p> <p>Mid point knowledge check through each unit</p> <p>End of topic test at the end of every unit.</p>
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