YEAR 10 2023-2024 SUM 1/2

'An ambitious curriculum that meets the needs of all'

Medium Term Planning - Topic: Waves

Curriculum Intent	**In addition to working further on objectives from Years 7-9, pupils will be taught, following National Curriculum guidelines, the following this topic:**
Skills/Assessment Objective Links	• Amplitude, wavelength, frequency, relating velocity to frequency and wavelength. • Transverse and longitudinal waves. • Electromagnetic waves, velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays. • Velocities differing between media: absorption, reflection, refraction effects. • Production and detection, by electrical circuits, or by changes in atoms and nuclei. • Uses in the radio, microwave, infra-red, visible, ultra-violet, X-ray and gammaray regions, hazardous effects on bodily tissues.
Spiritual, moral, social, and cultural development	**SMSC:** Wave behavior is common in both natural and man-made systems. It appears to be fundamental to the existence of everything raising spiritual questions about the nature of the universe. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves and presents social and moral challenges about how our cities and environments are designed to support people living in harmony with both each other and nature. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves but these advances in technology also present significant moral and cultural challenges that our students explore. **PSHE/British Values:** Waves carry energy from one place to another and can also carry information. They are fundamental for the ongoing development of our society in the age of information. It is important that students achieve an understanding of waves and how we manipulate them so they can support the growth of a safe, ethical and responsible society in out technological future. **Skills Builder:** Use and interpretation of models. Analysis and evaluation skills. Interpretation and use of standard form and suffixes to represent very small and very large numbers. Independent research skills.
Numeracy	**Arithmetic and numerical computation:** Recognise and use expressions in decimal form. Recognise and use expressions in standard form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. **Handling data:** Use an appropriate number of significant figures. Find arithmetic means. Construct and interpret frequency tables and diagrams, bar charts and histograms. Understand the terms mean, mode and median. Use a scatter diagram to identify a correlation between two variables. Make order of magnitude calculations. **Algebra:** Understand and use the symbols: =, <, <<, >>, >, ∝ , ~ . Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities. Solve simple algebraic equations. **Graphs:** Translate information between graphical and numeric form. Understand that y = mx + c represents a linear relationship. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change. Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate. **Geometry and trigonometry:** Use angular measures in degrees. Visualise and represent 2D and 3D forms including two dimensional representations of 3D Objects. Calculate areas of triangles and rectangles, surface areas and volumes of cubes.

Literacy	**Vocabulary Tier 2:** Vibration, matter, amplitude, echo, reflection, absorption, radio wave, microwave, infrared, visible light, ultraviolet, x-rays, gamma rays, lens, ionisong, magnification. **Vocabulary Tier 3:** Transverse, longitudinal, oscillation, medium, wavelength, wave velocity, refraction **Reading:** Students are given the opportunity to develop their skills in specified tasks that develop disciplinary literacy. Throughout the GCSE Physics and Combined Science course they develop their understanding of the requirements of exam questions and the key terminology in questions. In addition, they read practical methodology and translate this to actions in laboratory tasks. **Writing:** Students construct answers independently and through class teaching. Their answers range from single word answers to the planning and writing of 6-mark "extended writing" tasks that require linking of multiple concepts from a topic. These often develop students ability to construct written evaluations of contrasting situations, where the use of comparative connectives are required. **Oracy:** Students are regularly given the opportunity to practice their scientific vocabulary in class discussion, through choral response and in giving instruction to others during practical activities.
Becoming future ready	**Careers/Employability:** Medical treatment and diagnosis (radiology), medical research, nuclear power, nuclear fusion research and R&D, infrastructure repair and maintenance, military, environmental conservation and repair, food supply logistics, archaeology and earth science, theoretical and particle Physicist.
Adaptation **QFT/SEND Provision**	Throughout this topic, quality first teaching will provide differentiation: **By product:** Assessments have opportunities for students to achieve all grades, with structured questions and opportunities for development of extended writing for all abilities. **By resource:** PowerPoints, worksheets and booklets are differentiated as appropriate and produced in conjunction with class teachers for students who would benefit from additional scaffolding of resources in order to achieve their potential. **By Intervention**: by providing different levels of supervision and support, including the specific deployment of teaching assistants within lessons. Structured intervention is planed and delivered based on summative assessment results. **By Progressive Questioning:** exploring pupils' understanding through interactive dialogue. **By Grouping:** according to prior attainment, gender, social preference. **By Task:** Pupils should be involved in the identification of targets which are meaningful to them and in the selection of an appropriate task from the given range. **By Offering Optional Activities:** In class or as homework, to extend learning. This QFT/SEND provision will be explicit within the lesson-by-lesson schemes of work.
Implementation Curriculum Delivery **Learning Outcomes (Knowledge)**	To be able to: **Wave Properties:** • Required practical. I can make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements • P.6.1.1.a -I can describe waves as either transverse or longitudinal, defining these waves in terms of the direction of their oscillation and energy transfer, and giving examples of each • P.6.1.1.b - I can define waves as transfers of energy from one place to another, carrying information, and therefore explain that for water and sound waves it is the wave itself and not the water or air that travels • P.6.1.2.a - I can define amplitude, wavelength, frequency, period and wave speed, and identify them where appropriate on diagrams • P.6.1.2.b - I can state examples of methods of measuring wave speeds in different media and identify the suitability of apparatus of measuring frequency and wavelength • P.6.1.2.c - I can calculate wave speed, frequency or wavelength by applying, but not recalling, the equation: [$v = f \lambda$], and I can calculate wave period by recalling and applying the equation: [$T = 1/f$] • P.6.1.2.d (Physics only) - I can demonstrate how changes in velocity, frequency and wavelength are inter-related in the transmission of sound waves from one medium to another • P.6.1.3.a (Physics only) - I can describe a wave's ability to be reflected, absorbed or transmitted at the boundary between two different materials • P.6.1.3.b (Physics only) - I can draw the reflection of a wave at a surface by constructing ray diagrams

