Critical Thinking Items

14.1 Speed of Sound, Frequency, and Wavelength 13.

What can be said about the frequency of a monotonous sound?

a. It decreases with time.
b. It decreases with distance.
c. It increases with distance.
d. It remains constant.

14.

A scientist notices that a sound travels faster through a solid material than through the air. Which of the following can explain this?

a. Solid materials are denser than air.
b. Solid materials are less dense than air.
c. A solid is more rigid than air.
d. A solid is easier to compress than air.

14.2 Sound Intensity and Sound Level 15.

Which property of the wave is related to its intensity? How?

a. The frequency of the wave is related to the intensity of the sound. The larger-frequency oscillations indicate greater pressure maxima and minima, and the pressure is higher in greater-intensity sound.
b. The wavelength of the wave is related to the intensity of the sound. The longer-wavelength oscillations indicate greater pressure maxima and minima, and the pressure is higher in greater-intensity sound.
c. The amplitude of the wave is related to the intensity of the sound. The larger-amplitude oscillations indicate greater pressure maxima and minima, and the pressure is higher in greater-intensity sound.
d. The speed of the wave is related to the intensity of the sound. The higher-speed oscillations indicate greater pressure maxima and minima, and the pressure is higher in greater-intensity sound.

16.

Why is decibel (dB) used to describe loudness of sound?

a. Because, human ears have an inverse response to the amplitude of sound.
b. Because, human ears have an inverse response to the intensity of sound.
c. Because, the way our ears perceive sound can be more accurately described by the amplitude of a sound rather than the intensity of a sound directly.
d. Because, the way our ears perceive sound can be more accurately described by the logarithm of the intensity of a sound rather than the intensity of a sound directly.

17.

How can humming while shooting a gun reduce ear damage?

a. Humming can trigger those two muscles in the outer ear that react to intense sound produced while shooting and reduce the force transmitted to the cochlea.
b. Humming can trigger those three muscles in the outer ear that react to intense sound produced while shooting and reduce the force transmitted to the cochlea.
c. Humming can trigger those two muscles in the middle ear that react to intense sound produced while shooting and reduce the force transmitted to the cochlea.
d. Humming can trigger those three muscles in the middle ear that react to intense sound produced while shooting and reduce the force transmitted to the cochlea.

18.

A particular sound, S1, has an intensity 3 times that of another sound, S2. What is the difference in sound intensity levels measured in decibels?

a. 9.54\,\text{dB}
b. 6.02\,\text{dB}
c. 3.01\,\text{dB}
d. 4.77\,\text{dB}

14.3 Doppler Effect and Sonic Booms 19.

When the source of sound is moving through the air, does the speed of sound change with respect to a stationary person standing nearby?

a. Yes
b. No

20.

Why is no sound heard by the observer when an object approaches him at a speed faster than that of sound?

a. If the source exceeds the speed of sound, then destructive interference occurs and no sound is heard by the observer when an object approaches him.
b. If the source exceeds the speed of sound, the frequency of sound produced is beyond the audible range of sound.
c. If the source exceeds the speed of sound, all the sound waves produced approach minimum intensity and no sound is heard by the observer when an object approaches him.
d. If the source exceeds the speed of sound, all the sound waves produced are behind the source. Hence, the observer hears the sound only after the source has passed.

21.

Does the Doppler effect occur when the source and observer are both moving towards each other? If so, how would this affect the perceived frequency?

a. Yes, the perceived frequency will be even lower in this case than if only one of the two were moving.
b. No, the Doppler effect occurs only when an observer is moving towards a source.
c. No, the Doppler effect occurs only when a source is moving towards an observer.
d. Yes, the perceived frequency will be even higher in this case than if only one of the two were moving.

14.4 Sound Interference and Resonance 22.

When does the amplitude of an oscillating system become maximum?

