3

Sound Waves Questions

Foundational Knowledge

3.1 Vibration (p. 28)

1. A “back-and-forth” movement of an object around a rest position is called
   A. Vibration
   B. Inertia
   C. Mass
   D. Random motion

2. A mass and a ______ can model a simple mechanical system that can oscillate.
   A. Spring
   B. Balloon
   C. Air molecule
   D. Wheel

3. Another term for “vibration” is
   A. Acceleration
   B. Inertia
   C. Equilibrium
   D. Oscillation

4. "Equilibrium" is the position where a system that can vibrate is
   A. Moving with its greatest acceleration
   B. Changing direction
   C. At rest and not moving
   D. Slowing down

5. What will cause an object to move from a position of equilibrium?
   A. Application of an outside force
   B. Removal of all energy
   C. Reduction of the object's power
   D. Elimination of all forces acting on the object

6. Stretching a spring builds up
   A. Potential energy
   B. Kinetic energy
   C. Both potential and kinetic energy
   D. Frictional energy

7. Releasing a stretched spring will yield
   A. Potential energy
   B. Kinetic energy
   C. Both potential and kinetic energy
   D. Frictional energy

8. The force that causes a stretched spring to recoil back to its equilibrium position is called
   A. Displacement force
   B. Restorative force
   C. Pressure force
   D. Equilibrium force

9. Forces that oppose the movement of an object are known as
   A. Restorative forces
   B. Displacement forces
   C. Frictional forces
   D. Oscillatory forces

10. For a spring, the restorative force is also known as
    A. Elastic force
    B. Inertia
    C. Frictional force
    D. Kinetic energy

3.2 The Nature of Waves (p. 28)

11. A wave is the movement of ______ between two points without moving an object from one point to the other.
    A. Force
    B. Mass
    C. Energy
    D. Pressure

12. The material that transports the energy of a wave is called the
    A. Mass
    B. Equilibrium
    C. Spring
    D. Medium

13. Sound, water waves, and vibration carried through solid structures are known as
    A. Mechanical waves
    B. Vacuum waves
    C. Air waves
    D. Electromagnetic waves

14. A single disturbance in a medium can be described as a ______ wave.
    A. Pulse
    B. Repeating
    C. Equilibrium
    D. Vacuum

15. A vibrating tuning fork produces
    A. A pulse wave
    B. Repeating waves
    C. Equilibrium
    D. Electromagnetic waves

16. As a sound wave travels through the medium of air, areas of ______ are produced.
    A. Compression and rarefaction
    B. Rarefaction and equilibrium
    C. Compression and inertia
    D. Friction and pulses

17. An area of compression in a sound wave is represented by
    A. An increase in the air pressure (density)
    B. A decrease in the air pressure (density)
    C. An increase in the inertia of the air molecules
    D. Maintenance of equilibrium position of the air molecules

18. Sound waves are carried as ______ waves.
    A. Transverse
    B. Longitudinal
    C. Water
    D. Electromagnetic

19. As an object is vibrating, the movement of the object's particles are perpendicular to the direction of movement of the wave energy. This is what type of wave? ______

3.3 Transfer of Energy in Waves (p. 32)

20. A wave in the air
    A. Transmits energy from molecule (or particle) to molecule
    B. Moves each air molecule a long distance, where it then stays
    C. Does not result in movement of air molecules
    D. Only disturbs the air particles that are in direct contact with the object that is vibrating

21. A water wave is what type of wave?
    A. Transverse
    B. Longitudinal
    C. Combination of transverse and longitudinal
    D. Waves do not occur in water

22. True/False Throwing an object is an example of a wave of energy being transported.

3.4 Visualizing a Sound Wave (p. 35)

23. A simple mass-spring system produces
    A. Random motion
    B. Sound
    C. Simple harmonic motion
    D. Simple harmonic circles

24. A waveform is a graphical representation of a change of some phenomenon over
    A. Space
    B. Time
    C. Distance
    D. Area

25. Another term for "simple harmonic motion" is
    A. Uniform circular motion
    B. Waveform motion
    C. Graphical motion
    D. Compression motion

26. The peak (upward curve) of a sound waveform would represent ______, while the valley (downward curve) would represent ______.
    A. Rarefaction; compression
    B. Compression; rarefaction
    C. Pressure; displacement
    D. Equilibrium; displacement

27. The vertical axis of a sound waveform represents the ______ of the sound.
    A. Amplitude of the pressure
    B. Distance moved by each air molecule
    C. Time
    D. Acceleration of each air molecule

