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**Knowledge Rich Curriculum Plan**

SCIENCE- Sound, light and waves



| **Lesson/Learning Sequence** | **Intended Knowledge:**  *Students will know that…* | **Prior Knowledge:**  *In order to know this, students need to already know that…* | **Working Scientifically** | **Tiered Vocabulary and Reading Activity** | **Assessment** | **Support** |
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| ***01***  ***Sound*** | *Students will know that faster vibrations (shorter wavelengths) will increase the pitch and slower vibrations (longer wavelengths) will decrease the pitch. Students will know that creating a bigger vibration (higher amplitude) causes the sound to be louder and a smaller vibration (smaller amplitude) makes the sound quieter. Students will know that vibrations/frequency are measured in hertz. Students will know that sound is a longitudinal wave and be able to describe, amplitude, crest, trough and wavelength.* | *Students need to already know that when particles vibrate sound is produced. Students need to already know when an object is hit harder a louder sound is produced.* | *Enquiry: students can hypothesize the changes in the waves at different amplitudes and frequencies.*  *Analyse patterns and draw conclusions* | *Amplitude- the maximum displacement*  *Wavelength- the distance between the same point on a successive wave*  *Frequency- the number of waves that have passed a fixed point*  *Crest- the point on the surface of a wave, where the displacement is at its maximum* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 1*  *End of topic test*  *Summative assessment 3*  Questions:  How might the vibrations affect the sound?  Answer: faster vibrations increase pitch 🡪 shorter wavelength 🡪 higher frequency  Slower vibrations decrease pitch 🡪 higher wavelength 🡪 Lower frequency  How would you describe a longitudinal wave?  Answer: oscillations that are perpendicular to the direction of the wave 🡪 wavelength is the measurement from crest to crest (or trough to trough) of the wave. 🡪 the crest is the peak of the wave 🡪 the trough is the bottom of the wave🡪amplitude is the height of the wave (from rest) | *Knowledge organiser (provided on Teams and in class)*  <https://www.bbc.co.uk/bitesize/topics/zw982hv/articles/z8mmb82>  <https://www.kayscience.com/d/what-are-sound-waves-h-s-1> |
| ***02***  ***How does sound travel?*** | *Students will know that sound requires particles to travel from a source through a medium to another source. Students will know that sound waves move faster in solids than liquids and gases. Students will know how particles vibrate to produce sounds. Students will know how sounds become quieter the further they move from the source. Students will know definitions for transmission - pass across or through a material. Absorption - taken in by a material and reflection - bouncing off a surface.* | *Students need to already know that faster vibrations are linked to a higher pitch of sound. Students need to already know that bigger vibrations are linked to a louder sound. Students need to already know that sounds are caused by vibrations. Students need to already know that sound is a wave and requires a medium. Students need to already know the particle arrangement of particles in a solid, liquid and gas.* |  | *Transmission- When a wave travels through a medium* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 1*  *End of topic test*  *Summative assessment 3*  Questions:  How might the substance that sound travels through affect the speed of sound?  Answer: Sound travels faster in solids 🡪 particles are closer to each other so pass on vibrations better 🡪 sound doesn’t travel in a vacuum 🡪 no particles to pass on vibrations  How might the volume of sound be affected by distance away from the source:  Answer: The further away you are the quieter the sound 🡪 particles are vibrating with less energy  How might the material sound vibration hits affect the sound  Answer: different materials might absorb, transmit or reflect the waves 🡪 reflect is when the wave bounces off a surface 🡪 transmit is when waves pass through the material 🡪 absorb is when the wave is taken in by the substance | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/topics/zw982hv/articles/z8mmb82*](https://www.bbc.co.uk/bitesize/topics/zw982hv/articles/z8mmb82)  [*https://www.kayscience.com/d/what-are-sound-waves-h-s-1*](https://www.kayscience.com/d/what-are-sound-waves-h-s-1) |
