Unit 13: Electromagnetic Radiation

Unit #:	APSDO-00018813	Duration:	1.0 Week(s)	Date(s):	

Team:
Christopher Jones (Author), John Salerni, Jason Cleveland, Christopher Jones, Scott Rand
Grades:
8
Subjects:
Science

Unit Focus

In this unit, students will learn about the nature, types, properties, and characteristics of the waves that comprise the electromagnetic spectrum. Students will also learn about applications of radio, microwave, infrared, visible, ultraviolet, x-ray, and gamma ray radiation. Summative assessments may include application problems, experimental designs, laboratory practices, data analyses, models, and position statements. These may be in the form of stand-alone tasks or as part of quizzes, tests, labs, or other assignments. Primary instructional materials may include the course textbook, supplemental print and online resources, and related laboratory equipment and materials.

Stage 1: Desired Results - Key Understandings

Established Goals

Next Generation Science Standards (DCI)
Science: 8

- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. *PS4.6.A1*
- Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. *PS4.6.C1*
- However, because light can travel through space, it cannot be a matter wave, like sound or water waves. *PS4.6.B4*

Science: 11

Transfer

T1 (T3) Collect, analyze, and evaluate the quality of evidence in relation to a question.
T2 (T5) Communicate scientific information clearly, thoroughly, and accurately.
T3 (T2) Design an investigation or model using appropriate scientific tools, resources, and methods.
T4 (T4) Develop a valid scientific conclusion, assess its validity and limitations, and determine future course of actions to inspire further questions.
T5 (T1) Integrate knowledge from a variety of disciplines and apply it to new situations to make sense of information, formulate insightful questions, and/or solve problems.
T6 (T6) Use mathematics to represent physical variables and their relationships, to make quantitative predictions, and to solve problems.

Meaning

Understandings	Essential Questions

• Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. *PS4.9.B1* • 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. *PS4.9.C1* • Photoelectric materials emit electrons when they absorb light of a high-enough frequency. *PS4.9.B4* • Solar cells are human-made devices that likewise capture the sun''s energy and produce electrical energy. *PS3.9.D2* • 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. *PS4.9.B3*	**U1** (U480) Waves carry energy, not matter, from one location to another. **U2** (U481) Wavelength, frequency, and amplitude are properties of a wave that determine its characteristics (e.g., pitch, color, sound, energy). **U3** (U477) Objects can be seen if light is available to illuminate them or if they give off their own light. **U4** (U487) Photoelectric materials such as solar panels emit electrons when they absorb light with high-enough frequency.	**Q1** (Q479) How do we use waves to explain what we see and hear in the world around us? **Q2** (Q478) How are wave properties evident in everyday life? **Q3** (Q451) What does energy look and feel like?
	Acquisition of Knowledge and Skill	
	Knowledge	**Skills**
		S1 Compare and contrast the variety of wave energies, frequencies, and wavelengths of the electromagnetic spectrum **S2** Explain everyday applications of electromagnetic waves **S3** Explain the direct relationship between an electromagnetic wave's frequency and energy **S4** Explain how light is created in incandescent, fluorescent, and neon light bulbs **S5** Explain the photoelectric effect and its implications