Curriculum Rationale and Overview

Subject: Physics **Year group: 11**

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
National Curriculum context	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 gamma-ray regions, hazardous effects on bodily tissues	Exploring the magnetic fields of permanent and induced magnets, and the Earth's magnetic field, using a compass Magnetic effects of currents, how solenoids enhance the effect	The main features of the solar system.			
Scheme of Learning Title:	Waves	Magnetism and Electromagnetism	Space (Triple only)			

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Content *What will students know?*	The definition of transverse and longitudinal waves in terms of direction oscillation. The different EM waves in order of wavelength and their uses and dangers. TRIPLE: Processes which convert wave disturbances between sound waves and vibrations in solids. how echo sounding using high frequency sound waves is used to detect objects in deep water and measure water depth. A lens forms an image by refracting light and that the distance from the lens to the principal focus is called the focal length. State that all bodies, no matter what temperature, emit and absorb infrared radiation and that the hotter the body, the more infrared radiation it radiates in a given time A perfect black body as an object that absorbs all the radiation incident on it and explain why it is the best possible	The interaction between like and unlike polls. How to plot the magnetic field pattern of a magnet using a compass Examples of how the magnetic effect of a current can be demonstrated TRIPLE: the principles of the generator effect, including the direction of induced current, effects of Lenz' Law and factors that increase induced p.d.	The types of body that make up the solar system and describe our solar system as part of a galaxy. The life cycle of a star the size of the Sun and of a star which is much more massive than the Sun.	[redacted]

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	emitter. The temperature of the Earth as dependent on the rates of absorption and emission of radiation.			
What will students understand?	Waves travel at different speeds in different media. How the changes in atoms can result in EM waves being generated. HT: how EM waves are reflected, refracted, absorbed or transmitted by different substances. TRIPLE: 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. How ultrasounds are used to form images That images produced by a convex lens can be either real or virtual, but those produced by a concave lens are always virtual. the colour of an object is related to the differential absorption, transmission and	The difference between permanent and induced magnets. The behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic. How a solenoid arrangement can increase the magnetic effect of the current. HT: How rotation is caused by an electric motor. TRIPLE: How moving-coil loudspeaker, headphones and microphones work. How the generator effect is used in an alternator to generate a.c. and in a dynamo to generate d.c. How the effect of an alternating current in one coil inducing a current in another is used in transformers. How the ratio of the potential differences across the two coils depends on the ratio of the number of turns on each.	How stars are formed. How fusion processes lead to the formation of new elements and how supernovas have allowed heavy elements to appear in later solar systems. For circular orbits, the force of gravity leads to a constantly changing velocity but unchanged speed. For for a stable orbit, the radius must change if the speed changes. Qualitatively, the red-shift of light from galaxies that are receding and how this red-shift changes with distance from Earth. Why the change of each galaxy's speed with distance is evidence of an expanding universe. How scientists are able to use observations to arrive at theories, such as the Big Bang theory and discuss that there is still much about the universe that is not understood	[redacted]

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	reflection of different wavelengths of light by the object Describe the effect of viewing objects through filters or the effect on light of passing through filters and the difference between transparency and translucency Why an opaque object has a particular colour, with reference to the wavelengths emitted. when the temperature is increased, the intensity of every wavelength of radiation emitted increases, but the intensity of the shorter wavelengths increases more rapidly. the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted.			[redacted]
What will students be able to do?	Identify and calculate wavelength, wave speed, amplitude and frequency – including the use of a ripple tank. Measure wavelengths in different media.	Draw the magnetic field pattern of a bar magnet, showing how field strength and direction are indicated and change from one point to another. Draw the magnetic field pattern for a straight wire carrying a current and for	n/a	

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	Investigate how IR radiation is absorbed/radiated from a surface depends on the surface nature. HT: Illustrate refraction at the boundary between media by constructing ray diagrams and wave front diagrams. TRIPLE: 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 Construct ray diagrams for both convex and concave lenses Calculate magnification as a ratio with no units by applying, but not recalling, the formula: [magnification = image height / object height] Investigate the reflection of light by different types of surface and the refraction of light by different substances.	a solenoid (showing the direction of the field). HT: use Fleming's left-hand rule and explain what the size of the induced force depends on Higher Tier: Calculate the force on a conductor carrying a current at right angles to a magnetic field by applying the equation: *[F = BIL]* TRIPLE: Interpret diagrams of electromagnetic devices in order to explain how they work. Apply the equation linking the p.d.s and number of turns in the two coils of a transformer to the currents and the power transfer Apply but not recalling the equations: **[Vs × Is = Vp × Ip]** and **[Vp / Vs = Np / Ns]** for transformers.		[redacted]

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How will they be formally assessed?	End of Topic Test: Give properties, uses and dangers of the electromagnetic spectrum.	End of Topic Test: Explain the relationship between magnetic force and interacting field lines.	End of Topic Test: Describe the theories surrounding the start of the Universe (Big bang and Steady State).	[redacted]