Homework, Chapter 9

1) A sound wave coming from a tuba has a wavelength of 1.50 m and travels to your ears at a speed of 345 m/s. What is the frequency of the sound you hear?

2) What is the intensity of a sound with a measured intensity level of 84 dB? ($I_0 = 10^{-12}$ W/m$^2$)
3) How far away is a lightning strike if you hear the thunderclap 3.00 s after you see the lightning bolt strike? ($v_{\text{sound}} = 340 \text{ m/s}$, $v_{\text{light}} = 3 \times 10^8 \text{ m/s}$)

4) If the intensity of a sound is increased by a factor of 100, how is the decibel level changed? The new decibel level will be how much greater?
5) The intensity level of sound 20 m from a jet airliner is 120 dB. At what distance from the airplane will the sound intensity level be a tolerable 100 dB? (Assume spherical spreading of sound.)

6) The Doppler shift of ultrasonic waves can measure the speed of blood in an artery. If the frequency of the stationary source is 100 kHz and the reflected sound has a Doppler shift of 200 Hz, what is the blood flow speed? (The speed of sound inside the body is 1500 m/s.)
7) A sound source of frequency 1000 Hz moves at 50.0 m/s toward a listener who is at rest. What is the apparent frequency heard by the listener? (speed of sound = 340 m/s)

8) The lower A on a piano has a frequency of 27.5 Hz. If the tension in the 2.0-m-long string is 304 N and one-half wavelength occupies the string, what is the mass of the string?
9) What is the lowest frequency that will resonate in an organ pipe 2.00 m in length, closed at one end? What is the wavelength? The speed of sound in air is 340 m/s.

10) A tuning fork is sounded above a resonating tube (one end closed), which resonates at a length of 0.20 m and again at 0.60 m. If the tube length were extended further, at what point will the tuning fork again create a resonance condition?