

1. The angle that a swinging simple pendulum makes with the vertical obeys the equation $\theta(t) = (0.150 \text{ rad}) \cos((2.85 \text{ rad/s}) t + 1.66 \text{ rad})$. What is the length (in m) of the pendulum?

1.21

2. A 2.25-kg object is attached to a horizontal and ideal massless spring on a table. What should be the spring constant, k , of this spring (in N/m) so that the maximum acceleration of the object will be 10 m/s^2 when it oscillates with an amplitude of 4.5 cm?

500

3. A simple harmonic oscillator has an amplitude of 3.50 cm and a maximum speed of 0.260 m/s. What is the speed (in m/s) when the displacement is 1.75 cm?

0.225

4. A simple harmonic oscillator consists of a block of mass 2.00 kg attached to a spring of spring force constant 100 N/m. When $t = 1.00 \text{ s}$, the position and velocity of the block are $x = 0.129 \text{ m}$ and $v = 3.415 \text{ m/s}$. What is the amplitude of the oscillation (in m)?

0.50

5. Find the speed (in m/s) of an ocean wave whose vertical displacement y as a function of time t is given by $y(x, t) = 3.7 \cos((2.2)x (5.6)t)$, where all quantities are in SI units.

2.5

6. A guitar string 0.650 m long is fixed at both ends and has a tension of 61.0 N and a mass per unit length of 3.00 g/m. What is the string's fundamental frequency of vibration (in Hz) when plucked?

110

7. A piano wire with mass 3.00 g and length 80.0 cm is stretched with a tension of 25.0 N. A wave with frequency 120.0 Hz and amplitude 1.6 mm travels along the wire. Calculate the average power (in W) carried by the wire.

0.22

8. A 2.5 m long string that has a mass of 0.10 kg is fixed at both ends and is under a tension of 30 N. When the n -th harmonic is excited, there is a node 0.50 m from one end. What is n ?

5

9. A factory siren indicating the end of a shift has a frequency of 90.0 Hz. The speed of sound is 344 m/s. What frequency (in Hz) is perceived by the occupant of a car traveling towards the factory at 25.0 m/s?

97

10. The fundamental mode in a pipe of length L that is open at both ends has frequency 200 Hz. Which of the following frequencies (in Hz) does NOT correspond to a harmonic of the pipe?

900

11. One of the harmonics of a column of air open at one end and closed at the other has a frequency of 448 Hz and the next higher harmonic has a frequency of 576 Hz. What is the fundamental frequency (in Hz) of the air column?

64

12. A carousel that is 5.00 m in radius has a pair of 600-Hz sirens mounted on posts at opposite ends of a diameter. The carousel rotates with an angular velocity of 0.800 rad/s. A stationary listener is located at a distance from the carousel. The speed of sound is 344 m/s. What is the maximum beat frequency of the sirens (in Hz) at the position of the listener?

14

13. If the intensity level at distance d of one trombone is 70 db, what is the intensity level (in db) of 76 identical trombones, all at a distance d ?

89