PHENOMENA, DRIVING QUESTIONS AND STORYLINE

WAVES

This unit explores the anchoring phenomenon: Waves can be both helpful and harmful. Examples explored include information transmitted by waves, hearing loss due to loud music, and eye damage from looking at the sun. Students generate and answer questions such as: How can loud sounds cause hearing loss? How can sunlight damage eyes? How do waves transfer energy? How can waves be used to transmit information?

Phenomenon	Driving Questions	Guiding Questions	Activities	PE	Storyline/Flow (How an activity leads to subsequent activities)
Humans can hear a large range of sound intensities.	How much sound energy is safe?	What is the range of sound intensities that humans can hear? (Activity 1) How can we model sound waves? (Activity 2) What are the properties of sound waves? (Activity 3) What can be done to prevent noise-induced hearing loss? (Activity 4)	1, 2, 3, 4	MS-PS4-1	One example of a wave is sound. Sound can be helpful as we can use it to hear soft things as well as loud things and communicate with it. As sound travels as a wave, it has wave properties. One of these properties, energy/intensity, can be harmful but can be mitigated through the use of certain technologies.
Certain technologies make use of or modify waves.	How can wave technology be used to enhance or protect human senses?	What can be done to prevent noise-induced hearing loss? (Activity 4) Which type of signal, analog or digital, is more reliable? (Activity 5) What is the difference between digital and analog transmission? (Activity 6) What part of sunlight is transmitted through selected films? (Activity 11) How is sunscreen different from other kinds of lotion? (Activity 14)	4, 5, 6, 11, 14	MS-PS4-2 MS-PS4-3	There are many technologies that utilize waves or modify wave properties. Very recently, one such technology, digital technology, has revolutionized the ways in which we can encode and store information. We are able to record analog signals, likes sound waves, as digital files, like mp3s, which has many benefits.

PHENOMENA, DRIVING QUESTIONS AND STORYLINE

WAVES (continued)

Phenomenon	Driving Questions	Guiding Questions	Activities	PE	Storyline/Flow (How an activity leads to subsequent activities)
We experience many different types of waves. (Sound, light, water, seismic, etc.)	How do different types of waves transfer energy?	How can we model sound waves? (Activity 2)	2, 3, 7, 8, 9, 12, 13	MS-PS4-1 MS-PS4-2	While storing information as digital files is useful, it is also useful to send information digitally. One of the most prevalent ways information is sent, both analog and digital information, is via light waves. Light waves are not longitudinal waves, like sound, but instead travel as transverse waves. To learn more about transverse waves, and waves in general, we can experiment with light waves. Light waves are useful in demonstrating many wave properties like: reflection, refraction, absorption, transmission, and frequency/ wavelength.
		What are the properties of sound waves? (Activity 3)			
		What are the characteristics of a transverse wave? (Activity 7)			
		What kind of surface makes a good reflector? (Activity 8)			
		How does light behave at the boundary between two different materials? (Activity 9)			
		What are the characteristics of electromagnetic waves? (Activity 12)			
		How do different materials absorb or reflect light? (Activity 13)			
The energy carried by a beam of light is affected by the color of the light.	How can exposure to sunlight harm humans?	How are the colors of the visible light spectrum similar to and different from each other? (Activity 10)	10, 11, 12, 13, 14, 15	MS-PS4-2	For light, frequency corresponds to the color of light – electromagnetic spectrum – as well as the energy of light. That is, the energy carried by a beam of light is affected by the color of the light. So while light is good for you – vitamin D; the ability to see – it can also be harmful at high energies like UV. What can we do to mitigate the risk of high energy/harmful sunlight?
		What part of sunlight is transmitted through selected films? (Activity 11)			
		What are the characteristics of electromagnetic waves? (Activity 12)			
		How do different materials absorb or reflect light? (Activity 13)			
		How is sunscreen different from other kinds of lotion? (Activity 14)			
		What personal ultraviolet protection plan fits your risk factors and lifestyle? (Activity 15)			