Short Answer

14.1 Speed of Sound, Frequency, and Wavelength 52.

What component of a longitudinal sound wave is analogous to a trough of a transverse wave?

a. compression
b. rarefaction
c. node
d. antinode

53.

What is the frequency of a sound wave as perceived by the human ear?

a. timbre
b. loudness
c. intensity
d. pitch

54.

What properties of a solid determine the speed of sound traveling through it?

a. mass and density
b. rigidity and density
c. volume and density
d. shape and rigidity

55.

Does the density of a medium affect the speed of sound?

a. No
b. Yes

56.

Does a bat make use of the properties of sound waves to locate its prey?

a. No
b. Yes

57.

Do the properties of a sound wave change when it travels from one medium to another?

a. No
b. Yes

14.2 Sound Intensity and Sound Level 58.

When a passing driver has his stereo turned up, you cannot even hear what the person next to you is saying. Why is this so?

a. The sound from the passing car's stereo has a higher amplitude and hence higher intensity compared to the intensity of the sound coming from the person next to you. The higher intensity corresponds to greater loudness, so the first sound dominates the second.
b. The sound from the passing car's stereo has a higher amplitude and hence lower intensity compared to the intensity of the sound coming from the person next to you. The lower intensity corresponds to greater loudness, so the first sound dominates the second.
c. The sound from the passing car's stereo has a higher frequency and hence higher intensity compared to the intensity of the sound coming from the person next to you. The higher frequency corresponds to greater loudness so the first sound dominates the second.
d. The sound from the passing car's stereo has a lower frequency and hence higher intensity compared to the intensity of the sound coming from the person next to you. The lower frequency corresponds to greater loudness, so the first sound dominates the second.

59.

For a constant area, what is the relationship between intensity of a sound wave and power?

a. The intensity is inversely proportional to the power transmitted by the wave, for a constant area.
b. The intensity is inversely proportional to the square of the power transmitted by the wave, for a constant area. $I=\frac{1}{P^2}$
c. The intensity is directly proportional to the square of the power transmitted by the wave, for a constant area. $I = \text{P}^2$
d. The intensity is directly proportional to the power transmitted by the wave, for a constant area. $I=\frac{P}{A}$

60.

What does I stand for in the equation $\beta (\text{dB}) = 10\,\log_{10}\left(\frac{I}{I_0} \right)$? What is its unit?

a. Yes, I is the sound intensity in watts per meter squared in the equation, $\beta (\text{dB}) = 10\log_{10}\left(\frac{I}{I_0}\right)$.
b. I is the sound illuminance and its SI unit is lumen per meter squared.
c. I is the sound intensity and its SI unit is watts per meter cubed.
d. I is the sound intensity and its SI unit is watts per meter squared.

61.

Why is the reference intensity $I_0 = 10^{-12}\,\text{W}/\text{m}^2$?

a. The upper limit of human hearing is 100 decibels, i.e. \beta = 100\,\text{dB}. For \beta = 100\,\text{dB}, I_0 = 10^{-12}\,\text{W}/\text{m}^2.
b. The lower threshold of human hearing is 10 decibels, i.e. \beta = 10\,\text{dB}. For \beta = 10\,\text{dB}, I_0=10^{-12}\,\text{W}/\text{m}^{2}
c. The upper limit of human hearing is 10 decibels, i.e. \beta = 10\,\text{dB}. For \beta = 10\,\text{dB}, I_0 = 10^{-12}\,\text{W}/\text{m}^2
d. The lower threshold of human hearing is 0 decibels, i.e., \beta = 0\,\text{dB}. For \beta = 0\,\text{dB}, I_0 = 10^{-12}\,\text{W}/\text{m}^{2}

62.

Given that the sound intensity level of a particular wave is 82\,\text{dB}, what will be the sound intensity for that wave?

a. I=1.6\times10^{-6}\,\text{W/m}^2
b. I=82\times10^{-12}\,\text{W/m}^2
c. I=8.2\times10^{-12}\,\text{W/m}^2
d. I=1.6\times10^{-4}\,\text{W/m}^2

63.

For a sound wave with intensity 1.58 \times 10^{-4}\,\text{W}/\text{m}^2, calculate the pressure amplitude given that the sound travels through air at 0^{\circ}\text{C}.

a. 0.734\,\text{Pa}
b. 3.67\,\text{Pa}
c. 0.135\,\text{Pa}
d. 0.367\,\text{Pa}

64.

Which nerve carries auditory information to the brain?

a. buccal nerve
b. peroneal nerve
c. cochlear nerve
d. mandibular nerve

65.

