Quiz 9

Solutions

Choose the best answer.

1. Two sound waves of wavelength 0.34 m start out in phase. Wave #1 has intensity I_0 alone and wave #2 has intensity $3I_0$ alone. The speed of sound is 340 m/s. Which of the following is *wrong*?

   A. The frequency of the waves is 1000 Hz.

   B. If wave #2 travels 0.68 m farther than wave #1 to get to a detector, there will be constructive interference.

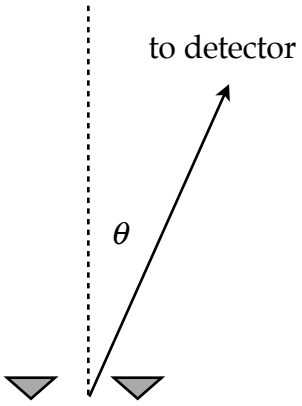
   ☛C. If the waves interfere constructively the resulting intensity is $4I_0$. $[(1+\sqrt{3})^2 I_0.]$

   D. The ratio of the amplitude of #2 to that of #1 is $\sqrt{3}$.

Choose T or F depending on whether the statement is true or false.

2. Nearly all of the energy of a sound wave striking a rigid smooth wall is reflected back by the wall. **T**

3. Two speakers sending out waves of a single wavelength in phase are arranged as shown, 0.5 m apart. The resulting sound is received by a detector at angle θ relative to the dotted line shown. Maximum intensity is received at four angles from 0 to $\pi/2$.



   a. What is the smallest of those angles? Explain how you know.

   b. If $\pi/2$ is the largest of those angles, what is the wavelength?

   c. At how many angles will minimum intensity be received? Explain.

a. Along the vertical line the path difference is zero, so $\theta = 0$ is the smallest.

b. The points of maximum intensity correspond to $\delta = 0, 2\pi, 4\pi, 6\pi$, so $\theta = \pi/2$ corresponds to $\delta = 6\pi$. The path difference is 0.5 m, so we have $6\pi = \frac{2\pi}{\lambda}(0.5)$ or $\lambda = 1/6$ m.

c. There is a minimum between each pair of maxima, so there are three angles where $\delta = \pi, 3\pi, 5\pi$.