Pre-AP physics Textbook practice problems Waves and Sound (Ch. 12 and 13)

25. **Figure 12-27** depicts a pulse wave traveling on a spring.

a. In which direction are the particles of the medium vibrating?

b. Is this wave transverse or longitudinal?

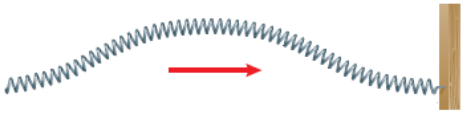

Figure 12-27

31. What happens to the wavelength of a wave on a string when the frequency is doubled? What happens to the speed of the wave?

33. Two tuning forks with frequencies of 256 Hz and 512 Hz are struck. Which of the sounds will move faster through the air?

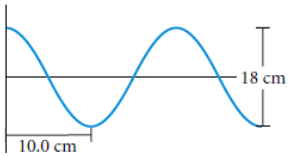

Figure 12-28

35. A wave traveling in the positive x direction with a frequency of 25.0 Hz is shown in **Figure 12-28** above. Find the following values for this wave:

a. amplitude

b. wavelength

c. period

d. speed

37. Using the superposition principle, draw the resultant waves for each of the examples in **Figure 12-29.**

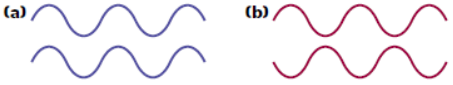

Figure 12-29

41. A wave of amplitude 0.75 m interferes with a second wave of amplitude 0.53 m.

a. Find the maximum possible amplitude of the resultant wave if the interference is constructive.

b. Find the maximum possible amplitude of the resultant wave if the interference is destructive.

45. Which of the following wavelengths will produce standing waves on a string that is 3.5 m long?

a. 1.75 m
b. 3.5 m
c. 5.0 m
d. 7.0 m

48. Green light has a wavelength of 5.20×10^{-7} m and travels through the air at a speed of 3.00×10^{8} m/s. Calculate the frequency and the period of green light waves with this wavelength.

50. A sound wave traveling at 343 m/s is emitted by the foghorn of a tugboat. An echo is heard 2.60 s later. How far away is the reflecting object?

51. The notes produced by a violin range in frequency from approximately 196 Hz to 2637 Hz. Find the possible range of wavelengths in air produced by this instrument when the speed of sound in air is 340 m/s.

57. The distance between two successive crests of a certain transverse wave is 1.20 m. Eight crests pass a given point along the direction of travel every 12.0 s. Calculate the wave speed.

59. A harmonic wave is traveling along a rope. The oscillator that generates the wave completes 40.0 vibrations in 30.0 s. A given crest of the wave travels 425 cm along the rope in a time period of 10.0 s. What is the wavelength?

Chapter 13

28. A stereo speaker represented by *P* in **Figure 13-22** emits sound waves with a power output of 100.0 W. What is the intensity of the sound waves at point *x* when $r = 10.0$ m?
(See Sample Problem 13A.)

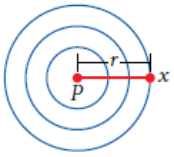

Figure 13-22

30. **Figure 13-23** shows a stretched string vibrating in several of its modes. If the length of the string is 2.0 m, what is the wavelength of the wave on the string in (**a**), (**b**), (**c**), and (**d**)?

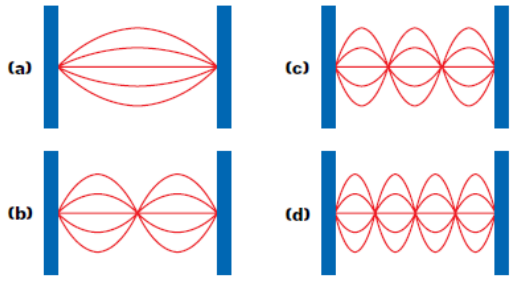

Figure 13-23

39. What are the first three harmonics of a note produced on a 31.0 cm long violin string if waves on this string have a speed of 274.4 m/s?
(See Sample Problem 13B.)

40. The human ear canal is about 2.8 cm long and can be regarded as a tube open at one end and closed at the eardrum. What is the fundamental frequency around which we would expect hearing to be best when the speed of sound in air is 340 m/s?
(See Sample Problem 13B.)

41. A pipe that is open at both ends has a fundamental frequency of 320 Hz when the speed of sound in air is 331 m/s.

a. What is the length of this pipe?
b. What are the next two harmonics?
c. What is the fundamental frequency of this pipe when the speed of sound in air is increased to 367 m/s due to a rise in the temperature of the air?

44. When two tuning forks of 132 Hz and 137 Hz, respectively, are sounded simultaneously, how many beats per second are heard?

51. The fundamental frequency of an open organ pipe corresponds to the note middle C (f= 261.6 Hz on the chromatic musical scale). The third harmonic (f_3) of another organ pipe that is closed at one end has the same frequency. Compare the lengths of these two pipes.

53. Some studies indicate that the upper frequency limit of hearing is determined by the diameter of the eardrum. The wavelength of the sound wave and the diameter of the eardrum are approximately equal at this upper limit. If this is so, what is the diameter of the eardrum of a person capable of hearing 2.0×10^4 Hz? Assume 378 m/s is the speed of sound in the ear.