Ch12 P9. What is the sound level of a sound whose intensity is $1.5 \times 10^{-6}\mathrm{W/m^2}$?

We have that

$$\begin{aligned}\beta &= 10\log_{10}\left(\frac{1.5\times10^{-6}\mathrm{W/m^2}}{1.0\times10^{-12}\mathrm{W/m^2}}\right)\\ &= 62\,\mathrm{dB}.\end{aligned}$$

Ch12 P38. A particular organ pipe can resonate at 264 Hz, 440 Hz, and 616Hz, but at any other frequencies between. (a) Show whay this is an open or closed pipe. (b) What is the fundamental of this pipe?

(a) It is closed because it is odd integers times 88 Hz. The way to figure this out is to take differences between each harmonic:

$$\begin{aligned}440\mathrm{Hz}-264\mathrm{Hz} &= 176\mathrm{Hz},\\ 616\mathrm{Hz}-440\mathrm{Hz} &= 176\mathrm{Hz}.\end{aligned}$$

And noticing that the difference is 176 Hz, which might be the fundamental if this is an open pipe. However, note that 440 is not a multiple of 176. Consider instead half of 176 which is 88. It turns out that 265 is 3×88, 440 is 5×88, and 616 is 7×88. Since these are odd integers, this tells us that the pipe is a closed pipe.

The fundamental is 88Hz.

Ch11 Q16. How did geophysicists determine part of the Earth's interior is liquid?

Only longitudinal waves can travel through liquid, tranverse waves cannot. Since we observe no traverse waves below the Earth's surface, this lead them to reason the earth's interior must be liquid.

Ch11 Q24. When a standing wave exists on a string, the vibrations if incident and reflected waves cancel at the nodes. Does this mean the energy was destroyed? Explain.

It isn't meaningful to refer to the energy at a point. The particles in the medium do have less energy at the nodes than at the anti-nodes. where they would have more energy.

Ch11 P40. A cord of mass 0.65 kg is stretched between two supports 8.0 m apart. If the tension in the cord is 120 N, how long will it take a pulse to trabel from one support to the other?

The speed in a suspended string is $v=\sqrt{TL/m}$, so

$$\begin{aligned}v &= \sqrt{\frac{(120\mathrm{N})8.0\mathrm{m}}{.65\mathrm{kg}}}\\ &= 38\,\mathrm{m/s}.\end{aligned}$$

Thus, the time for a signal to propagate across the rope is

$$\begin{aligned}t &= L/v\\ &= 8.0/38\,\mathrm{m/s}\\ &= 0.21\mathrm{s}.\end{aligned}$$

Ch11 P49. If a violin string vibrates at 440 Hz as its fundamental frequency, what are the frequences of the first four harmonics?

Since this is a violin, the allowed harmonics are any integral multiple times the frequency. They first four harmonics are 440Hz, 880Hz,1320Hz, and 1760Hz.

Ch11 P53. If two successive overtones of a vibrating string are 280Hz and 350Hz, what is the frequency of the fundamental?

Harmonics are $n f_1$, so successive overtones have a difference of f_1. Thus, the fundamental is

$$f_1 = 350\text{Hz} - 280\text{Hz} = 70\text{Hz}.$$

So, these are the fourth and fifth harmonics.