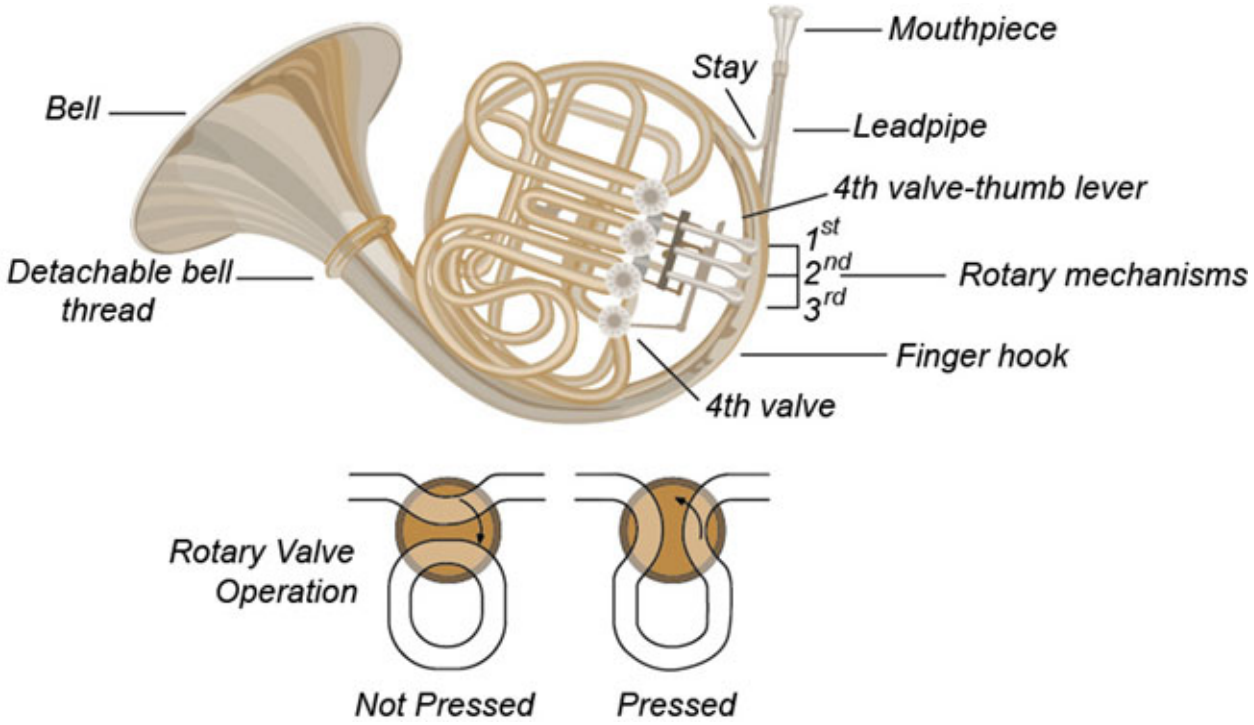
a. When two sound waves interfere destructively.
b. When the driving force produces a transverse wave in the system.
c. When the driving force of the oscillator to the oscillating system is at a maximum amplitude.
d. When the frequency of the oscillator equals the natural frequency of the oscillating system.

23.

How can a standing wave be formed with the help of a tuning fork and a closed-end tube of appropriate length?

a. If the tube is just the right length, the reflected sound arrives back at the tuning fork exactly half a cycle later, and it interferes constructively with the continuing sound produced by the tuning fork.
b. If the tube is just the right length, the reflected sound arrives back at the tuning fork exactly half a cycle later, and it interferes destructively with the continuing sound produced by the tuning fork.
c. If the tube is just the right length, the reflected sound arrives back at the tuning fork exactly one full cycle later, and it interferes constructively with the continuing sound produced by the tuning fork.
d. If the tube is just the right length, the reflected sound arrives back at the tuning fork exactly one full cycle later, and it interferes destructively with the continuing sound produced by the tuning fork.

24.



Brass instruments like the horn have rotary valves. See the first image to see where these valves are on a horn and the second image to see how they function when pressed.

Make a claim about the effect of these valves.

a. They increase the frequency of the sound by making the tube longer.
b. They increase the frequency of the sound by making the tube shorter.
c. They increase the amplitude of the sound by causing it to remain in the tube for a longer period of time.
d. They decrease the amplitude of the sound by causing it to remain in the tube for a longer period of time.