CURIOSITY COMPASSION COURAGE

Curriculum overview

Subject	Physics	Year group	12
Vision statement:	At Landau Forte our curriculum exists to ensure all students regardless of background and ability have the opportunity to unlock their potential. We are committed to students being challenged from their previous key stage learning experiences. Our broad and balanced curriculum is ambitious, coherently planned and sequenced, and will provide the platform for preparing students with the foundations for examination success. Our Curriculum Intent has been informed by a wide variety of researchers and is steeped in evidence based research. Christine Counsell summarises the aspiration of our curriculum to empower all learners creating a pathway to success in university, their career and life: *'A curriculum exists to change the pupil, to give the pupil new power. One acid test for a curriculum is whether it enables even lower attaining or disadvantaged pupils to clamber into the discourse and practices of educated people, so that they gain powers of the powerful.'* As well as excellent academic success we aim to ensure our students leave us as polite and well-rounded young adults. Our new core values of Compassion, Courage and Curiosity are currently being embedded throughout our curriculum offer to ensure we continue to meet our social, emotional, spiritual and moral obligations.		
Curriculum intent:	*In line with the Academy's vision to enhance students' understanding of the world by ensuring an educational journey guided with care and compassion the Science department at Landau Forte Academy QEMS aim to deliver a curriculum that not only develops students' knowledge and understanding of the subject but inspires them to succeed far beyond their education at the academy.* *The science curriculum aims to be;* ○ *Aspirational* ○ *Ambitious* ○ *Coherent both in planning and sequence* ○ *Adapted successfully to suit all needs and abilities* ○ *Broad - covering not only aspects of the subject but how this can be taken into the outside world* *In delivering the knowledge based curriculum students will be able to not only achieve the best they can academically but also link theory to reason, understand why they learn about specific concepts, grasp how this fits into the world of careers and ultimately develop the skills and reasoning needed to become well rounded individuals. The curriculum aims to give students a range of opportunities within the classroom and beyond allowing them to become confident and articulate in their scientific ideas. Consistently high expectations of both students and teaching staff ensures that every individual in Science has access to the highest quality of teaching and learning possible and working with key stakeholders ensures that our students have every opportunity to achieve.* *In summary the Science curriculum is developed and tailored for each specific year group taking into account the demographic of our students. The intention of which is to allow students to think deeper and use knowledge based skills within their learning both in science and throughout their lives*		

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Threshold Concepts (TCs):	*Foundations of physics* *Motion* *Forces in action* *Work, energy and power* *Materials* *Newton's Laws of Motion* *Momentum* *Electricity* *Waves* *Quantum physics*
KS4 specification summary:	The KS4 science curriculum ensure students have the knowledge to enable them to develop curiosity about the natural world, insight into working scientifically, and appreciation of the relevance of science to their everyday lives. This allows students to not only develop scientific knowledge and conceptual understanding through the specific disciplines of biology but also develop understanding of the nature, processes and methods of science, through different types of scientific enquiry that help them to answer scientific questions about the world around them. *Students learn about a variety of topics and concepts at KS4 (listed below), which form the foundation for the A-Level Physics teaching.* 1. Energy 2. Electricity 3. Particle model of matter 4. Atomic structure 5. Forces 6. Waves 7. Magnetism and electromagnetism 8. Space
Learner skills:	Critical thinking  Organisation  Collaboration  Adaptability  Oracy  Self-quizzing 

	Term 1 Aug-Oct	Term 2 Nov-Dec	Term 3 Jan-Feb	Term 4 Mar-Apr	Term 5 Apr-May	Term 6 Jun-Jul
The Big Question	How can we describe, model and explain everything in existence, from the tiniest subatomic particles to the birth and death of the universe?					

