

LESSON FOURTEEN

What is the relationship between light, energy,
and the electromagnetic spectrum?

SCIENCE

Constructing Explanations, Engaging in Argument, and
Obtaining, Evaluating, and Communicating Information

ENGLISH LANGUAGE ARTS

Reading Informational Text, Writing an Explanation

GRADE 8

90
minutes



PURPOSE

In this lesson, students continue to explore properties of light. Students refine their knowledge by understanding that energy is transported in electromagnetic waves. Students read an online text to gather information and write a summary. At the end of the lesson, students are expected to use their previous knowledge and what they learned in today's lesson to write an explanation of the relationship between light, energy, and the electromagnetic spectrum.



STANDARDS

● Common Core State Standards

- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. CCSS.ELA-LITERACY.RST.6-8.2
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. CCSS.ELA-LITERACY.WHST.6-8.2.B
- Use precise language and domain-specific vocabulary to inform about or explain the topic. CCSS.ELA-LITERACY.WHST.6-8.2.D



STANDARDS CONTINUED

● Common Core State Standards

- Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. CCSS.ELA-LITERACY.WHST.6-8.8
- Draw evidence from informational texts to support analysis, reflection, and research. CCSS.ELA-LITERACY.WHST.6-8.9

● Next Generation Science Standards

- Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. MS-PS-1-4
- Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. MS-PS-1-5
- Chemical Reactions. PS1.B
Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of reactants.
The total number of each type of atom is conserved, and thus the mass does not change.
- Wave Properties. PS4.A
A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.

● Science and Engineering Practices

- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information



LEARNING GOALS

- Understand that wavelength and frequency help explain energy.
- Understand electromagnetic waves exist along a spectrum and transport energy.



SUCCESS CRITERIA

- 1 Describe electromagnetic waves.
- 2 Construct an accurate explanation of the relationship between light, wave energy, and the electromagnetic spectrum.
- 3 Identify main ideas and supporting facts and details.
- 4 Reference appropriate and relevant evidence from text(s) to support explanation.



SUMMARY OF LESSON TASKS

- 1 Discuss and report initial thinking.
- 2 Read: [Tour of the Electromagnetic Spectrum](#).
- 3 Write a summary.
- 4 Conduct investigation.
- 5 Write an explanation.



CULMINATING TASK

Write a one to two-paragraph explanation in response to the question, “What is the relationship between light, energy, and the electromagnetic spectrum?” Include information that describes light as electromagnetic waves that make up the electromagnetic spectrum, relate color to the visible light spectrum, and explain the anatomy of a wave. Support your explanation with evidence from the texts, discussions, and other relevant sources. Cite your sources.

PART I: INTRODUCTION

INTRODUCE THE TOPIC Tell students to think about what they have learned about light and energy in previous lessons. Ask students to consider the question, “What is the relationship between light, energy, and the electromagnetic spectrum?”

DISCUSS AND REPORT INITIAL THINKING Students participate in small group discussions to formulate initial conjectures. After several minutes of discussion, direct students to write short responses to the opening question in their Science Notebooks. Students use their notes to participate in a short whole class discussion around the question, “What is the relationship between light, energy, and the electromagnetic spectrum?” Chart student responses.

PART II: GUIDED PRACTICE



SUCCESS CRITERION

EVIDENCE-GATHERING OPPORTUNITY

- Identify main ideas and supporting facts and details.
- Reference appropriate and relevant evidence from text(s).

As students complete their Triple Entry Journals, check that they are recording the main ideas, corresponding supporting facts and details, and are able to describe their reasoning for linking these together.



If you encounter students that are having difficulty with reasoning, a description of why specific facts or details support a corresponding main idea, then stop and model this process for students. You might want to prepare a few examples of reasoning, clearly linking main ideas with particular supporting facts and details, to show students what reasoning looks like.

WRITE A SUMMARY Write a one-paragraph summary of the texts in preparation for writing an explanation. Students use this summary as an opportunity to help them include relevant and appropriate evidence from the text.



- Identify main ideas and supporting details.
- Reference appropriate and relevant evidence from multiple texts.

Check that summaries demonstrate understanding of all three sections of the text.



ANTICIPATED RESPONSE PEDAGOGICAL ACTION

If you notice students are including extraneous details, support them by bringing the class together to first discuss and list the main ideas in the text. Model for students how they might distill the ideas in the text and cluster them together to write a concrete paragraph. Discuss the ideas with students and then write a sentence or two that reflects the synthesis. Supporting questions to engage students in this process include:

- What is the main idea in this section of the text?
- What ideas seem to relate to each other?
- How can we combine these ideas in a sentence?

based simulator to interact with waves. Introduce the investigation activity: [Phet Wave on a String](https://phet.colorado.edu/en/simulation/wave-on-a-string) (<https://phet.colorado.edu/en/simulation/wave-on-a-string>). Students work independently or in pairs, largely depending on the number of available laptops and on your knowledge of students. Give students time to explore and become familiar with the wave simulator. Students use the simulator to explore how amplitude and frequency affect waves. Students record their observations in their Science Notebooks. Students require access to a laptop/tablet that has the computer simulator installed or is capable of running it online. If no laptop or tablet is available, use an alternative investigation activity that makes use of manipulatives. This will require more time for preparation of materials and accompanying student support materials.



SUCCESS CRITERION

EVIDENCE-GATHERING OPPORTUNITY

- Describe electromagnetic waves.

As students use the simulator to explore waves, check-in with individual students or pairs and review the observations they have recorded in their Science Notebooks. Check that students are using appropriate content vocabulary to describe the waves in the simulator, including frequency and amplitude.



If you notice students have trouble using the simulator or making connections between amplitude, frequency, and wavelength, refer students to the texts they have read in today's lesson and in previous lessons.

PART III: CULMINATING TASK

What is the relationship between light, energy,
and the electromagnetic spectrum?

Additional criteria include:

- accurate description of the relationship between light, energy, and the electromagnetic spectrum
- description of light as electromagnetic waves
- explanation of the visible light spectrum
- description of the anatomy of a wave, including frequency and wavelength
- appropriate use of key content vocabulary
- references relevant and appropriate evidence to support explanation



Background

- [American Chemistry Society Teacher E-Resources](https://www.acs.org/content/acs/en/education/outreach/ncw/educational-resources/2015.html#fireworks) -
<https://www.acs.org/content/acs/en/education/outreach/ncw/educational-resources/2015.html#fireworks>

What is the relationship between light, energy,
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TRIPLE ENTRY JOURNAL

Main Ideas	Supporting Facts and Details	Reasoning linking my main idea and supporting facts/details

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