Curriculum Map

Subject: Physics **Year Group: 12**

	Autumn 1/Autumn 2	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Content	**Bridging Course:** Skills and Knowledge from GCSE, including maths skills (using the CGP Transition book and Ch 14, 15 and 16) Key skills and understanding from GCSE, Measurement, analysis and evaluation in physics, data handling, trigonometry, algebra, graphs. **1 Particles and Radiation (chapter 1)** Demonstrate knowledge, understanding and application of: Structure of an atom, isotopes, specific charge The strong nuclear force and radioactive decay Electromagnetic waves and photons Particles, antiparticles and $E=mc^2$. The electromagnetic force, Feynman	**1 Particles and Radiation (continued) (chapter 2 and 3)** The particle zoo: subatomic particles and their interactions (hadrons and leptons, baryons, mesons, quarks, antiparticles) The photoelectric effect, quanta, , ionisation energy and the electron volt Energy levels in atoms – de-excitation, excitation, fluorescence, spectra, Wave Particle Duality De Broglie's hypothesis **2 Mechanics and Materials continued** **ii) On The Move (Ch7)**	**3 Waves and Optics** **i Waves (Ch 4)** Longitudinal and transverse waves, polarisation, wave speed, phase difference Reflection, refraction and diffraction. Superposition Stationary waves Oscilloscopes **2 Mechanics and Materials continued** **Iii Newton's Laws (Ch 8)** Motion without force Newton's first law Weight F=ma Terminal speed – objects falling in fluids Stopping distance and vehicle safety	**3 Waves and Optics (continued)** **ii Optics (Ch 5)** Refraction of light Total internal reflection and optical fibres Young's double slit experiment Coherence, wavelength, colour, light sources, white light fringes Diffraction, single slit diffraction, Young's fringes, diffraction gratings, Types of spectra – continuous, line emission, line absorption, **2 Mechanics and Materials continued** **Iv Forces and Momentum (Ch 9)** Momentum and impulse Force-time graphs Impact forces	**4 Electricity (chapters 12 and 13)** Electric current and charge Potential difference and power Resistance Components and their characteristics DC Circuits Circuit rules EMF and internal resistance Circuit calculations The potential divider **2 Mechanics and Materials continued** **Work, Energy and Power (Ch 10)** Work and energy Conservation of energy Work, forces, displacement, force-distance graphs	**5 Further Mechanics Circular Motion (ch17)** Uniform circular motion Centripetal acceleration Applications – on the road and at the fairground. **2 Mechanics and Materials continued** **vi Materials (Ch 11)** Density Hooke's Law and springs Deformation of solids – tensile stress and tensile strain Stress strain curves Loading and unloading of different materials

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	diagrams, weak nuclear force, beta decay and electron capture. **2 Mechanics and Materials** **i) Forces in equilibrium (Ch 6)** vectors and scalars, resolving vectors, balanced forces, equilibrium of a point object, testing three forces in equilibrium Moments and turning effects, centre of mass, support forces Stability – stable and unstable equilibria, free body diagrams and the triangle of forces Statics calculations	speed and velocity, displacement-time graphs, acceleration – uniform and non-uniform Motion along a straight line at constant acceleration - equations Free fall, measuring g Motion graphs Projectile motion		Newton's Third Law, conservation of momentum Elastic and inelastic collisions	Kinetic and potential energy Power and energy Machines and efficiency	
Skills	Ch1 Matter and Radiation Understand the structure of an atom and be able to use the scientific terminology. Explain why some nuclei and stable and some are unstable. Calculate the energy of a photon.	Ch2 Quarks and Leptons Understand and use properties such as strangeness. Classify subatomic particles. Distinguish between different types of neutrinos.	Ch4 Waves Describe an experiment that can distinguish between transverse and longitudinal waves. Calculate the frequency of a wave from its period.	Ch5 Optics State and use Snell's Law. Calculate refractive index Investigate Total Internal Reflection Describe and interpret Young's Double Slit Interference experiment	Ch12 Electric Current Calculate the charge flow in a circuit. Calculate electric power. Discuss when Ohm's Law can be used. Investigate the characteristics of	Ch17 Motion in a Circle Recognise uniform motion in a circle. Define and use angular momentum and angular speed. Calculate centripetal force. Identify the forces that provide the centripetal force

