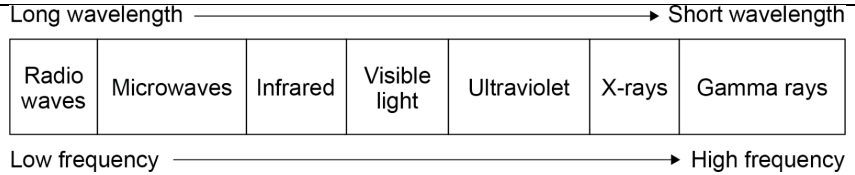
Meden School Curriculum Planning							
Subject	Physics	**Year Group**	10 TRIPLE	**Sequence No.**	13	**Topic**	P6 Waves a & b

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
KS3: Water waves are transverse, oscillations are perpendicular. Longitudinal waves like sound have oscillations parallel. Waves transfer energy. Waves can be reflected. KS3: Transverse waves have crests, troughs and displacement.	**L1:** Waves may be either **transverse** or **longitudinal.** The ripples on a water surface are an example of a transverse wave. Longitudinal waves show areas of **compressio**n and **rarefactio**n. Sound waves travelling through air are **longitudinal.** Students should be able to describe the difference between longitudinal and transverse waves. Students should be able to describe evidence that, for both ripples on a water surface and sound waves in air, it is the wave and not the water or air itself that travels. Students should be able to describe wave motion in terms of their **amplitude, wavelength, frequency and period.** The amplitude of a wave is the **maximum displacement** of a point on a wave away from its **undisturbed position.** The **wavelength** of a wave is the distance from a point on one wave to the **equivalent point** on the adjacent wave. The **frequency** of a wave is the number of waves passing a point each **second**. **L2:** $period = \frac{1}{frequency}$	

KS3 sound can be reflected of refracted. Sound travels as a pressure way through particles. KS3 Light waves are transverse, they transfer energy without the need of particles. They can travel in a vacuum. Light waves always travel a the same speed in a vacuum = 3 x 10^8 m/s. Light slows down when in enters materials. Refraction occurs when light enters a medium. Less dense to more dense, refracts towards the normal and vice versa.	$T = \frac{1}{f}$ period, *T*, in seconds, s frequency, *f*, in hertz, Hz The wave speed is the speed at which the **energy is transferred** (or the wave moves) through the medium. All waves obey the wave equation: *wave speed* = *f requency* × *wavelength* $v = f\lambda$ **wave speed**, *v*, in metres per second, m/s frequency, *f*, in hertz, Hz **wavelength**, *λ*, in metres, m Students should be able to: dentify **amplitude** and wavelength from given diagrams **L3:** describe a method to measure the **speed of sound** waves in air describe a method to measure the **speed of ripples on a water surface.** (Physics only) Students should be able to show how changes in velocity, frequency and wavelength, in transmission of sound waves from one medium to another, are inter-related. **Required practical activity 8:** make observations to identify the suitability of apparatus to **measure the frequency, wavelength and speed** of waves in a ripple tank **L4:** and waves in a solid and take appropriate measurements. (waves on a string prac) **L5:** Waves can be **reflected at the boundary** between two different materials. Waves can be **absorbed or transmitted** at the boundary between two different	Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves and resonance

	materials. Students should be able to construct **ray diagrams** to illustrate the reflection of a wave at a surface. Students should be able to describe the effects of **reflection, transmission and absorption** of waves at material interfaces. **L6:** (HT only) Different substances may **absorb, transmit, refract or reflect** electromagnetic waves in ways that vary with wavelength. (HT only) Some effects, for example refraction, are due to the difference in velocity of the waves in different substances. Students should be able to **construct ray diagrams** to illustrate the refraction of a wave at the boundary between two different media (HT only) Students should be able to use wave front diagrams to explain refraction in terms of the change of speed that happens when a wave travels from one medium to a different medium. **L7**: **Required practical activity 9 (physics only):** investigate the reflection of light by different types of surface and the refraction of light by different substances. **L8**: Electromagnetic waves are transverse waves that transfer energy from the source of the waves to an **absorber.** **Electromagnetic waves** form a **continuous spectrum** and all types of electromagnetic wave travel at the **same velocit**y through a vacuum (space) or air. The waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency. Going from long to short wavelength (or from low to high frequency) the groups are**: radio, microwave, infrared, visible light (red to violet), ultraviolet, X- rays and gamma rays**.	Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves. Debate about whether sunbeds should be banned Look at occurrence of skin cancer across the population. Who is most at risk, what precautions should be taken?