| ***03***  ***Auditory range or animals*** | *Students will be able to outline the structure of the ear. Students will be able to give a brief description of how the ear works. Students will know that the auditory range of animals is varied across different species. Students will know that the auditory range of humans is 20 Hz - 20,000 Hz. Students will know that the frequencies above 20,000 Hz are known as ultrasound. Students will know that certain animals such as Dolphins and Bats can utilise ultrasound. Students will know that the frequencies below 20Hz are known as infrasound. Students will know that certain animals such as whales and elephants can utilise and communicate via infrasound. Students will know the definition for echolocation - locating objects using reflected sound.* | *Students need to already know that frequency is linked how high the sound is which is caused by fast and slow vibrations. Students need to already know how sound is transmitted to the ear via vibrations of particles. Students need to know that sound requires a medium to pass through.* | *Communicate: Students can justify opinions about why different animals have different auditory ranges* | *Transpiration- a loss of water vapour through the stomata in the leaves of a plant*  *Annotate- a note added by way of explanation* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 1*  *End of topic test*  *Summative assessment 3*  Questions:  How might the frequency affect of a sound wave affect how we hear sound?  Answer: high frequency high pitch, low frequency low pitch. Auditory range 20 – 20 000 Hz. Anything above 20 000 Hz is ultrasound, anything below 20 Hz is infrasound.  How might ultrasound and infrasound be used by animals?  Answer: communication used by whales and elephants – infrasound. Dolphins and bats can observe ultrasound for echolocation. | *Knowledge organiser (provided on Teams and in class)*  [*https://www.youtube.com/watch?v=VxcbppCX6Rk*](https://www.youtube.com/watch?v=VxcbppCX6Rk) |
| ***04 Light*** | *Students will know that light is emitted by luminous objects. Students will know that travels in straight lines at the speed of light. Students will know that light can pass through transparent materials. Students will know that light cannot pass through opaque materials. Students will know that light can reflect of some materials E.g. mirrors. Students will know how shadows are formed* | *Students need to already know that light illuminates’ objects. Students need to already know how light can be reflected off materials.* | *Communicate: Students will be able to construct explanations about how shadows are formed.* | *Echolocation- a process of locating distant by used of sound waves* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 2*  *End of topic test*  *Summative assessment 3*  Questions:  How might the material light is directed at affect the movement of light?  Answer: light will be able to travel through transparent materials. Light won’t travel through opaque materials. Light can reflect of some materials.  How might shadows be formed?  Answer: light can’t travel through an opaque object 🡪 as light travels passed the object, it forms a shadow in the shape of the object 🡪 this is due to light travelling in straight lines, and not travelling through an opaque object. | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/guides/zq7thyc/revision/1*](https://www.bbc.co.uk/bitesize/guides/zq7thyc/revision/1)  [*https://www.kayscience.com/d/transverse-longitudinal-waves*](https://www.kayscience.com/d/transverse-longitudinal-waves) |
| ***05 The eye and vision*** | *Students will be able to label the parts of the eye; iris, lens, pupil, cornea, ciliary muscles, sclera, retina, optic nerve and suspensory ligaments. Students will be able to describe the function of some parts of the eye. The cornea retracts light, the iris controls how much light enters the pupil, the lens focuses light into the retina, the retina contains light receptors and the optic nerve carries impulses to the brain.* | *Students will know that light travels in straight lines. Students know that people have different eyes colours. Students will know some people need glass to improve their vision.* |  | *Binocular: adapted for or using both eyes*  *Iris- the ring-shaped membrane behind the cornea*  *Retina- the layer at the back of the eyeball that contains cells sensitive to light*  *Optic nerve- sends messages from the eye to the brain* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 2*  *End of topic test*  *Summative assessment 3*  Questions:  How might the structure of the eye play a role in our ability to observe and sense light?  Answer: the eye contains different parts 🡪 the parts of the eye are iris, pupil, cornea, ciliary muscles, sclera, retina, optic nerve and suspensory ligaments 🡪 corner refracts light 🡪 iris controls how much light enters the eye 🡪 lens focuses light onto the retina 🡪 retina contains light receptors and the optic nerve carries impulses to the brain. | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/topics/zgdmsbk/articles/z7by92p*](https://www.bbc.co.uk/bitesize/topics/zgdmsbk/articles/z7by92p) |