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	Discuss whether anti-atoms are possible. Use Feynman diagrams. Ch6 Forces in Equilibrium Resolve vectors. Explain and use the parallelogram of forces. Demonstrate when two or more forces have no overall effect on point objects. Apply the principle of moments to solve problems. Calculate the weight of a metre rule using the principle of moments. Solve single support and double support problems. Assess when tilted objects will topple. Solve problems using free body force diagrams. Solve statics calculations.	Evaluate the importance of lepton numbers Explain how we know that quarks exist. Apply knowledge of quarks to explain the quark changes that happen in beta decay. State and use the conservation rules for particle interactions. Ch3 Quantum Phenomena Discuss how the photon model was established. Explain whyEinstein's photon model was revolutionary. Explain what happens inside an atom when it becomes excited. Use energy levels to explain de-excitation and fluorescence. Calculate the wavelength of	Demonstrate the direction light waves bend when they travel out of glass and into air. Use the concept of superposition to explain wave cancellation. Deduce whether a stationary wave is formed by superposition. Compare the frequencies of higher harmonies with the first harmonic frequency. Be able to use and interpret oscilloscopes. Ch8 Newton's Laws of Motion Investigate Newton's first law of motion Apply the equation F=ma to a variety of settings Apply ideas about drag forces to explain terminal speed	Identify coherent sources. Observe diffraction and compare the single slit diffraction pattern with the pattern of Young's fringes. Determine the grating spacing for any given diffraction grating if it is not known. Ch9 Forces and Momentum Define the impulse of a force and calculate impulses fro force—time graphs. Relate Newton''s first and second laws of motion to momentum. Analyse impact forces in a variety of contexts. Apply Newton's third law of motion and the principle of conservation of momentum to various contexts.	different circuit components Ch13 Direct Current Rules State and use the circuit rules to describe what happens in a circuit. Calculate resistance in series and parallel circuits. Calculate current and pd for each component in a circuit. Measure the internal resistance of a battery. Calculate currents in circuits with diodes, more than one cell, resistors in series, resistors in parallel. Apply understanding of potential dividers to how they can be used in the real world. Ch10 Work, Energy and Power	on a banked track. Use equations to analyse fairground rides. Ch11 Materials Measure the density of different objects Investigate Hooke's Law Relate stress to force and strain to extension Analyse stress—strain curves for different materials Predict whether a metal wire will return to its original length when stretched. Compare the deformation of metal wires with other materials such as rubber and polythene.

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		light for a given electron transition. Discuss why we can change the wavelength of a matter particle but not that of a photon. Ch7 On The Move Analyse and interpret displacement-time graphs, distance-time graphs and velocity-time graphs. Explain why acceleration is a vector. Calculate the displacement of an object moving with uniform acceleration. Discuss if objects of different masses or sizes all form with the same acceleration. Calculate the motion of objects with constant acceleration as	Discuss the factors that affect the overall stopping distance of a vehicle. Discuss the design features of cars that make them safer.	Discuss elastic and inelastic collisions. Explain what happens during and after an explosion.	Discuss whether energy ever disappears. Calculate changes in kinetic energy and potential energy when work is done on an object. Measure and calculate power. Calculate efficiency and discuss whether any device can ever be 100% efficient.	

