



## Grades 9–12

### 3.2.9-12.W Physical Science: Waves and Electromagnetic Radiation

**Students who demonstrate understanding can** *evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.*

**Clarifying Statement:** Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.

**Assessment Boundary:** Assessment is limited to qualitative descriptions.

Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
<b>Obtaining, Evaluating, and Communicating Information</b> Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs. <ul style="list-style-type: none"> <li>Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible.</li> </ul>	<b>Electromagnetic Radiation</b> <ul style="list-style-type: none"> <li>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.</li> </ul>	<b>Cause and Effect</b> <ul style="list-style-type: none"> <li>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.</li> </ul>

**Pennsylvania Context:** N/A

**PA Career Ready Skills:** Analyze adverse situations for the purpose of identifying and selecting healthy coping skills.

### Connections to Other Standards Content and Practices

Standard Source	Possible Connections to Other Standard(s) or Practice(s)
Agriculture (AFNR)	CS.01.02.01.a: Research technologies used in AFNR systems.
Science, Environmental Literacy and Sustainability (NAEE)	9-12 Strand 2.1.A. Earth's physical systems: Learners describe the major processes and systems that form Earth and relate these processes, especially those that are large-scale and long-term to characteristics of Earth. They explain how changes in one system (hydrosphere, atmosphere, geosphere, and biosphere) result in changes to another. They describe how human sustainability depends on Earth systems.



Standard Source	Possible Connections to Other Standard(s) or Practice(s)
<b>PA Core Standards: ELA</b>	<p>CC.3.5.9-12.A: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> <p>CC.3.5.11-12.A: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</p> <p>CC.3.5.9-10.G: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</p> <p>CC.3.5.11-12.G: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p> <p>CC.3.5.9-10.H: Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.</p> <p>CC.3.5.11-12.H: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</p> <p>CC.3.6.9-10.G: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.</p> <p>CC.3.6.11-12.G: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.</p>
<b>PA Core Standards and Practices: Math</b>	<p>CC.2.4.HS.B.2: Summarize, represent, and interpret data on two categorical and quantitative variables.</p> <p>CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical experiments.</p> <p>CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.</p>
<b>PA Standards: Social Studies</b>	N/A
<b>Educational Technology (ISTE)</b>	1.3. Knowledge Constructor: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
<b>Technology and Engineering (ITEEA)</b>	STEL-1Q: Conduct research to inform intentional inventions and innovations that address specific needs and wants.