26.9 Interference

When constructive interference occurs with sound waves, the listener hears a louder sound. When destructive interference occurs, the listener hears a fainter sound or no sound at all.

- The crest of a transverse wave corresponds to a compression of a sound wave, and the trough of a transverse wave corresponds to a rarefaction of a sound wave.
- When the crests of one wave overlap the crests of another wave, there is constructive interference and an increase in amplitude. When the crests of one wave overlap the troughs of another wave, there is destructive interference and a decrease in amplitude.
- Destructive sound interference is a useful property in antinoise technology.

Name _____ Class _____ Date _____

26.10 Beats

When two tones of slightly different frequency are sounded together, a regular fluctuation in the loudness of the combined sounds is heard.

- The periodic variation in the loudness of sound is called **beats.**
- Beats can be heard when two slightly mismatched tuning forks are sounded together. When the combined waves reach your ears in step, the sound is a maximum. When the forks are out of step, in the sound is a minimum.
- Beats can occur with any kind of wave and are a practical way to compare frequencies. When wave frequencies are identical, beats disappear.

26.9 Interference (pages 522–523)

42. A _____ of a sound wave corresponds to a crest of a transverse wave.

43. A _____ of a sound wave corresponds to a trough of a transverse wave.

44. When the crests of one wave overlap the crests of another wave, there is _____ interference and an increase in _____.

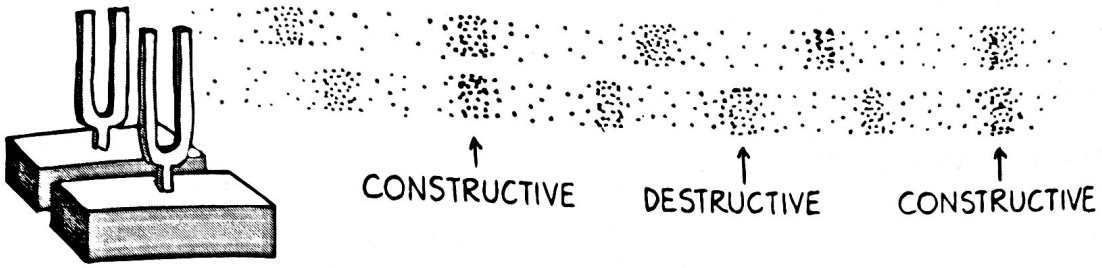
45. When the crests of one wave overlap the troughs of another wave, there is _____ interference and a decrease in _____.

46. Is the following sentence true or false? Constructive sound interference is a useful property in antinoise technology. _____

47. Describe how antinoise technology is used to protect the hearing of jackhammer users.

26.10 Beats (pages 524–525)

Use the figure below to answer Questions 48 and 49.



48. Use the figure to explain how beats are formed.

_____

_____

_____

_____

_____

49. Suppose one tuning fork in the figure vibrates 264 times per second, and the other vibrates 262 times per second.

    a. How often are the forks in step? _____

    b. What is the frequency of beats? _____

50. Is the following sentence true or false? If a piano tuner hears beats, the piano is out of tune. _____

Relating Properties of Sound

A musical note has a frequency of 264 Hz. What is the wavelength of the sound if it moves with a speed of 345 m/s?

1. Read and Understand

What information are you given?

speed of the sound wave = v = 345 m/s

frequency of the sound wave = f = 264 Hz

2. Plan and Solve

What unknown are you trying to calculate?

wavelength = λ

What relationship can you use to find the unknown?

wave speed = wavelength × frequency: $v = \lambda f$

Rearrange the equation to solve for the unknown variable.

$$\lambda = \frac{v}{f}$$

Replace each variable with its known value.

$$\lambda = \frac{345 \text{ m/s}}{264 \text{ Hz}} = 1.3 \text{ m}$$

3. Look Back and Check

Is your answer reasonable?

A speed of 345 m/s indicates that the medium through which the sound is traveling is probably air. A sound with a frequency of 264 Hz is an audible sound. The wavelength of 1.3 m is reasonable for an audible sound traveling through air.

Math Practice

On a separate sheet of paper, solve the following problems.

1. A dolphin emits a sound with a frequency of 1.2×10^5 Hz. What is the wavelength of this sound as it moves through seawater with a speed of 1530 m/s?

2. Sound with a wavelength of 5.8 m moves through a material at a speed of 1508 m/s. What is the frequency of the sound?

3. Sound with a frequency of 468 Hz and a wavelength of 4.7 m moves through a material. What is the speed of the sound?