Problems

14.1 Speed of Sound, Frequency, and Wavelength 25.

A bat produces a sound at 17,250\,\text{Hz} and wavelength 0.019\,\text{m}. What is the speed of the sound?

a. 1.7 \times 10^6\,\text{m}/\text{s}
b. 8.6\times 10^5\,\text{m}/\text{s}
c. 1.15\times 10^{-6}\,\text{m/s}
d. 3.28\times 10^2\,\text{m}/\text{s}

26.

Table 14.2

A sound wave with a frequency of 80 Hz is traveling through air at 0°C. The sound wave enters a block of aluminum. If the sound's frequency does not change, what happens to the sound's wavelength?

a. It's wavelength increases by a factor of 4.2.
b. It's wavelength increases by a factor of 18.
c. It's wavelength decreases by a factor of 4.2.
d. It's wavelength decreases by a factor of 18.

14.2 Sound Intensity and Sound Level 27.

Calculate the sound intensity for a sound wave traveling through air at 15° C and having a pressure amplitude of 0.80 Pa. (Hint—Speed of sound in air at 15° C is 340 m/s .)

a. 9.6×10^{-3} W / m^2
b. 7.7×10^{-3} W / m^2
c. 9.6×10^{-4} W / m^2
d. 7.7×10^{-4} W / m^2

28.

The sound level in dB of a sound traveling through air at 0^{\circ}\text{C} is 97\,\text{dB}. Calculate its pressure amplitude.

a. 4.3\,\text{Pa}
b. 0.20\,\text{Pa}
c. 0.04\,\text{Pa}
d. 2.1\,\text{Pa}

14.3 Doppler Effect and Sonic Booms 29.

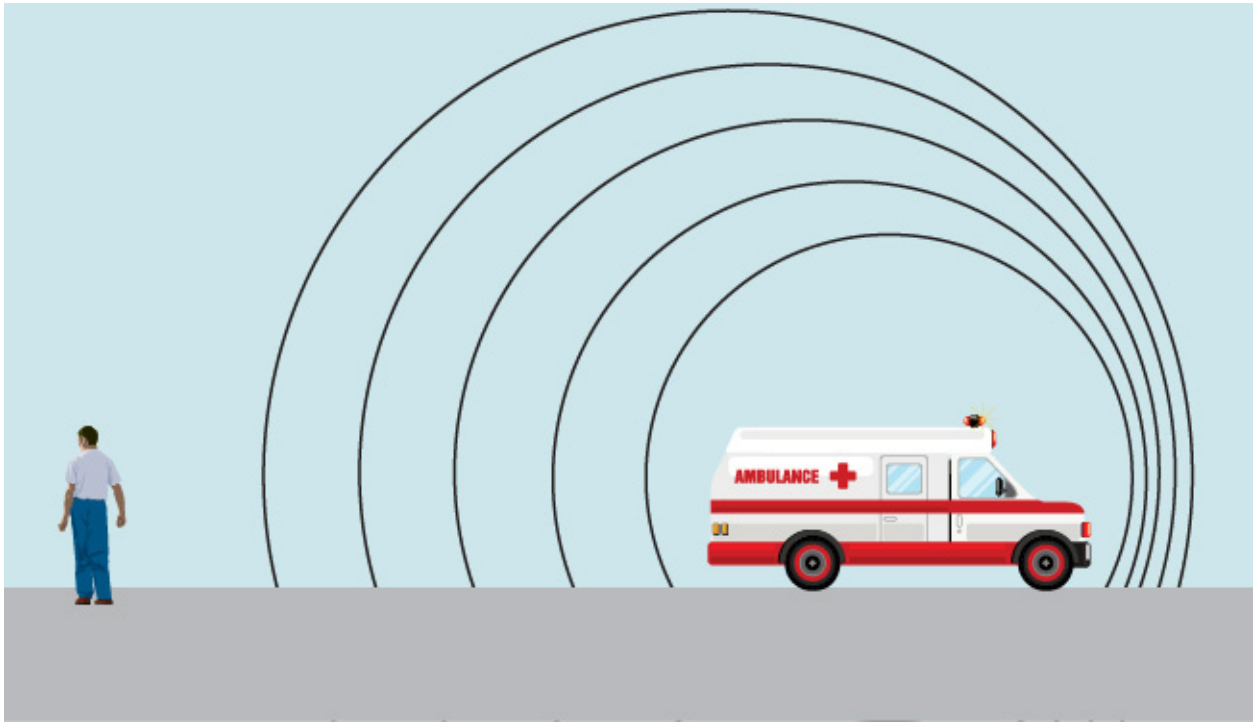

Figure 14.28

An ambulance is moving away from you. You are standing still and you hear its siren at a frequency of 101 Hz. You know that the actual frequency of the siren is 105 Hz. Assuming the speed of sound is 331 m/s, what is the speed of the ambulance?

a. 17.07\,\text{m}/\text{s}
b. 16.55\,\text{m}/\text{s}
c. 14.59\,\text{m}/\text{s}
d. 13.1\,\text{m/s}

30.

