

Waves Beyond Sight

Read how electromagnetic waves behave and serve different purposes.

PS.7 "The student will investigate and understand that electromagnetic radiation has characteristics. Key ideas include electromagnetic radiation, including visible light, has wave characteristics and behavior..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each statement that explains a wave characteristic or behavior, then circle each electromagnetic spectrum region and number the use named for it.

Energy Across the Spectrum

- ① Electromagnetic radiation is energy that travels as linked electric and magnetic fields. Unlike sound, these waves can move through empty space, so sunlight can cross the space between the Sun and Earth. Every electromagnetic wave has a wavelength, the distance between matching points on successive waves, and a frequency, the number of waves passing a point each second. In a vacuum, all electromagnetic waves travel at the same speed. A shorter wavelength means a higher frequency, and higher-frequency waves carry more energy.
- ② The electromagnetic spectrum arranges electromagnetic radiation from long wavelengths to short wavelengths. Radio waves have the longest wavelengths and low frequencies. They can carry broadcast and communication signals. Microwaves have shorter wavelengths than radio waves and are used in radar and some wireless communication. Infrared radiation is often detected as heat from warm objects. Visible light lets eyes and cameras detect colors. A wave can be reflected by a shiny surface, absorbed by a dark surface, transmitted through clear glass, or refracted when it enters a different material.
- ③ Beyond visible light, ultraviolet radiation has more energy and a shorter wavelength than visible light. It can cause sunburn, although controlled ultraviolet light can disinfect some surfaces. X-rays have still shorter wavelengths and can pass through soft body tissue, which helps doctors make images of bones. Gamma rays have the shortest wavelengths and highest frequencies. They are used in some cancer treatments and to sterilize medical equipment. Because ultraviolet, X-rays, and gamma rays can damage living cells, workers limit exposure with time, distance, shielding, and careful procedures.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 What are wavelength and frequency? How are they related?

2 Why can sunlight travel from the Sun to Earth, while sound cannot travel through empty space?

3 Name one wave behavior described in the passage and give the material or surface involved.

4 How do X-rays differ from ultraviolet radiation in wavelength, and what is one use of X-rays?

3 YOUR TURN _____ Your own words

Choose a real situation that is not described in the passage. Write exactly two sentences: in the first, name an electromagnetic spectrum region and explain a characteristic or behavior that makes it useful; in the second, state a benefit or a safety step.

PART 1 • READ AND MARK

Underline each statement that explains a wave characteristic or behavior, then circle each electromagnetic spectrum region and number the use named for it. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What are wavelength and frequency? How are they related?	Wavelength is the distance between matching points on successive waves. Frequency is the number of waves passing a point each second. A shorter wavelength means a higher frequency.
2	Why can sunlight travel from the Sun to Earth, while sound cannot travel through empty space?	Sunlight is electromagnetic radiation, which can move through empty space. Sound needs matter to travel through.
3	Name one wave behavior described in the passage and give the material or surface involved.	Answers include reflection by a shiny surface, absorption by a dark surface, transmission through clear glass, or refraction when a wave enters a different material.
4	How do X-rays differ from ultraviolet radiation in wavelength, and what is one use of X-rays?	X-rays have shorter wavelengths than ultraviolet radiation. They are used to make images of bones.

PART 3 • YOUR TURN (SAMPLE ANSWER)

A greenhouse monitor could use infrared radiation to detect which plants are cooler than others, because warm objects give off infrared radiation. The monitor could help a gardener find a plant that needs attention without touching it.

Accept equivalent wording that accurately connects wavelength, frequency, energy, wave behavior, or spectrum region to information in the passage. For the open response, accept any accurate region, characteristic or behavior, and logical benefit or safety step in exactly two sentences.