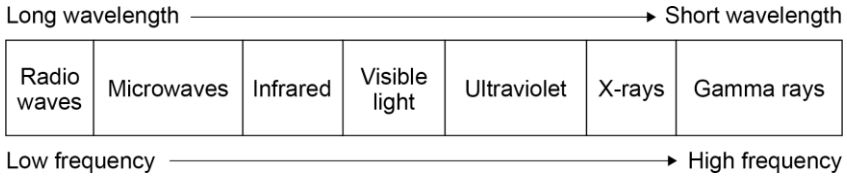
Meden School Curriculum Planning							
Subject	Physics	**Year Group**	10	**Sequence No.**		**Topic**	Waves

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**. Waves can be **mechanical**, require **matter**(particles) or **electromagnetic** meaning they do not use particles. Waves transfer energy without the transfer of matter. Transverse waves have **oscillations perpendicular** to the direction of energy transfer and longitudinal waves have **oscillations parallel** to the direction of energy transfer. The ripples on a water surface are an example of a transverse wave. EMS waves are also transverse. Longitudinal waves show areas of **compression** and **rarefaction.** Sound waves travelling through air are longitudinal. **L2**: 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. **L3**: The **period** of a wave is the time taken for one complete wave cycle to pass a point. $period = \frac{1}{frequency}$ $T = \frac{1}{f}$ **period**, T, in seconds, s frequency, f, in hertz, Hz Therefore $f = \frac{1}{T}$ **L4**: The **wave speed** is the speed at which the energy is transferred (or the wave moves)	

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.	through the **medium.** All waves obey the wave equation: *wave speed = frequency × wavelength* $v = f \lambda$ wave speed, v, in metres per second, m/sfrequency, f, in hertz, Hz wavelength, λ, in metres, m Speed of a sound wave can be measured by timing a **reflection(echo)** of a loud sound off a solid surface like a brick wall. **L5**: Identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a **ripple tank.** Photo should be taken with a ruler alongside the ripple tank to allow for wavelength to be measured. 10 waves could be measured and the divided by 10 to increase the accuracy. Video should be taken with a stopclock in the picture. The video should be played back in slow motion to count the number of waves passed a point in a designated period of time and then frequency calculated. Speed is calculated using $v = f \lambda$ **L6:** Waves on s string practical. Length of single loop **(first harmonic)** is measured. This length is half a wavelength. Frequency is determined by signal generator. Different distances are investigated, and speed calculated using $v = f \lambda$ **L7**: **Refraction** (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 therefraction 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. **L8: Electromagnetic waves** are transverse waves that transfer energyfrom the source of the waves to an absorber. Electromagnetic waves form a **continuous spectrum** and all types of electromagnetic wave travel at the same velocity 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	Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves and resonance

	groups are: **radio, microwave, infrared, visible light (red to violet), ultraviolet, X-rays and gamma rays.**  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. **L9** Electromagnetic waves have many practical applications. Forexample: • 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.** Changes in atoms and the **nuclei of atoms** can result in electromagnetic waves being generated or absorbed over a widefrequency range. Gamma rays originate from changes in the nucleus of an atom. (HT only) Students should be able to give brief explanations whyeach type of electromagnetic wave is suitable for the practical application. (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. **L10** 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)	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.	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 increasethe risk of **skin cancer**. X-rays and gamma rays are **ionising radiation** that can cause **the mutation of genes** and cancer. **P11 Required practical activity 21:** investigate how the amount of infrared radiation absorbed orradiated by a surface depends on the nature of that surface. Matt surface absorbed and emit the most IR radiation. Dark or black surfaces emit and absorb the most IR radiation. .	Why are houses painted white in the Mediterranean? Should radiators be black or white?