# 4300357 - Oscilações e Ondas
## 2º semestre de 2016

Lista de Exercícios Recomendados para a Terceira Prova.
Exercícios do livro adotado (Fundamentos de Física, Halliday & Resnick, Walker, volume 2, LTC, 9º edição, 2012) retirados da edição em inglês.

## Capítulo 17

### Problemas

•9 If the form of a sound wave traveling through air is

$$s(x, t) = (6.0\text{ nm})\cos(kx + (3000\text{ rad/s})t + \phi),$$

how much time does any given air molecule along the path take to move between displacements $s = +2.0$ nm and $s = -2.0$ nm?

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

$$\Delta p = (1.50\text{ Pa})\sin\pi[(0.900\text{ m}^{-1})x - (315\text{ s}^{-1})t].$$

Find the (a) pressure amplitude, (b) frequency, (c) wavelength, and (d) speed of the wave.

••13 A sound wave of the form $s = s_m\cos(kx - \omega t + \phi)$ travels at 343 m/s through air in a long horizontal tube. At one instant, air molecule $A$ at $x = 2.000$ m is at its maximum positive displacement of 6.00 nm and air molecule $B$ at $x = 2.070$ m is at a positive displacement of 2.00 nm. All the molecules between $A$ and $B$ are at intermediate displacements. What is the frequency of the wave?

•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?

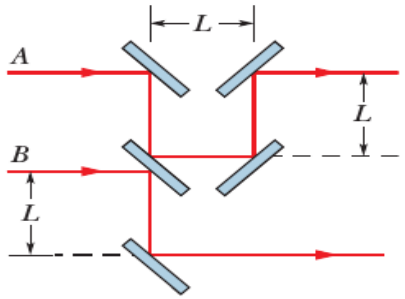

Fig. 17-33 Problem 18.

••18 GO In Fig. 17-33, sound waves $A$ and $B$, both of wavelength $\lambda$, are initially in phase and traveling rightward, as indicated by the two rays. Wave $A$ is reflected from four surfaces but ends up traveling in its original direction. Wave $B$ ends in that direction after reflecting from two surfaces. Let distance $L$ in the figure be expressed as a multiple $q$ of $\lambda$: $L = q\lambda$. What are the (a) smallest and (b) second smallest values of $q$ that put $A$ and $B$ exactly out of phase with each other after the reflections?

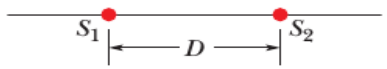

Fig. 17-34
Problems 19 and 105.

••19 Figure 17-34 shows two isotropic point sources of sound, $S_1$ and $S_2$. The sources emit waves in phase at wavelength 0.50 m; they are separated by $D = 1.75$ m. If we move a sound detector along a large circle centered at the midpoint between the sources, at how many points do waves arrive at the detector (a) exactly in phase and (b) exactly out of phase?

•24 Suppose that the sound level of a conversation is initially at an angry 70 dB and then drops to a soothing 50 dB. Assuming that the frequency of the sound is 500 Hz, determine the (a) initial and (b) final sound intensities and the (c) initial and (d) final sound wave amplitudes.

•26 A 1.0 W point source emits sound waves isotropically. Assuming that the energy of the waves is conserved, find the intensity (a) 1.0 m from the source and (b) 2.5 m from the source.

••34 GO Two atmospheric sound sources $A$ and $B$ emit isotropically at constant power. The sound levels $\beta$ of their emissions are plotted in Fig. 17-39 versus the radial distance $r$ from the sources. The vertical axis scale is set by $\beta_1 = 85.0$ dB and $\beta_2 = 65.0$ dB. What are (a) the ratio of the larger power to the smaller power and (b) the sound level difference at $r = 10$ m?

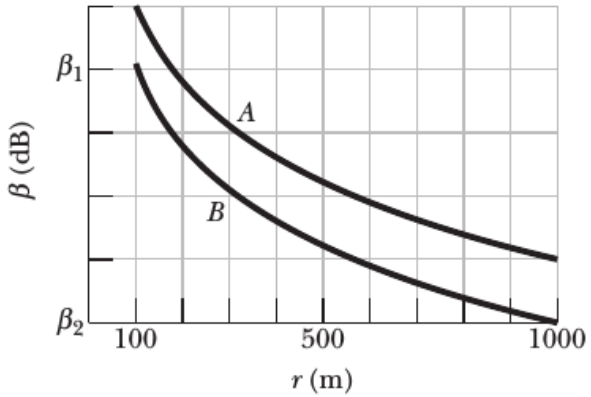


**Fig. 17-39** Problem 34.

•56 An ambulance with a siren emitting a whine at 1600 Hz overtakes and passes a cyclist pedaling a bike at 2.44 m/s. After being passed, the cyclist hears a frequency of 1590 Hz. How fast is the ambulance moving?

•57 A state trooper chases a speeder along a straight road; both vehicles move at 160 km/h. The siren on the trooper's vehicle produces sound at a frequency of 500 Hz. What is the Doppler shift in the frequency heard by the speeder?

••60 A stationary motion detector sends sound waves of frequency 0.150 MHz toward a truck approaching at a speed of 45.0 m/s. What is the frequency of the waves reflected back to the detector?