Curriculum Map

Subject: Physics **Year Group: 13**

	Autumn 1/Autumn 2	Autumn 2	Spring 1	Spring 2	Summer
Content	**5 Further Mechanics continued** **Simple Harmonic Motion (Ch 18)** SHM, oscillations, time difference Circles and waves, sine wave solutions Applications of SHM Energy, free oscillations, damped oscillations, forced vibrations, resonance **6 Thermal Physics (ch19)** Internal Energy and Temperature Specific heat capacity Changes of state Gases (Ch 20) The Experimental Gas Laws Ideal Gas Law Kinetic Theory of Gases	**7 Fields** **Gravitational Fields (ch21)** Gravitational Field Strength, Gravitational Potential Newton's Law of Gravitation Planetary fields and satellite motion **Electric Fields (ch22)** Field patterns Electric Field Strength Electric Potential Coulomb's Law Point Charges Comparing Electric and Gravitational Fields	**7 Fields continued** **Capacitors (ch23)** Capacitance, energy stored in a charged capacitor, charging and discharging a capacitor through fixed resistors, dielectrics **Magnetic Fields (ch 24)** Current-carryng conductors in magnetic fields, Moving charges in magnetic fields Charged particles in circular orbits **Electromagnetic Induction (ch25)** Generating electricity, the laws of electromagnetic induction, alternating current generators, alternating current and power, transformers	**7 Nuclear Physics** **Radioactivity (ch 26)** Discovery of nucleus, properties of alpha, beta and gamma radiation The dangers of radioactivity Radioactive decay, using radioactive isotopes, decay modes, nuclear radius **Nuclear Energy (ch27)** Energy and mass Binding Energy Fission and fusion Thermonuclear reactors	**8 Optional Topic** **Turning Points in Physics** Discovery of the electron Wave particle duality Thermionic emission Matter waves Electromagnetic waves Different theories of light Photoelectricity Special relativity

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Skills	**Ch 18** Apply the definitions of amplitude, frequency and period to examples of SHM. State conditions about acceleration that apply to SHM. Describe various phase differences. Use the equation that relates displacement to time for bodies moving with SHM. Apply understanding of SHM to various practical examples such as the pendulum. Describe how KE and GPE vary with displacement in SHM, and describe the effects of damping. Distinguish between free and forced vibrations. **Ch19** Demonstrate the first law of thermodynamics in action. Measure Specific Heat Capacity. Measure latent heat.	**Ch21** Gravitational Fields Define radial and uniform fields. Illustrate a gravitational field. Calculate gravitational potential difference between two points. Discuss whether spherical objects like planets can be treated as point masses. Describe the shape of a graph of g against r for points outside the surface of a planet. Compare the above graph with graphs of V against r. State the conditions for satellites to be in stable orbits. **Ch22** Electric Fields Illustrate the strength of electric fields using field lines. Describe how to measure the strength of an electric field. Explain why potential is defined in terms of the work done per unit positive charge,	**Ch23** Capacitors Relate pd across the plates of a capacitor to the charge on its plate. Discuss uses of capacitors. Describe the form of energy stored in a capacitor. Interpret the shape of charging and discharging curves. Explain which components you would choose to make charge/discharge slower. Explain how dielectrics affect capacitors. **Ch24** Magnetic Fields Determine the direction of the force on a current carrying wire in an electric field. Measure the strength of a magnetic field. Use equations to calculate the force on a moving charge. Apply the factors that affect charged particles in circular	**Ch26** Radioactivity Describe and explain the experiments that led to the discovery of the nucleus. Compare the properties of alpha, beta and gamma radiation by referring to experiments. Explain how to represent the change in a nucleus when it emits alpha, beta and gamma radiation. Discuss how exposure to ionising radiation can be reduced. Use the idea of half life to discuss radioactive decay. Explain why radioactive decay is a random process. Discuss various uses of radioactive isotopes. Interpret and use N—Z charts. Explain how high energy electron diffraction works. **Ch27** Nuclear Energy Use the equation $E=mc^2$ in a variety of contexts.	Turning Points in Physics Use appropriate equations to estimate the size of the nucleus of an atom from the least distance of approach of an alpha particle. Use measured data to plot a straight line graph to verify the inverse square law for gamma radiation. Use count rate to find the decay constant of a radioactive isotope. Calculate the energy of a gamma photon from an energy level diagram. Use given data to calculate the mass defect and the binding energy per nucleon of a nucleus, and the energy released in a nuclear fission event.

