CREST Olympiads

#CRESTInnovator

# CREST Science Olympiad (CSO)
# Worksheet for
# Class 9

## Topic

## Sound

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# Worksheet on Sound

1. **In an experiment to study the speed of sound in air, a person claps hands at a known distance from a wall and measures the time taken for the echo to return. If the time is 0.5 seconds and the speed of sound is 340 $ms^{-1}$, what is the distance of the wall from the person?**

   a. 170 m
   b. 85 m
   c. 340 m
   d. 680 m

2. **A sound wave with a frequency of 750 Hz travels through a medium with a speed of 375 m/s. Calculate the wavelength of the wave and determine the time it takes for one complete wave to pass a given point.**

   a. Wavelength: 0.5 m, Time: 0.001 s
   b. Wavelength: 0.75 m, Time: 0.001 s
   c. Wavelength: 0.25 m, Time: 0.002 s
   d. Wavelength: 0.375 m, Time: 0.001 s

3. **When a person is listening to music, which part of the ear helps differentiate between different pitches of sound?**

   a. Pinna
   b. Cochlea
   c. Oval window
   d. Eardrum

4. **A radio station broadcasts at a frequency of 98.5 MHz. If the speed of radio waves is approximately $3 \times 10^8$ m/s, what is the wavelength of these waves?**

   a. 3.05 m
   b. 0.305 m
   c. 305 m
   d. 30.5 m

5. **In a concert hall, which seating arrangement is likely to result in better sound quality?**

   a. Parallel walls with hard surfaces
   b. Irregularly shaped walls with soft surfaces
   c. Parallel walls with reflective surfaces
   d. Irregularly shaped walls with glass panels

# Answer Key

**1.** b - In this experiment, the time taken for the sound to travel to the wall and back is the total time for the sound to cover twice the distance between the person and the wall. The formula to calculate the distance (d) using the time (t) and speed (v) is:
$2d/v = t$
$d = (v \times t)/2$

Given that the speed of sound (v) is 340 m/s and the time (t) is 0.5 seconds, you can plug these values into the formula:
$d = (340\ ms^{-1} \times 0.5\ s)/2$
$d = 85\ m$

So, the distance of the wall from the person is 85 metres.

**2.** a - To calculate the wavelength of the wave, we can use the formula:

Wavelength(λ) = Speed of Sound(v) / Frequency(f)

Given:
Frequency of the wave (f) = 750 Hz
Speed of sound in the medium (v) = 375 m/s

Substitute the values:
λ = 375 m/s / 750 Hz
λ = 0.5 m

So, the wavelength of the wave is 0.5 m.

To determine the time it takes for one complete wave to pass a given point (time period), we can use the formula:
Time Period(T) = 1/Frequency(f)

Substitute the given frequency:
T = 1/750
T= 0.001333s

So, the time it takes for one complete wave to pass a given point is approximately 0.001 seconds.

**3.** b - The cochlea is the part of the inner ear that helps differentiate between different pitches of sound. It contains specialised hair cells that respond to different frequencies of sound vibrations. Different sections of the cochlea are responsible for detecting different frequencies, allowing us to perceive various pitches of sound.

**4.** a - Wavelength (λ) is calculated using the formula:
λ = Speed of radio waves (v) / Frequency (f)

Given:
Speed of radio waves (v) = $3 \times 10^8$ m/s
Frequency (f) = $98.5 \times 10^6$ Hz (98.5 MHz)

Substitute the values:
λ = $(3 \times 10^8$ m/s) / $(98.5 \times 10^6$ Hz) ≈ 3.05 m

So, the correct answer is option a) 3. 05 m.

**5.** b - Better sound quality in a concert hall is often achieved by minimising the effects of echoes, reverberation, and standing waves. Irregularly shaped walls can help diffuse sound waves and prevent the formation of strong reflections and standing wave patterns. Soft surfaces, such as acoustic panels and draperies, absorb sound energy, reducing reverberation and creating a more balanced and clear sound environment. This arrangement helps to minimise acoustic distortions and improve the overall sound quality for the audience.

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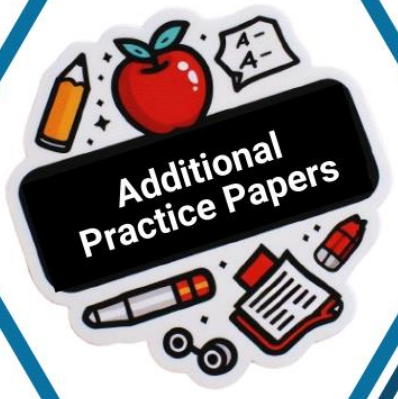


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