Why do some smaller instruments, such as piccolos, produce higher-pitched sounds than larger instruments, such as tubas?

a. Smaller instruments produce sounds with shorter wavelengths, and thus higher frequencies.
b. Smaller instruments produce longer wavelength, and thus higher amplitude, sounds.
c. Smaller instruments produce lower amplitude, and thus longer wavelength sounds.

d. Smaller instruments produce higher amplitude, and thus lower frequency, sounds.

14.3 Doppler Effect and Sonic Booms 66.

How will your perceived frequency change if you move away from a stationary source of sound?

a. The frequency will become lower.
b. The frequency will be doubled.
c. The frequency will be tripled.
d. The frequency will become higher.

67.

True or false—The Doppler effect also occurs with waves other than sound waves.

a. False
b. True

68.

A source of sound is moving towards you. How will what you hear change if the speed of the source increases?

a. The sound will become more high-pitched.
b. The sound will become more low-pitched.
c. The pitch of the sound will not change.

69.

Do sonic booms continue to be created when an object is traveling at supersonic speeds?

a. No, a sonic boom is created only when the source exceeds the speed of sound.
b. Yes, sonic booms continue to be created when an object is traveling at supersonic speeds.

70.

Suppose you are driving at a speed of 20.0\,\text{m/s} and you hear the sound of a bell at a frequency of 400.0\,\text{Hz}. What is the actual frequency of the bell if the speed of sound is 335\,\text{m/s}?

a. f_s=401\,\text{Hz or}\,f_s=315\,\text{Hz}
b. f_s=385\,\text{Hz or}\,f_s=419\,\text{Hz}
c. f_s = 415\,\text{Hz or}\,f_s = 366\,\text{Hz}
d. f_s=425\,\text{Hz}\; \text{or}\,f_s=377\,\text{Hz}

71.

What is the frequency of a stationary sound source if you hear it at 1200.0 Hz while moving towards it at a speed of 50.0 m/s? (Assume speed of sound to be 331 m/s.)

a. 1410 Hz
b. 1380 Hz
c. 1020 Hz
d. 1042 Hz

14.4 Sound Interference and Resonance 72.

What is the actual frequency of the wave produced as a result of superposition of two waves?

a. It is the average of the frequencies of the two original waves that were superimposed.
b. It is the difference between the frequencies of the two original waves that were superimposed.
c. It is the product of the frequencies of the two original waves that were superimposed.
d. It is the sum of the frequencies of the two original waves that were superimposed.

73.

Can beats be produced through a phenomenon different from resonance? How?

a. No, beats can be produced only by resonance.
b. Yes, beats can be produced by superimposition of any two waves having slightly different frequencies.

74.

How is human speech produced?

a. Human speech is produced by shaping the cavity formed by the throat and mouth, the vibration of vocal cords, and using the tongue to adjust the fundamental frequency and combination of overtones.
b. Human speech is produced by shaping the cavity formed by the throat and mouth into a closed pipe and using tongue to adjust the fundamental frequency and combination of overtones.
c. Human speech is produced only by the vibrations of the tongue.
d. Human speech is produced by elongating the vocal cords.

75.

What is the possible number of nodes and antinodes along one full wavelength of a standing wave?

a. 2 nodes and 3 antinodes or 2 antinodes and 3 nodes.
b. 2 nodes and 2 antinodes or 3 antinodes and 3 nodes.

c. 3 nodes and 3 antinodes or 2 antinodes and 2 nodes.
d. 6 nodes and 4 antinodes or 6 antinodes and 4 nodes.

76.

In a pipe resonator, which frequency will be the least intense of those given below?

a. second overtone frequency
b. first overtone frequency
c. fundamental frequency
d. third overtone frequency

77.

A flute is an open-pipe resonator. If a flute is 60\,\text{cm} long, what is the longest wavelength it can produce?

a. 240\,\text{cm}
b. 180\,\text{cm}
c. 60\,\text{cm}
d. 120\,\text{cm}

78.

What is the frequency of the second overtone of a closed-pipe resonator with a length of 22.0\,\text{cm}? (Assume the speed of sound is 331\,\text{m/s}.)

a. 7520\,\text{Hz}
b. 1510\,\text{Hz}
c. 376\,\text{Hz}
d. 1880\,\text{Hz}

79.

An open-pipe resonator has a fundamental frequency of 220\,\text{Hz} when the speed of sound is 331\,\text{m/s}. What will its fundamental frequency be when the speed of sound is 350\,\text{m/s}?

a. 690\,\text{Hz}
b. 470\,\text{Hz}
c. 110\,\text{Hz}
d. 230\,\text{Hz}