	• P.6.1.4.a (HT Physics only) - I can describe, with examples, processes which convert wave disturbances between sound waves and vibrations in solids, examples may include the effect of sound waves on the ear drum • P.6.1.4.b (HT Physics only) - I can explain why such processes only work over a limited frequency range and the relevance of this to the range of human hearing, which is from 20 Hz to 20 kHz • P.6.1.5.a (Physics only) - I can define ultrasound waves as having a frequency higher than the upper limit of human hearing, and explain how these are used to form images of internal structures in both medical and industrial imaging • P.6.1.5.b (Physics only) - I can compare the two types of seismic wave produced by earthquakes with reference to the media they can travel in and the evidence they provide of the structure of the Earth • P.6.1.5.c (Physics only) - I can describe how echo sounding using high frequency sound waves is used to detect objects in deep water and measure water depth **EM Waves** • P.6.2.1.a - I can state that electromagnetic waves are transverse waves that travel at the same velocity through a vacuum and transfer energy from a source to an absorber, and that they are grouped in terms of their wavelength and their frequency. • P.6.2.1.b - I can list the groups of electromagnetic waves in order of wavelength: radio, microwave, infrared, visible light (red to violet), ultraviolet, X-rays and gamma rays, illustrating the transfer of energy, with examples. • P.6.2.1.c - I can explain that because our eyes only detect a limited range of electromagnetic waves, they can only detect visible light. • P.6.2.2.a (HT) - I can explain how different wavelengths of electromagnetic radiation are reflected, refracted, absorbed or transmitted differently by different substances and types of surface. • P.6.2.2.b I can illustrate the refraction of a wave at the boundary between two different media by constructing ray diagrams. • P.6.2.2.c (HT) - I can describe that refraction is due to the difference in velocity of waves in different substances, and illustrate this using wave front diagrams. • P.6.2.3.a (HT) - I can explain that radio waves can be produced by oscillations in electrical circuits, or absorbed by electrical circuits, inducing an alternating current with the same frequency. • P.6.2.3.b - I can explain that changes in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed over a wide frequency range. • P.6.2.3.c - I can state examples of the dangers of each group of electromagnetic radiation, and discuss the effects of radiation as depending on the type of radiation and the size of the dose, measured in Sieverts. • P.6.2.4.a - I can state examples of the uses of each group of electromagnetic radiation, explaining why each type of electromagnetic wave is suitable for its applications. **Further Light:** • P.6.1.3.a - I can construct ray diagrams to illustrate reflection, transmission and absorption of waves at material interfaces. • Required practical – I can investigate the reflection and refraction of light by different substances. • P.6.2.5.a - I can state that a lens forms an image by refracting light, and that the distance from the lens to the principal focus is called the focal length. • P.6.2.5.b - I can explain that images produced by a convex lens can be either real or virtual, but those produced by a concave lens are always virtual. • P.6.2.5.c - I can construct ray diagrams for both convex and concave lenses. • P.6.2.5.d - I can calculate magnification as a ratio with no units by applying, but not recalling, the formula: • magnification = image height / object height • P.6.2.6.a - I can explain how the colour of an object is related to the differential absorption, transmission and reflection of different wavelengths of light by the object. • P.6.2.6.b - I can describe the effect of viewing objects through filters or the effect on light of passing through filters, and the difference between transparency and translucency. • P.6.2.6.c - I can explain why an opaque object has a particular colour, with reference to the wavelengths emitted.
Current learning to be developed in the future within:	• Topic 7 – Electromagnetism. • Topic 8 – Space.

Assessment	Refer to assessment maps for formative and summative assessment opportunities.
Impact	Attainment and Progress – Refer to assessment results / data review documentation.