Year 13 Physics Curriculum Overview

Rationale: The Year 12 Biology curriculum is designed to further explore and investigate Physics by building a mind-set that allows skills to be continuously developed. Students will study and experience modules such as fields, thermal physics, radiation and engineering Physics. In doing so, pupils will develop their practical, numeracy and investigative skills.

Term/Length of Time	Outline	Assessment/Teacher Feedback Opportunities	Homework and Literacy resources
Section 6 35 lessons including assessment and feedback	<u>Further mechanics and thermal physics</u> The earlier study of mechanics is further advanced through a consideration of circular motion and simple harmonic motion (the harmonic oscillator). A further section allows the thermal properties of materials, the properties and nature of ideal gases, and the molecular kinetic theory to be studied in depth. <u>Skills</u> • Estimate the acceleration and centripetal force in situations that involve rotation. • Sketch relationships between *x*, *v*, *a* and *t* for simple harmonic oscillators. • Students should recognise the use of the small-angle approximation in the derivation of the time period for examples of approximate SHM.	Circular motion, simple harmonic motion, thermal physics, and gases end of topic assessments in the style of exam questions Written and verbal feedback given throughout module through in-class activities and homework.	Homework is set weekly and contains a mixture of recall exam-style questions as well as more detailed application based exam style questions. All homework is reviewed with at least one detailed FAR (Feedback, Action, Response) marked by the teacher approximately once every 2 weeks <u>Optional homework tasks and Literacy resources:</u> SoL on science shared area, including PowerPoints, details of practical investigations, worksheets, revision resources, a range of AFL (assessment for learning) activities, research based tasks, model answers, short answer questions, exam questions, mark schemes, examiner's reports as well as homework. Physics offers many opportunities to develop and extend students' literacy skills. There is a large amount of new, subject-specific vocabulary, and so each unit includes a PLC (Personnel Learning checklist) which students will engage with throughout the unit. Students will use texts to find out information for themselves, using the functional layout of such texts, including index, contents and glossary sections of text books used in class, and also at home in an online format. Students will also review and connect information within topics.
Section 7 50 lessons	<u>Fields</u> The concept of field is one of the great unifying ideas in physics. The ideas of	Gravitational fields, Electric Fields, Capacitors, Magnetic	

	gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction. These topics have considerable impact on modern society. <u>Skills</u> • Students use graphical representations to investigate relationships between v, r and g. • Estimate various parameters of planetary orbits, eg kinetic energy of a planet in orbit. • Use logarithmic plots to show relationships between T and r for given data. • Determine the relative permittivity of a dielectric using a parallel-plate capacitor. • Investigate the relationship between C and the dimensions of a parallel-plate capacitor eg using a capacitance meter. • Investigation of the charge and discharge of capacitors. Analysis techniques should include	Fields and Electromagnetic induction end of topic assessments in the style of exam questions Written and verbal feedback given throughout module through in-class activities and homework.	<u>Useful websites:</u> https://www.physicsandmathstutor.com/ https://senecalearning.com/en-GB/ https://www.youtube.com/c/MalmesburyEducation https://www.aqa.org.uk/subjects/science/as-and-a-level/physics-7407-7408 https://www.savemyexams.co.uk/a-level/physics/aqa/17/revision-notes/ <u>Reading list:</u> 1. A Brief History of Time - Stephen Hawking 2. Surely You're Joking Mr Feynman: Adventures of a Curious Character - Ralph Leighton and Richard Feynman 3. Blackholes and Timewarps: Einstein's Outrageous Legacy - Kip Thorne 4. The First Three Minutes - Steven Weinberg 5. Six Easy Pieces - Richard P. Feynman 6. Seven Brief Lessons on Physics - Carlo Rovelli 7. Mr Tompkins in Paperback – George Gamow 8. Why Does E=mc^2 ? - Brian Cox and Jeff Forshaw 9. Does God Play Dice? - Ian Stewart 10. A Short History of Nearly Everything - Bill Bryson 11. Invention and Evolution: Design in Nature and Engineering – Michael French 12. Cosmos – Carl Sagan 13. Moondust: In Search of the Men Who Fell to Earth - Andrew Smith

Section 8 24 lessons including assessment and feedback	• log-linear plotting leading to a determination of the time constant, RC • Investigate how the force on a wire varies with flux density, current and length of wire using a top pan balance. • Investigate, using a search coil and oscilloscope, the effect on magnetic flux linkage of varying the angle between a search coil and magnetic field direction. • Investigate relationships between currents, voltages and numbers of coils in transformers. <u>Nuclear physics</u> This section builds on the work of Particles and radiation to link the properties of the nucleus to the production of nuclear power through the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass. Students should become aware of the physics that underpins nuclear energy production and also of the impact that it can have on society. <u>Skills</u> • Investigate the nature of alpha, beta and gamma radiation with hands on experience of radioactive sources	Radioactivity and Nuclear energy end of topic assessments in the style of exam questions Written and verbal feedback given throughout module through in-class activities and homework.	14. Quantum Theory Cannot Hurt You: Understanding the Mind-Blowing Building Blocks of the Universe - Marcus Chown 15. A Short History of Nearly Everything - Bill Bryson 16. Thing Explainer: Complicated Stuff in Simple Words - Randall Munroe

Section 9 20 lessons including assessment and feedback	• Investigation of the inverse-square law for gamma radiation. • Investigate the decay equation using a variety of approaches (including the use of experimental data, dice simulations etc) and a variety of analytical methods. • Make order of magnitude calculations of the radius of different atomic nuclei. <u>Engineering physics</u> This option offers opportunities for students to reinforce and extend the work of core units by considering applications in areas of engineering and technology. It extends the student's understanding in areas of rotational dynamics and thermodynamics. The emphasis in this option is on an understanding of the concepts and the application of physics. Questions can be set in novel or unfamiliar contexts, but in such cases the scene is set and any relevant required information is given. <u>Skills</u> • Explore the concept of moment of inertia • Identify the uses of flywheels • Students will make links between rotational mechanics and	Rotational dynamics and Thermodynamics and engines end of topic assessments in the style of exam questions Written and verbal feedback given throughout module through in-class activities and homework.	

	translational mechanics from previous learning. • Understand how four-stroke engines work. • Explore the applications of the laws of thermodynamics.		