## DRILL

## **CHAPTER 10 PRACTICE QUESTIONS**

- **Directions:** Complete the following problems as specified by each question, and then check your work using the solutions that follow. For extended, step-by-step solutions, access your Student Tools online.
- 1. If the bulk modulus of air is  $1.43 \times 10^5$  Pa, what is the density of air at sea level?
- Sound travels from air to water, where the bulk modulus is 2.2 × 10<sup>9</sup> Pa. If a sound was emitted above the surface of a pool of water at 5 mm, what would the wavelength be underwater? Note that the density of water is 1000 kg/m<sup>3</sup>.
- 3. What is the displacement of a mechanical wave at a distance of 5 cm from the origin of the wave after 2 s? Consider the amplitude to be 6 cm, the wavelength to be 1 cm, and the period to be 5 s.
- 4. Let's say you have a rope that is elastic, meaning that when it stretches it obeys Hooke's Law. If the force constant was 50 N/m, and you were to stretch the rope by 50 cm, what would the speed of a wave be on the rope? For this rope, the natural length is 1 m and the mass is 2 kg.
- 5. A string is fixed at both ends and has a tension of 100 N, a mass of 100 g, and a length of 10 cm. What is the lowest frequency standing wave you could produce on the string? What about the largest frequency?

- 6. You have a small speaker that emits a constant sound of 100 Hz. You then throw it into the air so that it reaches 3 m above where you release it. What is the frequency you hear right when you let it go? What about at the top of the trajectory? What about when it has fallen to the same height that you released it at? Assume in this problem that you've released the speaker above your head.
- 7. You drop a speaker emitting a sound at 150 Hz down a deep well. Once the speaker has dropped for 3 s, what is the beat frequency you hear from the sounds coming up from the well?

- 8. You can hear that a speaker produces a sound of intensity of 0.1 W/m<sup>2</sup> at your current location. What is the volume of that sound? What would the volume be if you doubled your distance from the speaker?
- 9. An organ has two pipes of identical length, 2 m, one with an open end and one with a stopped end. What is the beat frequency you would hear if each pipe emitted sound at its second-lowest harmonic frequency?