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| Waves 1 - In this topic you will calculate just how fast light is and use that to discover just how far away the sun is ( really close compared to the nearest star). You will then investigate how different waves allow us to hear and see.  |
| **Core Questions for the Unit** | **1 – What is a wave?**1. Identify similarities and differences between light waves and waves in matter.
2. Describe how light behaves when in contact with opaque, transparent and translucent objects.
3. Explain how light waves travel through a vacuum, and the speed of light.

**2- How do we see?**1. Identify the colours that white light splits into when shone through a prism.
2. Describe how light transfers from a source to an absorber leading to electrical effects in the retina.
3. Explain how we see different colours of objects using the light spectrum.
4. Explain how filters allow only one colour of light through, or can block light altogether.

**3- What are sound waves?**1. Describe the frequency of sound waves, measured in hertz, echoes, reflection and absorption of sound.
2. Explain why sound needs a medium to travel, the speed of sound in air, in water, in solids.

**4- How do we hear different sound waves?** 1. Identify the auditory range of humans and animals.
2. Describe how sounds can be detected by the ear, and different vibrations of sound can produce louder or more high pitched sounds.
3. Explain how the inner ear transfers sounds into electrical signals.

**5- How do waves transfer heat energy using waves?**1. Describe how radiation transfers heat energy.
2. Explain which materials are the best at transferring heat energy.
3. Investigate the link between material and how quick it transfers heat energy.
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| **Links to other subjects** | Y7 Electricity - Electrical energy. Maths – Numeracy section.  |
| **Scientific skills** | Collect data in finding the best material for absorbing and reflecting radiationCollect data in finding the best material for absorbing and reflecting radiationExplain which materials are the best at transferring dataExplain how light waves travel through vacuumsExplain why sound waves need a medium to travel |
| **Development of new knowledge** | **P5: Light** * The similarities and differences between light waves and the waves in matter
* Light waves travelling through a vacuum; speed of light
* The transmission of light through materials
* Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras
* Colours and the different frequencies of light, white light and prisms (qualitative only

**P6: Sound*** frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound
* Sound needs a medium to travel, the speed of sound in air, in water, in solids
* Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal
* Auditory range of humans and animals
* information for conversion to electrical signals by microphone.
 | **Strengthening of prior****knowledge** | **Light****Year 6**Demonstrates an understanding that light is a spectrum of colours.Is able to describe that light travels in a straight line.Is able describe the route of light from its source to the eye.Has the ability to use the idea of light travelling in straight lines to explain the shape of shadows.**Year 3**Demonstrates an understanding that we need light to see things and that dark is the absence of light.Is able to describe how light is reflected from surfaces.Demonstrates an understanding that the sun is a natural light source and can be dangerous to look at.Is able to describe how a shadow is formed when light is blocked.Is beginning to demonstrate an understanding of why the size of a shadow changes.**Sound**Demonstrates an understanding that sounds are caused by vibrations.Understands that sounds can travel through different medium.Is beginning to understand that volume is caused by the strength of vibrations.Demonstrates an understanding that pitch and volume can be changed.Understands that sound gets fainter the further away from its source. |
| **Vocabulary:** | **Tier 2 Words:**Evaluate Conclude CalculateRearrange Resource CompromiseJudgment Covert  Link Decide Efficiency National | **Tier 3 Words:**AmplitudeFrequencyWavelengthTransverseLongitudinalRadiation | **Reading Opportunities****Numeracy Opportunities** | <https://www.dezeen.com/2019/09/24/blackest-black-mit-material-news-vantablack/> - Vantablack<https://www.theguardian.com/lifeandstyle/2013/jul/13/experience-blindness-echolocation-daniel-kish> - Human echolocationConverting units Table drawingGraph drawing Pie charts Rearranging equations |
| **Activities you are likely to do in lesson.s** | **1 – What is a wave?*** Retrieval practice –Do it now questions on types of energy transfer and light/sound.
* Decode it now:Calculate
* Labelling a wave’s amplitude, wavelength, peaks and troughs
* Active reading on light and how it reacts with opaque, transparent and translucent objects
* Calculating the distance between planets using the speed of light
* Drawing ray diagrams to show light travels in a straight line
* Thinking map - Cognitive strategy comparing transverse and longitudinal waves
* Retrieval practice – Review it now questions based on lesson

**2- How do we see?*** Retrieval practice –Do it now questions on types of energy transfer and light/sound.
* Active reading - DART on vantablack. <https://www.kiwikidsnews.co.nz/vantablack-material-so-dark-you-cant-see-it/> (foundation). <https://www.coating.co.uk/vantablack-coating/> (higher).
* Labelling diagrams of the eye
* Mnemonic for the 7 colours of white light
* Mix and match different primary and secondary colours of light
* Looking at objects through different filters
* Retrieval practice – Review it now questions based on lesson

**3- What are sound waves?*** Retrieval practice –Do it now questions on types of energy transfer and light/sound.
* Watching a video of sound travelling slower than light (lightning then thunder? Explosion then bang?)
* Exam style questions looking at calculating the sped of sound through different mediums
* Decode it now - Transverse
* Looking at sound wave diagrams on oscilloscopes to see how loudness and pitch are determined by amplitude and wavelength.
* Retrieval practice – Review it now questions based on lesson

**4- How do we hear different sound waves?** * Retrieval practice –Do it now questions on types of energy transfer and light/sound.
* Listening to a human hearing range test for pupils to judge the range of their own hearing
* Thinking map - Problem solver based on how we hear using diagrams of the inner ear
* Labelling a diagram of the inner ear, and explain how the inner ear can transfer mechanical waves into electrical signals to the brain.
* Active reading - DART on Daniel Kish and human echolocation (how people with disabilities overcome what is deemed impossible) <https://theweek.com/articles/485731/blind-like-bat>
* Retrieval practice – Review it now questions based on lesson

**5- How do waves transfer heat energy using waves?*** Retrieval practice –Do it now questions on types of energy transfer and light/sound.
* Decode it now: Radiation
* Define and name 2 sources of radiation.
* Explain how thermal radiation can be felt from the Sun
* Investigate which colour/material is the best conductor and insulator of thermal radiation
* Graph skills based on measuring the temperature change of water when left in a black can and a silver can.
* Link to absorption and reflection
* Retrieval practice – Review it now questions based on lesson

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| How you will be assessed. | You will be assessed by: * A retrieval quiz during the Do It Now of every lesson.
* Mini quizzes and challenges during lesson.
* A progress assessment in the middle of the unit – Here we will reflect and improve on key areas and complete DIRT work.

An end of unit assessment that assesses your knowledge and skills that you have built in this unit and previous units that we link back to.  |