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Big picture questions:	Topic 3 What is Newtonian physics and how can we use it to describe the motion and interactions of objects around us?	Topic 3 How does electricity work and how can we use it?	Topic 4 What are the forces acting on solid objects and objects in a fluid, and how can we model these forces?	Topic 5 How can we describe the many different types of waves considering all their various properties and uses?	Topic 5 continues	Topic 6 How does Newtonian physics work in three-dimensions, and how does circular motion work?
Content (Linked to TCs):	Module 2: Foundations of Physics • Quantities and units • Making estimates • Errors and uncertainties • Graphical representations of uncertainties • Scalars and vectors Module 3: Section 1 Motion • Constant acceleration • Acceleration due to gravity • Projectile motion • Displacement-time graphs • Velocity-time graphs • Investigating motion • Stopping distances Section 2 Forces in Action • Mass, weight and force basics • Net forces • Equilibrium • Moments and torques	Module 3: Section 3 Work, Energy and Power • Work and power • Kinetic energy and gravitational potential energy • Conservation of energy Section 4: Materials • Hooke's law • Elastic and plastic deformation • Stress and strain • The Young modulus • Stress-strain graphs	Section 5: Newton's laws of motion and momentum • Newton's laws of motion • Momentum • Impulse and vehicle safety Module 4 Section 1: Electricity • Circuit diagrams • Current • Potential difference • Resistance and resistivity • Types of conductor • I-V characteristics • Power and electrical energy • Domestic electricity • E.m.f and internal resistance • Conservation of energy and charge in circuits • The potential divider	Continue Section 1: Electricity Section 2: Waves • Progressive waves • Frequency, speed and intensity • Electromagnetic waves • Polarisation • Reflection and refraction • Refractive index and total internal reflection • Superposition and interference • Diffraction • Two-source interference • Young's double-slit experiment • Diffraction gratings • Stationary waves	Section 3: Quantum Physics • The photon model • The Planck constant • The photoelectric effect • Wave-particle duality	Module 5: Section 1: Thermal physics • Phases of matter and temperature • Thermal properties of materials • The gas laws • The ideal gas equation • The pressure of an ideal gas • Internal energy of an ideal gas

	• Drag and terminal velocity • Density, pressure and upthrust					
Key vocabulary:	scalar, vector, momentum, principle of conservation of momentum, Newton's seconds law of motion, impulse, gravitational field strength, Newton's first law of motion, equilibrium, centre of gravity, Newton's second law of motion for fixed masses, Newton's third law of motion, moment, principle of moments, work, joule, energy, potential energy, gravitational potential energy, elastic potential energy, kinetic energy, principle of conservation of energy, efficiency, power, Watt,	Electric current, charge carrier, potential difference, volt, electromotive force, Ohm's law, resistance, Ohm, internal energy, resistivity, positive temperature coefficient, negative temperature coefficient, internal resistance,	Density, Archimedes' principle, laminar flow, turbulent flow, Stokes' law, terminal velocity, coefficient of viscosity, Hooke's law, elastic, plastic, stress, strain, Young modulus,	Amplitude, period, frequency, intensity, law of reflection, wave front, Snell's law, focal point, focal length, power or a lens, principle axis, optical centre, plane polarised waves, coherent, radiation flux density, electron-volt, ground state, ionisation energy, quantum, emission spectra, absorption spectrum, complementarity principle		Impulse, principle of conservation of energy, electron-volt, elastic collision, angular displacement, angular velocity, centripetal,
Assessment:	Retrieval quiz every lesson Key learning task for every section	Retrieval quiz every lesson Key learning task for every section	Retrieval quiz every lesson Key learning task for every section	Retrieval quiz every lesson Key learning task for every section	Retrieval quiz every lesson Key learning task for every section Progression PPE	Retrieval quiz every lesson Key learning task for every section

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Key/Historical misconceptions in this unit:	• Vectors Vs. scalars, the rules of vector addition, dot products (why the product of 2 vector quantities is not always a vector). • That motion in the horizontal and vertical axis occurs independently of the other, and accounting for this mathematically.	• Confusion over the rules of energy conservation in electrical circuits, and how this relates to current, voltage and resistance, and applying this to new scenarios.	• Newton's laws – when they apply and how to apply them to new scenarios correctly. • Conservation of momentum, and how to apply this correctly in mathematical terms to new situations. • Reconciling a theoretical understanding of what a potential divider is, and the real-life effect of that in circuits.	• Combining a theoretical understanding of individual circuit components and their effects in complex circuits, when multiple components must be considered at once.	• Quantum physics is all about uncertainty	
Sequencing:	We have chosen to sequence the year 12 curriculum like this because we start with the essential skills that build a foundation for the rest of the course continuing to build on and develop this knowledge in module 3 and 4. These modules ensure that students have a secure knowledge of key areas of physics, forces, energy and electricity before moving onto areas that further this. Topic 1 is woven throughout the course, covering all aspects of practical physics and the development and application of scientific process throughout history.					