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		their velocity reverses. Deduce whether overall motion should be broken down into stages. Identify the horizontal component of a vertical vector. Discuss what would happen if we could switch gravity off.				
Key questions	Ch 1 Matter & Radiation What is inside an atom? What is the strong nuclear force and what does it do? How are subatomic particles detected? What properties do different subatomic particles have? What is antimatter? How are the weak nuclear force, and the electromagnetic force involved with subatomic particles? What is radioactive decay? Ch 6 How do we resolve vectors?	Ch2 Quarks and Leptons How can we make sense of the particle zoo by classifying particles and antiparticles? What are quarks and what do they do? What different conservation rules apply to particles and antiparticles? CH 3 Quantum Phenomena What is Einstein's explanation of the photoelectric effect?	Ch4 Waves What are the properties of transverse and longitudinal waves? What test can we do in physics to distinguish between them? What is meant by the terms phase difference and superposition? What are the conditions required to form a stationary wave? Ch8 Newton's Laws of Motion	Ch5 Optics What are rays? What is Snell's Law? How can we explain refraction? What is total internal refection? Why do diamonds sparkle? What is the double slit experiment, and what does it show? What is coherence? What is fringing? What can we learn using diffraction gratings?	Ch12 and 13 Electricity What are charge carriers, what is electric current and what is potential difference? How do energy transfers take place in electrical devices? What is electrical resistance? When can Ohm's Law be used? What are superconductors? What are the characteristics of different circuit components	Ch 17 Motion in a Circle What is uniform circular motion? What are the definitions of angular displacement and angular speed? Why is velocity not constant when objects travel uniformly in a circle? Why do passengers feel like they are being forced outwards when a car goes round a bend quickly? How do the forces change when you

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	How can we examine three forces in equilibrium? What is the principle of moments and how can we calculate the centre of mass of an object? What are stable and unstable equilibria? How can we use physics to ensure that we lift things safely?	How do we measure ionisation energy? What is excitation and de-excitation and how are they related to energy levels and spectra? Is light a wave or a particle? What are matter waves? Ch 7 On the move What is the difference between distance and displacement? What is the difference between uniform and non-uniform acceleration? What can we find out form a velocity-time graph? Does a heavy object fall faster than a lighter one? How can we explain the difference between distance-time	How is weight different from mass? What effect does a resultant force have? When can we use, and when can we not use, F=ma? What is drag? What determines the terminal velocity of a falling object? What design features do cars have that make them safer? How do these features work?	What different types of spectra are there? Ch9 Force and Momentum What is momentum? What are impulses? What are Newton's First, Second and Third Laws? What are impact forces? What is conservation of momentum and how can we test it? What is the difference between elastic and inelastic collisions? What can always be said about the total momentum of a system that has been exploded?	(such as diodes, thermistors etc)? What are the rules for current and potential difference in series and parallel circuits? How do resistors behave in series and in parallel? Why is the pd of a battery less than its emf? How do potential dividers work? How can you supply a variable pd from a battery?	are on a rollercoaster or ferris wheel ride? Ch11 Materials How can we define and measure density? What is Hooke's Law and how can we investigate it? What is the relationship of stress, force, strain and extension? What happens when different materials are stretched beyond their elastic limits?

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		graphs and displacement-time graphs? How can we explain the difference between speed-time graphs and velocity-time graphs? How can we investigate projectile motion?				
Assessment	Transition Exam Topic Tests Seneca Learning Assessments				Transition Exam Topic Tests Seneca Learning Assessments PPE	Transition Exam Topic Tests Seneca Learning Assessments
Literacy/ Numeracy/ SMSC/ Character	**Literacy:** Kerboodle Retrieval Questions Isaac Physics Calculations Exampro Past Exam Questions **Numeracy**: Standard form and calculations using powers of ten. Significant figures Units – converting units Changing the subject of an equation Plotting graphs from experimental data SMSC and Character: Explore the frontiers of physics Gain insight into how physics is an international, collaborative discipline, and Visit CERN in Switzerland Understand how science works and develops, how science embraces the possibility of being 'wrong' Consider the extremely high cost of some cutting edge physics research, and debate its worth in comparison to other needs society has. Consider the value of scientific research that might have no immediate application Consider the benefits and costs of nuclear physics, its applications and uses in medicine, electrical power, and in warfare					