

1. What is the wavelength of a 5 Hz wave that travels with a speed of 10 m/s ?

- A. 0.25 m
- B. 0.5 m
- C. 1 m
- D. 2 m
- E. 50 m

2. A rope of length 5 m is stretched to a tension of 80 N. If its mass is 1 kg, at what speed would a 10 Hz transverse wave travel down the string?

- A. 2 m/s
- B. 5 m/s
- C. 20 m/s
- D. 50 m/s
- E. 200 m/s

3. A transverse wave on a long horizontal rope with a wavelength of 8 m travels at 2 m/s. At $t = 0$, a particular point on the rope has a vertical displacement of $+A$, where A is the amplitude of the wave. At what time will the vertical displacement of this same point on the rope be $-A$?

A. $t = \frac{1}{8}$ s

B. $t = \frac{1}{4}$ s

C. $t = \frac{1}{2}$ s

D. $t = 2$ s

E. $t = 4$ s

4. What is the wavelength of a wave with period 2 s and speed 2 cm/s ?

- A. 0.25 cm
- B. 0.5 cm
- C. 1 cm
- D. 2 cm

E. 4 cm

5. A string, fixed at both ends, supports a standing wave with a total of 4 nodes. If the length of the string is 6 m, what is the wavelength of the wave?

A. 0.67 m

B. 1.2 m

C. 1.5 m

D. 3 m

E. 4 m

6. A string, fixed at both ends, has a length of 6 m and supports a standing wave with a total of 4 nodes. If a transverse wave can travel at 40 m/s down the rope, what is the frequency of this standing wave?

A. 6.7 Hz

B. 10.0 Hz

C. 13.3 Hz

D. 20.0 Hz

E. 26.7 Hz

7. A sound wave travels through a metal rod with wavelength λ and frequency f . Which of the following best describes the wave when it passes into the surrounding air?

Wavelength Frequency

A. Less than λ Equal to f

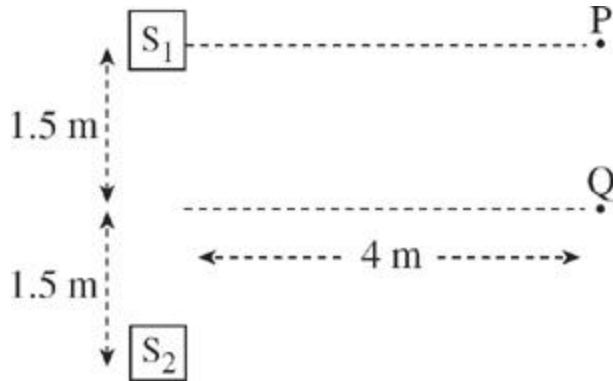
B. Less than λ Less than f

C. Greater than λ Equal to f

D. Greater than λ Less than f

E. Greater than λ Greater than f

8. In the figure below, two speakers, S_1 and S_2 , emit sound waves of wavelength 2 m, in phase with each other.



Let A_P be the amplitude of the resulting wave at point P, and A_Q the amplitude of the resultant wave at point Q. How does A_P compare to A_Q ?

- A. $A_P < A_Q$
- B. $A_P = A_Q$
- C. $A_P > A_Q$
- D. $A_P < 0, A_Q > 0$
- E. A_P and A_Q vary with time, so no comparison can be made.

9. An observer is 2 m from a source of sound waves. By how much will the sound level decrease if the observer moves to a distance of 20 m ?

- A. 1 dB
- B. 2 dB
- C. 10 dB
- D. 18 dB
- E. 20 dB

10. An organ pipe that's closed at one end has a length of 17 cm. If the speed of sound through the air inside is 340 m/s, what is the pipe's fundamental frequency?

- A. 250 Hz
- B. 500 Hz
- C. 1,000 Hz
- D. 1,500 Hz
- E. 2,000 Hz

11. A bat emits a 40 kHz “chirp” with a wavelength of 8.75 mm toward a tree and receives an echo 0.4 s later. How far is the bat from the tree?

- A. 35 m
- B. 70 m
- C. 105 m
- D. 140 m
- E. 175 m

12. A car is traveling at 20 m/s away from a stationary observer. If the car’s horn emits a frequency of 600 Hz, what frequency will the observer hear? (Use $v = 340$ m/s for the speed of sound.)

- A. $(34/36)(600 \text{ Hz})$
- B. $(34/32)(600 \text{ Hz})$
- C. $(36/34)(600 \text{ Hz})$
- D. $(32/34)(600 \text{ Hz})$
- E. $(32/36)(600 \text{ Hz})$