KS3: Black absorbs all frequencies of visible light.	 Our eyes only **detect visible light** and so detect a limited range of electromagnetic waves. Students should be able to give examples that illustrate the transfer of energy by electromagnetic waves Electromagnetic waves have many practical applications. For example: **radio waves – television and radio** **microwaves – satellite communications, cooking food** **infrared – electrical heaters, cooking food, infrared cameras** **visible light – fibre optic communications** **ultraviolet – energy efficient lamps, sun tanning** **X-rays and gamma rays – medical imaging and treatments.** (HT only) Students should be able to give brief explanations why each type of electromagnetic wave is suitable for the **practical application.** **L9:** (HT only) Radio waves can be produced by **oscillations** in electrical circuits. (HT only) When radio waves are **absorbed they** may create an **alternating current** with the **same frequency** as the radio wave itself, so radio waves can themselves **induce** oscillations in an electrical circuit. Changes in atoms and the **nuclei of atoms** can result in electromagnetic waves being **generated or absorbed** over a wide frequency range. Gamma rays originate from changes in the nucleus of an atom **L10: Required practical activity 10:** investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.	Why are houses painted white in the Mediterranean? Should radiators be black or white?

	L11: (HT only) The temperature of the Earth depends on many factors including: the rates of absorption and emission of radiation, reflection of radiation into space. (HT only) Students should be able to explain how the **temperature of a body** is related to the balance between incoming radiation absorbed and radiation emitted, using everyday examples to illustrate this balance, and the example of the factors which determine the temperature of the Earth. (HT only) Students should be able to use information, or draw/ interpret diagrams to show how radiation affects the **temperature of the Earth's surface** and atmosphere. **L12:** Each colour within the visible light spectrum has its own narrow band of wavelength and frequency. Reflection from a smooth surface in a single direction is called **specular reflection**. Reflection from a rough surface causes scattering: this is called **diffuse reflection.** Objects that transmit light are either **transparent or translucent**. Students should be able to explain: how the colour of an object is related to the differential absorption, transmission and reflection of different wavelengths of light by the object the effect of viewing objects through filters or the effect on light of passing through filters why an **opaque** object has a particular colour. **L13:** Colour filters work by absorbing certain wavelengths (and colour) and transmitting other wavelengths (and colour). The colour of an opaque object is determined by which wavelengths of light are more strongly reflected. Wavelengths that are not reflected are absorbed. If all wavelengths are reflected equally the object appears white. If all wavelengths are absorbed the objects appears black. **L14:** All bodies (objects), no matter what temperature, emit and absorb infrared radiation. The **hotter the body, the more infrared radiation it radiates** in a given time.	

	A **perfect black bod**y is an object that absorbs all of the radiation incident on it. A black body does not reflect or transmit any radiation. Since a good absorber is also a good emitter, a perfect black body would be the **best possible emitte**r. Students should be able to explain: that all bodies (objects) **emit radiatio**n that the **intensity** and wavelength distribution of any emission depends on the temperature of the body. (HT only) A body at constant temperature is absorbing radiation at the same rate as it is emitting radiation. The temperature of a body increases when the body absorbs radiation faster than it emits radiation. **L15:** uses of xrays and gamma in medication – how **xrays work** and **sterilization of equipment** **L16:** Ultraviolet waves, X-rays and gamma rays can have **hazardous** effects on human body tissue. The effects depend on the type of radiation and the size of the dose. Radiation **dose (in sieverts)** is a measure of the risk of harm resulting from an exposure of the body to the radiation. 1000 millisieverts (mSv) = 1 sievert (Sv) Students will not be required to recall the unit of radiation dose. Students should be able to draw conclusions from given data about the risks and consequences of exposure to radiation. Ultraviolet waves can cause skin to **age prematurely** and increase the risk of **skin cancer**. X-rays and gamma rays are **ionising** radiation that can cause the mutation of genes and cancer. **L17:** revision **L18:** Test **L19:** GPA	