Chapter 12 Answers to Problems

1. 3.4 mm **2.** 6.1 mm **3.** 173 ms **4.** (a) 338 m/s (b) 2.8 km **5.** 4.7 s **6.** 3.5 km/s **7.** 1.4 km/s **10.** 770 m **11.** 1.1 μJ **12.** 0.099 W **13.** 95 dB Not much different than with only one machine running. **14.** 107 dB **15.** (a) 28.7 N/m^2 (b) 1.58 mN **16.** 26% **18.** (a) 125.0% (b) 3.522 dB **19.** 8.58 mm **20.** (a) 32.8 cm (b) 252.4 Hz **21.** (a) 65.6 cm (b) 252.4 Hz **22.** 396 Hz **23.** 43.3 cm **24.** (a) Closed at one end, since the numbers in the ratios of these frequencies are all odd. (b) 78.0 Hz (c) 1.10 m **25.** 34ºC **26.** (a) 1.20 m (b) 90.0 cm (c) 338 m/s **27.** 3/4 **28.** 1.31 m **29.** (a) There is a displacement node (pressure antinode) at the center of the rod and displacement antinodes (pressure nodes) at the ends. (b) 5100 m/s (c) 13.1 cm (d) The ends move in opposite directions and, thus, they are out of phase. **30.** (a) 438.0 Hz (b) tighten **31.** (a) 290.0 Hz (b) 1.4% **32.** 2 Hz **33.** (a) 85.6 N (b) 432 m/s (c) 335 Hz (d) 0.256 m **34.** 0.2 Hz **35.** 580 Hz **36.** –69 Hz **37.** 6.35 Hz **38.** (a) 2.0 kHz (b) 670 Hz **39.** (a) 1.5 kHz (b) 500 Hz **40.** 8.4 m/s **41.** (a) 3.0 kHz (b) 330 Hz (c) 1.0 kHz **44.** 49 m/s **45.** (a) 670 m (b) 2.8 s **46.** (a) 520 m (b) 4.0 cm (c) 9.2 mm **47.** 403 m **48.** 5.42 km **49.** 83.6 kHz **50.** 34 cm **51.** 640 Hz **52.** (a) $2fv(u–v)$ (b) $2fv/u$ **53.** (a) 319 Hz (b) 319 Hz 1.1 m **54.** 9.8 m **55.** 17.9 Hz 53.6 Hz 89.3 Hz 125 Hz **56.** 3.4 kHz 10 kHz 17 kHz Resonance at 3.4 kHz (2<3.4<5) enhances the sensitivity of the ear for frequencies critical to speech recognition. **57.** (b) 110% 46% **58.** (a) 9.9 m (b) 1.8 ms (c) No **59.** 2.3 kHz **60.** 3.2 kHz **61.** 0.0955 s **62.** (a) 138 dB (b) 88.0 dB **63.** (a) 5.05 m (b) 16.35 Hz **64.** 15 m **65.** 196 Hz **66.** 1280 N **67.** 0.019 **68.** (a) 6.7×10^{-8} m/s (b) 1×10^{-19} J (c) The ear is about as sensitive as it can be. **69.** 29.0 dB