Name key

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The velocity of propagation of a transverse wave on a 2.0-m long string fixed at both ends is 200 m/s. Which one of the following is not a resonant frequency of this string? 1) C
A) 100 Hz B) 200 Hz C) 25 Hz D) 50 Hz

2) If a guitar string has a fundamental frequency of 500 Hz, which one of the following frequencies can set the string into resonant vibration? 2) A
A) 1500 Hz B) 250 Hz C) 750 Hz D) 1750 Hz

3) The lowest tone to resonate in an open pipe of length L is 200 Hz. Which one of the following frequencies will not resonate in the same pipe? 3) B
A) 800 Hz B) 900 Hz C) 400 Hz D) 600 Hz

4) Which of the following is a false statement? 4) A
A) Sound can travel through a vacuum.
B) The transverse waves on a vibrating string are different from sound waves.
C) Sound waves are longitudinal pressure waves.
D) "Pitch" (in music) and frequency have approximately the same meaning.
E) Light travels very much faster than sound.

5) A pipe of length L closed at one end is resonating at its fundamental frequency. Which statement is correct? 5) B
A) The wavelength is 4L and there is a displacement node at the pipe's open end.
B) The wavelength is 4L and there is a displacement antinode at the pipe's open end.
C) The wavelength is L and there is a displacement antinode at the pipe's open end.
D) The wavelength is L and there is a displacement node at the pipe's open end.

6) The lowest tone to resonate in a closed pipe of length L is 200 Hz. Which of the following frequencies will not resonate in that pipe? 6) B
A) 1000 Hz B) 400 Hz C) 1400 Hz D) 600 Hz

7) An open pipe of length L is resonating at its fundamental frequency. Which statement is correct? 7) C
A) The wavelength is 2L and there is a displacement antinode at the pipe's midpoint.
B) The wavelength is L and there is a displacement node at the pipe's midpoint.
C) The wavelength is 2L and there is a displacement node at the pipe's midpoint.
D) The wavelength is L and there is a displacement antinode at the pipe's midpoint.

8) An object in simple harmonic motion obeys the following position versus time equation: y = (0.50 m) sin (π/2 t). What is the amplitude of vibration? 8) C
A) 0.75 m B) 1.0 m C) 0.50 m D) 0.25 m

9) For a wave, the frequency times the wavelength is the wave's 9) C
A) intensity. B) amplitude. C) speed. D) power.

$V = f\lambda$

10) The corresponding violin strings on two violins in an orchestra are found to produce a beat frequency of 2 Hz when a frequency of 660 Hz is played. What percentage change in the tension of one of the strings would bring them to the same frequency? 10) B

A) 0.8% B) 0.6% C) 0.2% D) 0.4%

$600\left(\frac{340}{340-30}\right)$

11) What is the frequency heard by a stationary observer when a train approaches with a speed of 30 m/s. The frequency of the train horn is 600 Hz and the speed of sound is 340 m/s. 11) C

A) 653 Hz B) 551 Hz C) 658 Hz D) 600 Hz

V_{sound} 343.7 m/s

12) On a 30°C day, there is an explosion. The sound is heard 3.4 s after seeing the flash. How far away was the explosion? 12) C

A) 0.10 km B) 1.5 km C) 1.2 km D) 0.75 km

13) What is the intensity level of a sound with intensity 10^{-3} W/m2? 13) C

A) 30 dB B) 96 dB C) 90 dB D) 60 dB

$dB = 10 \log(1E^{-3} / 1E^{-12}) = 90 dB$

14) The frequency of the third harmonic of an open pipe is 900 Hz. What is the length of the pipe? 14) A

A) 0.567 m B) 0.283 m C) 0.189 m D) 1.13 m

15) The intensity of a point source at a distance d from the source is I. What is the intensity at a distance 2d from the source? 15) C

A) 4I B) 2I C) I/4 D) I/2

$I \propto \frac{1}{r^2}$

14) $f = \frac{nv}{2L}$

$900 = \frac{3(340)}{2L}$

$L = .567 m$

10) $f = \frac{V}{2L} = \frac{\sqrt{\frac{T}{m/\ell}}}{2L}$

$f \propto \sqrt{T}$

$\frac{662}{660} \propto \sqrt{T}$

$T \propto 1.006$