

What Is a Wave? Lesson 4

Electric Avenue

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Grade Level	9th Grade	**Time Frame**	90 minutes
Subject	Science	**Duration**	1-2 class period(s)
Course	Physical Science		

Essential Question

What are waves? How do waves behave differently from particles?

Summary

In this fourth lesson of the "What Is a Wave?" unit, students will learn how electromagnetic radiation is related to common items, understand how electromagnetic radiation is a form of energy, and create electromagnetic spectrum charts.

Snapshot

Engage

Students construct images and summarize how those images relate to waves.

Explore

Students infer how common items are related to electromagnetic radiation.

Explain

Students compile Cornell Notes related to the electromagnetic spectrum.

Extend

Students create electromagnetic spectrum charts.

Evaluate

Students' electromagnetic spectrum charts serve as the evaluation.

Standards

Oklahoma Academic Standards (Physical Science)

PS.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.
PS.PS4.4.1: When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat).
PS.PS4.4.2: Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells.
PS.PS4.4.3: Photoelectric materials emit electrons when they absorb light of high enough frequency.

Attachments

- Cornell Notes—Electric Avenue - Spanish.docx
- Cornell Notes—Electric Avenue - Spanish.pdf
- Cornell Notes—Electric Avenue.docx
- Cornell Notes—Electric Avenue.pdf
- EM Spectrum Chart Rubric—Electric Avenue - Spanish.docx
- EM Spectrum Chart Rubric—Electric Avenue - Spanish.pdf
- EM Spectrum Chart Rubric—Electric Avenue.docx
- EM Spectrum Chart Rubric—Electric Avenue.pdf
- Lesson-Slides-Electric-Avenue.pptx
- Painting a Picture Chart—Electric Avenue - Spanish.docx
- Painting a Picture Chart—Electric Avenue - Spanish.pdf
- Painting a Picture Chart—Electric Avenue.docx
- Painting a Picture Chart—Electric Avenue.pdf
- Painting a Picture Images—Electric Avenue - Spanish.docx
- Painting a Picture Images—Electric Avenue - Spanish.pdf
- Painting a Picture Images—Electric Avenue.docx
- Painting a Picture Images—Electric Avenue.pdf
- Puzzled Photos—Electric Avenue - Spanish.docx
- Puzzled Photos—Electric Avenue - Spanish.pdf
- Puzzled Photos—Electric Avenue.docx
- Puzzled Photos—Electric Avenue.pdf

Materials

- Lesson Slides (attached)
- Puzzled Photos (attached, one set)
- Painting a Picture Images (attached, one set)
- Painting a Picture Chart (attached, one per student)
- Cornell Notes handout (attached, one per student)
- EM Spectrum Chart Rubric (attached, one per student)
- Copy paper
- Markers or colored pencils

20 minutes

Engage

Teacher's Note: Lesson Prep

Print the attached **Puzzled Images** handout and cut each image into several pieces so that you have enough pieces for each student in your class to have one. Consider laminating the pieces and storing in plastic bags to reuse.

Print the attached **Painting a Picture Images** packet before class and hang the images around the classroom.

Use the attached **Lesson Slides** to guide the lesson. You can review the essential questions and lesson objectives with students on **slides 3 and 4** before beginning the lesson.

Begin by showing **slide 5** and introducing students to the Puzzled strategy. Give each student a random piece from the **Puzzled Photos**. Tell students to move around the room to locate the other pieces of their image, assemble the pieces to complete the image, and stay together as a group. When students believe they have correctly assembled the pieces to form an image, check to make sure it is correct.

Ask students to discuss with their groups how their image relates to the Waves unit content that they have been learning about. After the discussion, show the complete puzzled images on **slides 6-10** and ask each group to share what their image represents and how it relates to waves.

20 minutes

Explore

Pass out copies of the **Painting a Picture Chart**. Show **slide 11** and introduce students to the Painting a Picture strategy. As students view each image posted in the classroom, they should record their observations about each image in the first column of the chart and how each image relates to electromagnetic radiation in the second column of the chart.

After giving students time to view and record their observations for each image, show **slides 12-16** and provide frequency and wavelength range information to students. Have students add this information to the third column of their charts. Use this time to allow students to share their observations and inferences and correct any misconceptions they may have.

Show **slide 17** and play the "Electromagnetic Spectrum" video.

Embedded video

https://youtube.com/watch?v=cfXzwh3KadE

Teacher's Note: Lesson Pacing

Consider stopping at this point until the next class period.

30 minutes

Explain

Instruct your students to think about how heat-sensing snakes relate to the electromagnetic spectrum as they watch the "Heat Sensing Pit Vipers" video on **slide 18.**

Embedded video
https://youtube.com/watch?v=lySW2-eYilg

Ask for volunteers to share their thoughts after the video.

Pass out copies of the **Cornell Notes** handout or have your students set up a page in their science notebook, share the instructional strategy Cornell Notes System, and use **slides 19-24** to explain the electromagnetic spectrum. Show **slide 25** and ask students to write a summary at the bottom of their note sheet.

Move to **slide 26** and ask students to compare their summaries with a student nearby. Then, ask for volunteers to share their summaries.

30 minutes

Extend

Show **slide 27** and provide each student with a piece of copy paper and markers or colored pencils. Tell students to create an electromagnetic spectrum chart that includes the information listed. Pass out copies of the **EM Spectrum Chart Rubric** and tell students that you will use the rubric to assess their understanding of the lesson.

Evaluate

The Electromagnetic Spectrum chart serves as the evaluation activity for this lesson.

Resources

- BBC Studios. (2008, November 24). Heat sensing pit vipers - deadly vipers - BBC animals [Video]. YouTube. https://www.youtube.com/watch?v=lySW2-eYilg
- Best0fScience. (2010, August 1). The electromagnetic spectrum [Video]. YouTube. https://www.youtube.com/watch?v=cfXzwh3KadE
- Kamenícek, J. (2014, March 31). London Millennium Bridge from Saint Paul's [Image]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:London_Millennium_Bridge_from_Saint_Paul%27s.jpg
- K20 Center. (n.d.). Cornell notes system. Strategies. https://learn.k20center.ou.edu/strategy/56
- K20 Center. (n.d.). Puzzled. Strategies. https://learn.k20center.ou.edu/strategy/63
- K20 Center. (n.d.). Painting a picture. Strategies. https://learn.k20center.ou.edu/strategy/1331