Suggested problems: **Chapter 17**

The quiz questions will be very similar to the following text-book problems. Refer to the course website for the latest version of this document. You are encouraged to seek the help of your instructor during his office hours.

6.A man strikes one end of a thin rod with a hammer. The speed of sound in the rod is 15 times the speed of sound in air. A woman, at the other end with her ear close to the rod, hears the sound of the blow twice with a 0.12 s interval between; one sound comes through the rod and the other comes through the air alongside the rod. If the speed of sound in air is 343 m/s, what is the length of the rod?

**Answer:** 44 m

12. The pressure in a traveling sound wave is given by the equation

Δ*p* = (1.50 Pa) sin {π[(0.900 m−1) *x* − (315 s−1) *t*]}. Find the (a) pressure amplitude, (b) frequency, (c) wavelength, and (d) speed of the wave.

**Answer:** a) 1.50 Pa; b) 158 Hz; c) 2.22 m; d) 350 m/s

16. Two sound waves, from two different sources with the same frequency, 540 Hz, travel in the same direction at 330 m/s. The sources are in phase. What is the phase difference of the waves at a point that is 4.40 m from one source and 4.00 m from the other?

**Answer:** 4.11 rad = 236 º

22. In Fig. 17-37, sound with a 40.0 cm wavelength travels rightward from a source and through a tube that consists of a straight portion and a half-circle. Part of the sound wave travels through the half-circle and then rejoins the rest of the wave, which goes directly through the straight portion. This rejoining results in interference. What is the smallest radius *r* that results in an intensity minimum at the detector?

**Answer:** 17.5 cm

28. Two sounds differ in sound level by 1.00 dB. What is the ratio of the greater intensity to the smaller intensity?

**Answer:** 1.26

58. A sound source *A* and a reflecting surface *B* move directly toward each other. Relative to the air, the speed of source *A* is 29.9 m/s, the speed of surface *B* is 65.8 m/s, and the speed of sound is 329 m/s. The source emits waves at frequency 1200 Hz as measured in the source frame. In the reflector frame, what are the (a) frequency and (b) wavelength of the arriving sound waves? In the source frame, what are the (c) frequency and (d) wavelength of the sound waves reflected back to the source?

**Answer:** (a) 1.58×103 Hz; (b) 0.208 m; (c) 2.16×103 Hz; (d) 0.152 m

80. A detector initially moves at constant velocity *vD* directly toward a stationary sound source and then (after passing it) directly from it. The emitted frequency is *f*. During the approach the detected frequency is *f*app and during the recession it is *f*rec. If the frequencies are related by (*f*app - *f*rec)/*f* = 0.500, what is the ratio *vD*/*v* of the speed of the detector to the speed of sound?

**Answer:** 0.25