**Suggested problems: Chapter 16- HRW-Principles of Physics-10th Edition**.

**6.** What phase difference between two identical traveling waves, moving in the same direction along a stretched string, results in the combined wave having an amplitude 0.850 times that of the common amplitude of the two combining waves? Express your answer in (a) degrees, (b) radians, and (c) wavelengths.

**Answer:** (a) 130 º; (b) 2.26 rad; (c) 0.360 λ

**12.** A rope, with a mass 1.39 kg and fixed at both ends, oscillates in a second-harmonic standing wave pattern. The displacement of the rope is given by y = (0.10 m) sin (π x/2) sin(12π t), where x = 0 at one end of the rope, x is in meters, and t is in seconds.What are (a) the length of the rope, (b) the speed of the waves on the rope, and (c) the tension of the rope? (d) If the rope oscillates in a third-harmonic standing wave pattern, what will be the period of oscillation?

**Answer:** (a) 4.0 m; (b) 24 m/s; (c) 200 N; (d) 0.11 s

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13.** A sinusoidal wave travels along a string. The time for a particular point to move from maximum displacement to zero is 0.135 s. What are the (a) period and (b) frequency? (c) The wavelength is 1.40 m; what is the wave speed?

**Answer:** (a) 0.540 s; (b) 1.85 Hz; (c) 2.59 m/s

**17.** A nylon guitar string has a linear density of 7.20 g/m and is under a tension of 180 N. The fixed supports are distance D = 90.0 cm apart. The string is oscillating in the standing wave pattern shown in Fig.16-38. Calculate the (a) speed, (b) wavelength, and (c) frequency of the traveling waves whose superposition gives this standing wave.

**Answer:** (a) 158 m/s; (b) 60.0 cm; (c) 264 Hz



\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**44.** A The function *y*(*x*, *t*) = (15.0 cm) cos (π*x* – 15.0 π*t*), with *x* in meters and *t* in seconds, describes a wave on a taut string. What is the transverse speed for a point on the string at an instant when that point has the displacement *y* = +6.00 cm?

**Answer:** 648 cm/s = 6.48 m/s

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**52.** A string along which waves can travel is 2.70 m long and has a mass of 130 g. The tension in the string is 36.0 N. What must be the frequency of traveling waves of amplitude 7.70 mm for the average power to be

170 W.

**Answer:** 332 HZ

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**54.** The speed of a transverse wave on a string is 170 m/s when the string tension is 120 N. To what value must the tension be changed to raise the wave speed to 180 m/s?

**Answer:** 135 N