28. Mathematically, simple harmonic motion can be described as a ______.

3.5 Properties of Sound Waves (p. 35)

29. How often a wave pattern repeats itself is described as that wave's
    A. Amplitude
    B. Frequency
    C. Time
    D. Movement

30. One "cycle" of vibration is defined as
    A. One complete repetition of the waveform's pattern
    B. The maximum amplitude of the waveform
    C. The total number of repeated waveform patterns produced
    D. The total duration of the sound

31. Frequency is measured as
    A. The amplitude of compression and rarefaction
    B. The total time (duration) of the waveform
    C. The number of complete cycles per second
    D. The amplitude of one complete cycle

32. The unit for measuring the frequency of a waveform is
    A. Watts
    B. Hertz
    C. Cycles per second
    D. Either "hertz" or "cycles per second"

33. The frequency of a waveform is 302 hertz. How many cycles of the waveform will repeat per second?
    A. 1
    B. 151
    C. 302
    D. No way to determine this from the information provided

34. The measurement of the time it takes for one complete cycle of vibration is called the
    A. Frequency
    B. Intensity
    C. Phase
    D. Period

35. If you know the cycle period, the formula for calculating the frequency of a wave is
    A. Frequency = 1 / period
    B. Frequency = 1 × period
    C. Frequency = 2 × period
    D. Cycle period is not related to the frequency of the wave.

36. True/False Another term for "cycle" is "phase."

37. The amount of energy carried by a waveform is determined by the vibrating object's
    A. Frequency of vibrations
    B. Mass
    C. Amplitude of vibrations
    D. Cycle period

38. The intensity of a waveform expresses that waveform's
    A. Power
    B. Frequency
    C. Phase
    D. Duration

39. The unit for measuring the intensity of a sound is
    A. W/m^2
    B. Seconds
    C. Hertz
    D. Degrees

40. The relationship between the amplitude of a sound's pressure wave and the resulting sound energy can be expressed by
    A. The intensity is increased as the square of the amplitude
    B. The intensity equals the amplitude
    C. The intensity is halved as the amplitude is doubled
    D. The intensity is doubled as the amplitude is doubled

41. Halving a sound pressure waveform's amplitude will result in
    A. Halving of that sound's intensity
    B. Doubling of that sound's intensity
    C. Quartering of that sound's intensity
    D. No change to that sound's intensity

42. True/False As sound travels through a medium, the sound's intensity increases with greater distance from the sound source.

43. The relationship between sound energy and distance from the sound source is described as
    A. A reduction in frequency relationship
    B. An inverse square relationship
    C. An amplitude doubling relationship
    D. A hearing threshold relationship

44. The unit for sound intensity is
    A. Hertz (Hz)
    B. Degrees of phase (degrees)
    C. Milliseconds (ms)
    D. Decibel sound pressure level (dB SPL)

45. True/False A sound's intensity is measured as the relative power of one sound as compared to another sound.

46. True/False The decibel scale is a linear counting scale that allows us to express large numbers easily.

47. True/False The decibel scale was named after the inventor of the telephone.

48. The lowest intensity sound that humans can typically hear at 1000 Hz is
    A. 10^{-12} W/m^2
    B. 10 W
    C. 20 hertz
    D. 20,000 hertz

49. A 10 times increase in a sound's intensity would equal
    A. An increase of 10 dB
    B. An increase of 100 dB
    C. A decrease of 10 dB
    D. No change to the dB of the sound

50. Wavelength is defined as
    A. The distance a single cycle of a wave travels through a medium such as air
    B. The amount of distance between a waveform's peak and valley, also called "amplitude"
    C. How far away you can hear a sound
    D. The change in a sound's intensity with distance

51. The unit for wavelength is
    A. Hertz
    B. Decibels
    C. Milliseconds
    D. Distance/cycle

52. True/False A sound's wavelength is dependent on the velocity of the sound wave as it travels through a medium.

53. True/False The relationship between wavelength and frequency is inverse such that an increase in wavelength would result in a decrease in frequency.