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		and why it is measured in V. Calculate the electric potential difference between two points. Calculate the force between two charged objects. Use equations related to point charges. Compare the similarities and differences between electric and gravitational fields.	orbits to practical examples. Understand how cyclotrons and mass spectrometers work. **Ch25** Electromagnetic Induction Investigate electromagnetic induction. Use Fleming's Right Hand Rule. Relate the induced emf in a coil to the magnetic flux linkage through it. State, explain and apply Lenz's Law. Understand how AC generators work. Calculate power supplied by an alternating current. Be able to describe and explain the energy changes in a transformer.	Use the idea of binding energy to explain why energy is released in nuclear fission. Explain, compare and contrast nuclear fission and nuclear fusion. Explain what happens inside a nuclear reactor.	

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Key questions	**Ch18** Simple Harmonic Motion What is simple harmonic motion and how can we apply our understanding to real life situations? What are sine waves and what can we learn from them? What is the theory of the simple pendulum? How are free oscillations different to damped oscillations? What are the circumstances in which resonance occurs? **Ch19** Thermal Physics What is internal energy? What is the first law of thermodynamics? What is absolute zero? What do we mean when we talk about heating up and cooling down? Why does the temperature of a substance stay constant when it is changing state? What is latent heat?	**Ch21** Gravitational Fields What is meant by the strength of a gravitational field? How are radial fields and uniform fields different? What is gravitational potential? How can we use potential gradients? What is Kepler's Third Law? What is Newton's Universal Law of Gravitation? What is the significance of the gradient of the V—r graph? What happens to the speed of a satellite if it moves closer to Earth? **Ch22** Electric Fields How can we charge a metal object? How can we illustrate the strength of an electric field using field lines? How can we measure the strength of an electric field? Why is potential defined in terms of	**Ch23** Capacitors What is a capacitor and what are they used for? Why do capacitors store energy as they are being charged? Which circuit components would you choose to make charge/discharge happen more slowly? How do dielectrics affect capacitors? **Ch24** Magnetic Fields How can you measure the strength of a magnetic field? What factors do the magnitude of a force on a current-carrying wire depend on? What happens to charged particles in a magnetic field? How do charged particles in circular orbits behave? **Ch25** Electromagnetic Induction Describe what must happen to a conductor for electricity to be generated.	**Ch26** Radioactivity How was the nucleus discovered and what took them so long? How big is a nucleus? What are the properties of alpha, beta and gamma radiation? What are the dangers of radiation? What is meant by the activity of a radioactive isotope? What is half life? Does anything affect radioactive decay? What practical uses are there for radioactive isotopes? What can we tell about radioactive isotopes from N—Z charts? Are more massive nuclei wider? **Ch27** Nuclear Energy What can the equation $E=mc^2$ tell us? What is binding energy? Why is energy released in nuclear fission?	How are experimental methods and mathematics used in the determination of fundamental physical constants? How was the electron discovered and how were its properties determined? How have ideas about wave-particle duality developed over the years? What is de Broglie's hypothesis? How do electron microscopes work? What is Einstein's Theory of Special Relativity? What experimental evidence is there to support Einstein's theory? How have all these ideas helped with the development of new technology?

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		work done per unit of positive charge? How does the force between two point charges change with distance? Why is E equal to zero inside a charged sphere? What are the main similarities and differences between electric and gravitational fields?	How is the induced emf in a coil related to the magnetic flux linkage? How do Alternating Current generators work? What is alternating current? What is the purpose of a transformer?	How do nuclear fission and nuclear fusion happen? What goes on inside a nuclear reactor?	
Assessment	Topic Tests Seneca Learning Assessments	Topic Tests Seneca Learning Assessments PPE	Topic Tests Seneca Learning Assessments	Topic Tests Seneca Learning Assessments PPE	Topic Tests Seneca Learning Assessments
Literacy/ Numeracy/ SMSC/ Character	Kerboodle Retrieval Questions Isaac Physics Calculations Exampro Past Exam Questions SMSC and Character: Explore the frontiers of physics Gain insight into how physics is an international, collaborative discipline. Understand how science works and develops, how science embraces the possibility of being 'wrong' Develop an appreciation of the history of 20th Century Physics and the enormous changes it brought to our understanding of light, matter and the universe. 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 Develop research and synthesis skills in the Optional Topic.				