



Grades 9–12

3.2.9-12.U Physical Science: Waves and Electromagnetic Radiation

Students who demonstrate understanding can evaluate questions about the advantages of using digital transmission and storage of information.

Clarifying Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.

Assessment Boundary: N/A

Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
<p>Asking Questions and Defining Problems</p> <p>Asking questions and defining problems in 9–12 builds from K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.</p> <ul style="list-style-type: none"> Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design. 	<p>PS4.A: Wave Properties</p> <ul style="list-style-type: none"> 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. 	<p>Stability and Change</p> <ul style="list-style-type: none"> Systems can be designed for greater or lesser stability. <hr/> <p><i>Connections to Engineering, Technology, and Applications of Science</i></p> <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.

Pennsylvania Context: Examples of Pennsylvania context include but are not limited to geographic features in Pennsylvania that limit the transmission of electromagnetic waves across the state.

PA Career Ready Skills: Situate self in any social context as a means to determine a response.

Connections to Other Standards Content and Practices

Standard Source	Possible Connections to Other Standard(s) or Practice(s)
Agriculture (AFNR)	CS.01.02.02.b: Analyze how technology is used in AFNR systems to maximize productivity.
Science, Environmental Literacy and Sustainability (NAEE)	9-12 Strand 3.1.A. Identifying and investigating issues: Learners apply their research and analytical skills to systematically investigate environmental issues ranging from local issues to those that are regional or global in scope.



Standard Source	Possible Connections to Other Standard(s) or Practice(s)
PA Core Standards: ELA	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. 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. 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. 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.
PA Core Standards and Practices: Math	N/A
PA Standards: Social Studies	6.1.9.D: Explain how incentives cause people to change their behavior in predictable ways. 6.1.12.C: Analyze the opportunity cost of decisions made by individuals, businesses, communities, and nations.
Educational Technology (ISTE)	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.
Technology and Engineering (ITEEA)	STEL-4T: Evaluate how technologies alter human health and capabilities.