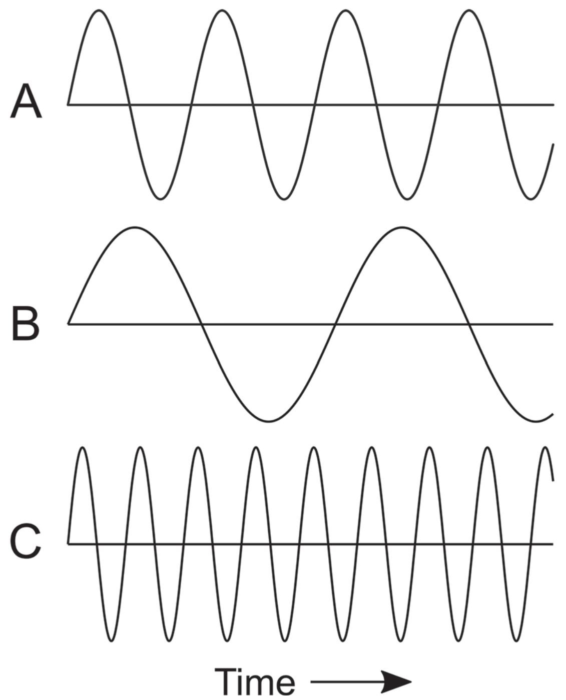

Figure 3–1

54. Which of the waveforms in Figure 3–1 will have the longest wavelength as they travel through the air?
    A. A
    B. B
    C. C
    D. All of the waveforms will have the same wavelength.

55. Which of the waveforms in Figure 3–1 has the highest frequency?
    A. A
    B. B
    C. C
    D. All of the waveforms have the same frequency.

56. The speed of sound through the air is dependent on what properties?
    A. Sound wave frequency
    B. Air pressure and temperature
    C. Sound wave amplitude
    D. Sound wave wavelength

57. The speed of sound in the air at room temperature and at sea level is
    A. 340 meters/second
    B. 110 dB
    C. 20 meters
    D. 20,000 hertz

58. True/False Sound speed is highest in the air and slowest through liquids.

59. True/False Sound speed is the same as sound wave frequency.

3.6 The Perception of Sound Waves (p. 46)

60. Match the term on the left with the descriptor on the right. Descriptors may be used more than once or not at all.

_____Fundamental frequency	1. Perceptual
_____Loudness	2. Acoustic or physiologic
_____Intensity	3. Both perceptual and acoustic/physiologic
_____Pitch	
_____Difference limen	

61. The psychoacoustic phenomena of loudness can be measured using the
    A. Bark scale
    B. Phon or sone scales
    C. Bark or semitone scales
    D. Phon, sone, or Bark scales

62. The difference limen is usually
    A. 1 dB
    B. 2 dB
    C. 5 dB
    D. 0 dB

63. If a sound is 60 phons, then
    A. It is as loud as a 60-Hz pure tone produced at 60 dB.
    B. The sound is 60 times as loud as a 1000-Hz pure tone produced at 100 Hz.
    C. It is as loud as a 1000-Hz pure tone produced at 60 dB.
    D. Its loudness level depends upon the frequency of the pure tone.

64. Audiometric zero is
    A. The point at which the 10-phon line intercepts the 1000-Hz line at 10 dB
    B. The average minimum audibility curve for adults under 65 years of age
    C. The normal binaural minimum audible field for adults 18 to 25 years of age
    D. The sound pressure level in decibels for a given frequency

65. For the average adult with normal hearing, perception of the difference in frequencies between 120 Hz and 220 Hz
    A. Is easier than the perception of the frequency difference between 1000 and 1100 Hz
    B. Is harder than the perception of the frequency difference between 1000 and 1100 Hz
    C. Is equal in difficulty to the perception of the frequency difference between 1000 and 1100 Hz
    D. Is not possible without amplification

66. The semitone scale
    A. Is a psychoacoustic scale representing linear differences between frequencies
    B. Reflects human's linear perception of pitch
    C. Consists of 24 tones separated from each other by one semitone interval
    D. Consists of 12 tones separated from each other by one semitone interval

67. The formula used to determine the semitone difference between two frequencies is
    A. $39.86 \times \log_{10}$(lower frequency / higher frequency)
    B. $39.86 \times \log_{10}$(higher frequency / lower frequency)
    C. $39.86[\log_{10}$(lower frequency / higher frequency)]
    D. $39.86[\log_{10}$(higher frequency / lower frequency)]

68. The Bark scale is a nonlinear transformation such that
    A. Equal distances on the Bark scale correspond to equal distances in pitch
    B. Equal distances on the Bark scale correspond to semitone distances in pitch
    C. As the Bark scale proceeds from low to high frequency, the distances between the scale units increase to match the human nonlinear perception of pitch
    D. As the Bark scale proceeds from low to high frequency, the distances between the scale units decrease to match the human nonlinear perception of pitch