

Cp physics - Webreview : Sound

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- _____ 1. Which of the following is the region of a sound wave in which the density and pressure are greater than normal?
- rarefaction
 - compression
 - amplitude
 - wavelength
- _____ 2. The highness or lowness of a sound is perceived as
- compression.
 - wavelength.
 - ultrasound.
 - pitch.
- _____ 3. At a large distance from a sound source, spherical wave fronts are viewed as
- wavelengths.
 - troughs.
 - rays.
 - plane waves.
- _____ 4. The point at which a ray crosses a wave front corresponds to a _____ of a sound wave.
- wavelength
 - compression
 - trough
 - source
- _____ 5. The property of sound called *intensity* is proportional to the rate at which energy flows through
- an area perpendicular to the direction of propagation.
 - an area parallel to the direction of propagation.
 - a cylindrical tube.
 - a sound wave of a certain frequency.
- _____ 6. The intensity of a sound at any distance from the source is directly proportional to the sound's
- wavelength.
 - pitch.
 - power.
 - frequency.
- _____ 7. When the frequency of a force applied to a system matches the natural frequency of vibration of the system, _____ occurs.
- damped vibration
 - random vibration
 - timbre
 - resonance
- _____ 8. The Tacoma Narrows bridge collapsed in 1940 when winds caused _____ to build up in the bridge.
- a compression wave
 - a longitudinal wave
 - a standing wave
 - friction
- _____ 9. When an air column vibrates in a pipe that is open at both ends,
- all harmonics are present.
 - no harmonics are present.
 - only odd harmonics are present.
 - only even harmonics are present.
- _____ 10. When an air column vibrates in a pipe that is closed at one end,
- all harmonics are present.
 - no harmonics are present.
 - only odd harmonics are present.
 - only even harmonics are present.
- _____ 11. The quality of a musical tone of a certain pitch results from a combination of
- fundamental frequencies.
 - harmonics.
 - transverse waves.
 - velocities.
- _____ 12. How many beats per second are heard when two vibrating tuning forks having frequencies of 342 Hz and 345 Hz are held side by side?
- 687 Hz
 - 343.5 Hz
 - 5 Hz
 - 3 Hz

Cp physics - Webreview : Sound Answer Section

MULTIPLE CHOICE

1. B
2. D
3. D
4. B
5. A
6. C
7. D
8. C
9. A
10. C
11. B
12. D
13. B
14. D

SHORT ANSWER

15. compression
16. longitudinal
17. rarefaction
18. frequency
19. The pitch rises.
20. Sound travels faster in a solid than in a gas because the particles of a solid are closer together than those of a gas.
21. The speed of sound in air increases as temperature increases.
22. plane
23. The apparent pitch of the sound drops as the ambulance passes.
24. The stationary observer hears a sound with a higher pitch than the sound source is emitting. As the source moves, the wave fronts ahead of the source are pushed closer together than they would be if the source were stationary. Because the perceived wavelength is less while the wave speed is constant, the perceived frequency is greater, and thus the observed pitch is higher.
25. Resonance occurs when the frequency of a force applied to an object is the same as the natural frequency of an object.
26. $2L$

PROBLEM

27. 4 beats/s

Given

$$v = 343 \text{ m/s}$$

$$L = 53.3 \text{ cm} = 0.533 \text{ m}$$

$$f_{\text{signal}} = 165 \text{ Hz}$$

Solution

For a resonating tube closed at one end,

$$f_n = n \frac{v}{4L}$$

At the fundamental frequency, $n = 1$, so

$$f_1 = \frac{v}{4L} = \frac{343 \text{ m/s}}{4(0.533 \text{ m})} = 161 \text{ Hz}$$

$$f_{\text{signal}} = 165 \text{ Hz}$$

$$\text{Beat frequency} = f_{\text{signal}} - f_1 = 165 \text{ Hz} - 161 \text{ Hz} = 4 \text{ beats/s}$$