Wave Feature Detectives

Compare amplitude, frequency, and wavelength in transverse and electromagnetic waves.

8.8.A "compare the characteristics of amplitude, frequency, and wavelength in transverse waves, including the electromagnetic spectrum; and"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB In the passage, underline each sentence about amplitude, circle each sentence about frequency, and number each sentence about wavelength. If a sentence compares more than one feature, make every mark that applies.

Waves on a Rope and in Space

1. At a stadium, fans can make a rope move up and down, creating a transverse wave. The rope's motion is perpendicular to the direction the wave travels. Amplitude is the greatest distance from the resting position to a crest or trough. A larger amplitude means each piece of rope moves farther up or down. Frequency is the number of complete waves that pass a point each second. A higher frequency makes the rope vibrate more times per second.

2. Wavelength is the distance from one crest to the next crest, or from one matching point to the next. On the same rope, waves with longer wavelengths have crests farther apart. Wavelength and frequency are different measurements. If waves travel at the same speed, a higher frequency has a shorter wavelength, while a lower frequency has a longer wavelength. Changing amplitude does not by itself change either the wave's frequency or wavelength when its speed stays constant.

3. Electromagnetic waves, including radio waves, visible light, X-rays, and gamma rays, are transverse waves. They can travel through empty space. In a vacuum, all electromagnetic waves move at the same speed. Therefore, wavelength and frequency are inversely related: radio waves have long wavelengths and low frequencies, while gamma rays have short wavelengths and high frequencies. A light wave can have greater or smaller amplitude without changing its wavelength or frequency. For visible light, greater amplitude produces greater intensity.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does amplitude describe a rope wave differently from frequency?

2. Two waves travel at the same speed. One has a higher frequency. How does its wavelength compare with the other wave's wavelength?

3. Compare radio waves and gamma rays by wavelength and frequency.

4. A visible light wave becomes more intense, but its wavelength and frequency stay the same. What changed?

3 YOUR TURN

Your own words

Write exactly three sentences about two electromagnetic waves traveling through a vacuum. Compare their wavelengths and frequencies, then explain how one wave's amplitude could change without changing its wavelength or frequency.

ANSWER KEY

Wave Feature Detectives

GRADE 8 · TEKS 8.8.A

PART 1 · READ AND MARK

In the passage, underline each sentence about amplitude, circle each sentence about frequency, and number each sentence about wavelength. If a sentence compares more than one feature, make every mark that applies. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does amplitude describe a rope wave differently from frequency?	**Amplitude is the greatest distance from the resting position to a crest or trough. Frequency is the number of complete waves that pass a point each second.**
2	Two waves travel at the same speed. One has a higher frequency. How does its wavelength compare with the other wave's wavelength?	**It has a shorter wavelength.**
3	Compare radio waves and gamma rays by wavelength and frequency.	**Radio waves have long wavelengths and low frequencies. Gamma rays have short wavelengths and high frequencies.**
4	A visible light wave becomes more intense, but its wavelength and frequency stay the same. What changed?	**Its amplitude increased.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Signal A has a long wavelength and a low frequency, while Signal B has a short wavelength and a high frequency. Because both signals travel through a vacuum, their wavelength and frequency change in opposite directions. Signal A could have a larger amplitude, making it more intense without changing its wavelength or frequency.

Accept equivalent descriptions of amplitude, frequency, and wavelength. For electromagnetic waves in a vacuum, students should show that wavelength and frequency are inversely related, while amplitude can change independently of them.