Concept Items

14.1 Speed of Sound, Frequency, and Wavelength 1.

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

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

2.

The compressibility of air and hydrogen is almost the same. Which factor is the reason that sound travels faster in hydrogen than in air?

a. Hydrogen is more dense than air.
b. Hydrogen is less dense than air.
c. Hydrogen atoms are heavier than air molecules.
d. Hydrogen atoms are lighter than air molecules.

14.2 Sound Intensity and Sound Level 3.

What is the mathematical relationship between intensity, power, and area?

a. $I = \frac{P}{A^2}$
b. $I = PA$
c. $I = \frac{A}{P}$
d. $I = \frac{P}{A}$

4.

How does the "decibel" get its name?

a. The meaning of deci is "hundred" and the number of decibels is one-hundredth of the logarithm to base 10 of the ratio of two sound intensities.
b. The meaning of deci is "ten" and the number of decibels is one-tenth of the logarithm to base 10 of the ratio of two sound intensities.
c. The meaning of deci is "one-hundredth" and the number of decibels is hundred times the logarithm to base 10 of the ratio of two sound intensities.
d. The meaning of deci is "one-tenth" and the number of decibels is ten times the logarithm to base 10 of the ratio of two sound intensities.

5.

What is "timbre" of sound?

a. Timbre is the quality of the sound that distinguishes it from other sound
b. Timbre is the loudness of the sound that distinguishes it from other sound.
c. Timbre is the pitch of the sound that distinguishes it from other sound.
d. Timbre is the wavelength of the sound that distinguishes it from other sound.

14.3 Doppler Effect and Sonic Booms 6.

Two sources of sound producing the same frequency are moving towards you at different speeds. Which one would sound more high-pitched?

a. the one moving slower
b. the one moving faster

7.

When the speed of the source matches the speed of sound, what happens to the amplitude of the sound wave? Why?

a. It approaches zero. This is because all wave crests are superimposed on one another through constructive interference.
b. It approaches infinity. This is because all wave crests are superimposed on one another through constructive interference.
c. It approaches zero, because all wave crests are superimposed on one another through destructive interference.
d. It approaches infinity, because all wave crests are superimposed on one another through destructive interference.

8.

What is the mathematical expression for the frequency perceived by the observer in the case of a stationary observer and a moving source?

a. f_{obs}=f_s\left(\frac{v_w}{v_s\,\pm\,v_w}\right)
b. f_{obs}=f_s\left(\frac{v_w\,\pm\,v_s}{v_w}\right)
c. f_{obs}=f_s\left(\frac{v_s\,\pm\,v_w}{v_w}\right)
d. f_{obs}=f_s\left(\frac{v_w}{v_w\,\pm\,v_s}\right)

14.4 Sound Interference and Resonance 9.

When does a yo-yo travel the farthest from the finger?

a. when the amplitude of the finger moving up and down is greater than the amplitude of the yo-yo
b. when the amplitude of the finger moving up and down is less than the amplitude of the yo-yo
c. when the frequency of the finger moving up and down is equal to the resonant frequency of the yo-yo
d. when the frequency of the finger moving up and down is different from the resonant frequency of the yo-yo

10.

What is the difference between harmonics and overtones?

a. Harmonics are all multiples of the fundamental frequency. The first overtone is actually the first harmonic.

b. Harmonics are all multiples of the fundamental frequency. The first overtone is actually the second harmonic.
c. Harmonics are all multiples of the fundamental frequency. The second overtone is actually the first harmonic.
d. Harmonics are all multiples of the fundamental frequency. The third overtone is actually the second harmonic.

11.

What kind of waves form in pipe resonators?

a. damped waves
b. propagating waves
c. high-frequency waves
d. standing waves

12.

What is the natural frequency of a system?

a. The natural frequency is the frequency at which a system oscillates when it undergoes forced vibration.
b. The natural frequency is the frequency at which a system oscillates when it undergoes damped oscillation.
c. The natural frequency is the frequency at which a system oscillates when it undergoes free vibration without a driving force or damping.
d. The natural frequency is the frequency at which a system oscillates when it undergoes forced vibration with damping.