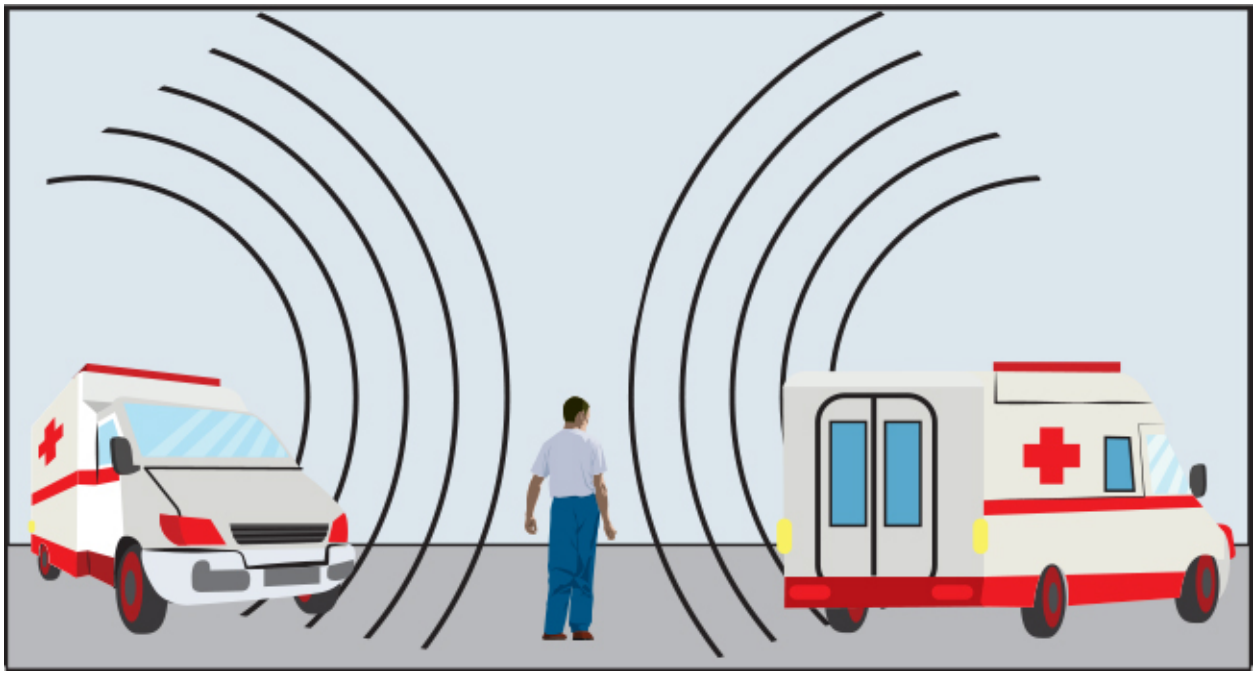

Figure 14.29

An ambulance passes you at a speed of 15.0m/s and its siren has a frequency of 995 Hz. Assuming the speed of sound in air is 331m/s, what is difference in the frequencies you perceive before and after it passes you?

a. 47.0\,\text{Hz}
b. 43.0\,\text{Hz}
c. 94.9\,\text{Hz}
d. 90.0\,\text{Hz}

14.4 Sound Interference and Resonance 31.

What is the length of an open-pipe resonator with a fundamental frequency of 400.0\,\text{Hz}? (Assume the speed of sound is 331\,\text{m/s}.)

a. 165.1\,\text{cm}
b. 82.22\,\text{cm}
c. 20.25\,\text{cm}
d. 41.38\,\text{cm}

32.

An open-pipe resonator has a fundamental frequency of 250\,\text{Hz}. By how much would its length have to be changed to get a fundamental frequency of 300.0\,\text{Hz}? (Assume the speed of sound is 331\,\text{m/s}.)

a. 77.32\,\text{cm}
b. 44.09\,\text{cm}
c. 32.16\,\text{cm}
d. 11.03\,\text{cm}