| ***06 Colour*** | *Students will know that white light is a mixture of all colours in the visible light spectrum. White light is separated by a process called dispersion because of different wavelengths. The colours that can be seen are red, orange, yellow, green, blue, indigo and violet. Students will know that objects look coloured because they reflect certain colours of light and absorb others. For example, grass looks green because it reflects green light and absorbs the other colours of the spectrum* | *Students will know the colours of the rainbow.* | *Communicate: Student s will be able to construct and explanation as to why objects appear a specific colour.* | *Dispersion- the separation of light*  *Wavelength- the distance between the same point on two successive waves*  *Refracted- the bending of light which occurs in different object densities*  *Absorbed- energy taken in*  *Reflected- the change in a direction of a wave* | *Retrieval questions*  *Simple exam questions*  *Homework quiz 2*  *End of topic test*  *Summative assessment 3* | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/guides/zq7thyc/revision/6#:~:text=Light%20is%20refracted%20when%20it,colours%2C%20a%20process%20called%20dispersion%20*](https://www.bbc.co.uk/bitesize/guides/zq7thyc/revision/6#:~:text=Light%20is%20refracted%20when%20it,colours%2C%20a%20process%20called%20dispersion%20)*.* |
| ***07 Reflection*** | *Students will know that the angle of incident is the measurement from the incident ray and the 'normal' line. Students will know that the angle of reflection is the measurement from the reflected ray and the 'normal' line. Students will know that the 'normal' line is perpendicular to the reflective medium. Students will know that the angle of incident is equal to the angle of reflection.* | *Students need to already know that light can be reflected. Students need to already know that a right angle is 90 degrees. Students need to already know how to use a protractor.* | *Enquire: Students will be able to collect data about the change in angle of incidence when the angle of reflection has changed*  *Analyse: Students will be able to draw conclusions based on their data.* | *Incident ray- the ray of light that falls on any surface*  *Reflective ray- the ray of light that is reflected off an object*  *Normal- A line drawn at 90 degrees to the reflective surface*  *Medium- A matter/materials* | *Retrieval questions*  *Simple exam questions*  *Homework quiz*  <https://www.satchelone.com/quizzes/67357236-assessment---reflection-and-refraction-quiz>  *End of topic test*  *Summative assessment 3* | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/guides/zq7thyc/revision/2*](https://www.bbc.co.uk/bitesize/guides/zq7thyc/revision/2) |
| ***08. Refraction*** | *Students will need to know that light moves in straight lines away from a source. Students will need to know that light moves through translucent materials. Students will need to know that light waves change speed when moving between objects with different densities. Students will need to know that the angle a ray of light approaches a translucent material is known as the angle of incidence (i). Students will need to know that the angle a ray of light that enters a translucent material is known as the angle of refraction (r). Students will need to know how to draw ray diagrams to show angles of incidence and refraction* | *Students need to already know that light travels in straight lines. Students need to already know that light passes through translucent materials. Students will need to already know how to use a protractor.* | *Enquire: Students will be able to devise questions regarding the change in the speed of light through different objects.*  *Communicate: Students will be able to construct an explanation of why refraction happens.* | *Translucent- allows light to pass through it*  *Refraction- the change in the speed of light due to the density of a medium* | *Retrieval questions*  *Simple exam questions*  *Homework quiz*  <https://www.satchelone.com/quizzes/67357236-assessment---reflection-and-refraction-quiz>  *Summative assessment 3*  *End of topic test* | *Knowledge organiser (provided on Teams and in class)*  [*https://www.bbc.co.uk/bitesize/guides/zq7thyc/revision/4*](https://www.bbc.co.uk/bitesize/guides/zq7thyc/revision/4) |