



High Energy Groove Energy, Frequency, and Wavelength

Level: Middle School

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National Science Education Standards:

(<http://www.nap.edu/readingroom/books/nses/html/index.html>)

Physical Science: Transfer of Energy

-The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

Science and Technology: Understandings about Science and Technology

- Science and technology are reciprocal. Science helps drive technology, as it addresses questions that demand more sophisticated instruments and provides principles for better instrumentation and technique. Technology is essential to science, because it provides instruments and techniques that enable observations of objects and phenomena that are otherwise unobservable due to factors such as quantity, distance, location, size, and speed. Technology also provides tools for investigations, inquiry, and analysis.

Science in Personal and Social Perspectives: Science and Technology in Society

- Technology influences society through its products and processes. Technology influences the quality of life and the ways people act and interact. Technological changes are often accompanied by social, political, and economic changes that can be beneficial or detrimental to individuals and to society. Social needs, attitudes, and values influence the direction of technological development.

Enduring Understanding: Waves in the electromagnetic spectrum vary in size from very long radio waves the size of buildings, to very short gamma-rays smaller than the size of the nucleus of an atom. There is a simple relationship between the frequency, wavelength and energy of an electromagnetic wave.

Essential question: What are the relationships observed between wave properties?

Objective: Students will observe the relationship between energy, frequency and wavelength within the electromagnetic spectrum.

Materials: Puzzle board

Puzzle pieces (You will need to cut the puzzle out the puzzle pieces ahead of time.)

Follow up questions

**You may want to laminate the puzzle board and pieces to ensure longevity.

Warm-up: Place a small rope or a small tub of water with a stirring device on each table. Instruct students to explore with their materials to see what kind of waves they can produce.

Discuss their findings.

Activity:

Electromagnetic Puzzle

--Pair up students to work on the puzzle.

--Allow 10-15 minutes to complete the puzzle

--Once the students have completed the puzzle they should complete the activity sheet to ensure they have constructed the puzzle correctly.

Review:

Review the activity sheet with the class. Discuss the structure of the spectrum. Low energy, low frequency, and long wavelengths and located at one end of the spectrum progress to high energy, high frequency, and short wavelengths on the other end of the spectrum.



Name _____ Date _____

The Electromagnetic Puzzle Activity Sheet

Directions: Use the completed puzzle to fill in the blanks with the following words: high, low, short, long.

1. You are heating leftovers in the microwave. The microwave possesses a _____ frequency in comparison to a gamma ray frequency.
2. You are listening to your favorite radio station. The radio wave contains a _____ amount of energy in comparison to the energy contained by infrared light.
3. You are observing the stars through x-ray technology. The x-rays possess a _____ wavelength in comparison to visible light waves.
4. There is no crayon with the color "ultraviolet" because this part of the electromagnetic spectrum has a frequency that is too _____ to be seen by the human eye.
5. It is time to watch your favorite television show. The FM waves that carry the picture portion of the broadcast possess a _____ wavelength in comparison to a microwave.
6. Infrared light allows us to see the dust between the stars. The infrared light contains a _____ amount of energy in comparison to the energy contained by ultraviolet rays.
7. You can feel the ultraviolet rays from the mid-day sun. The ultraviolet rays possess a _____ wavelength in comparison to gamma ray waves.
8. You are observing the sky through gamma ray technology. The gamma rays contain a _____ amount of energy in comparison to the energy contained by infrared rays.
9. The doctor is taking a x-ray of your injured hand. The x-ray possesses a _____ frequency in comparison to gamma ray frequencies.
10. Though imaging, Mars appears to be a red planet. The visible spectrum, which allows you to see color, possesses a _____ wavelength in comparison to x-ray frequencies.