Physics: Waves and their Applications in Technologies for Information Transfer

High School Physics		Links
Standard: Waves and their Applications in Technologies for Information Transfer		
HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.	https://www.nextgenscience.org/pe/hs-ps4-1-waves-and-their-applications-technologies-information-transfer
HS-PS4-4	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	https://www.nextgenscience.org/pe/hs-ps4-4-waves-and-their-applications-technologies-information-transfer
HS-PS4-5	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.	https://www.nextgenscience.org/pe/hs-ps4-5-waves-and-their-applications-technologies-information-transfer
21st Century Learning Expectations: • Hinsdale students will communicate through various means • Hinsdale students will be able to solve problems		Link for 21st Century Learning Expectations

Enduring Understandings (cross cutting concepts):	
• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. • Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. • Systems can be designed to cause a desired effect. • Science and engineering complement each other in the cycle known as research and development (R&D). • Modern civilization depends on major technological systems.	
Learning Competencies (engineering practices)	**Create Essential Questions (based on these core ideas)**
Students will be able to: (NGSS Science and Engineering practices) • Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations. • Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible.	• The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. • When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells.

• Communicate technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).	• Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. *(secondary)* • Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. • Photoelectric materials emit electrons when they absorb light of a high-enough frequency. • Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them.
Performance Task Resource/Sample: Energy Sources	