Science

(Chapter – 12) (Sound)

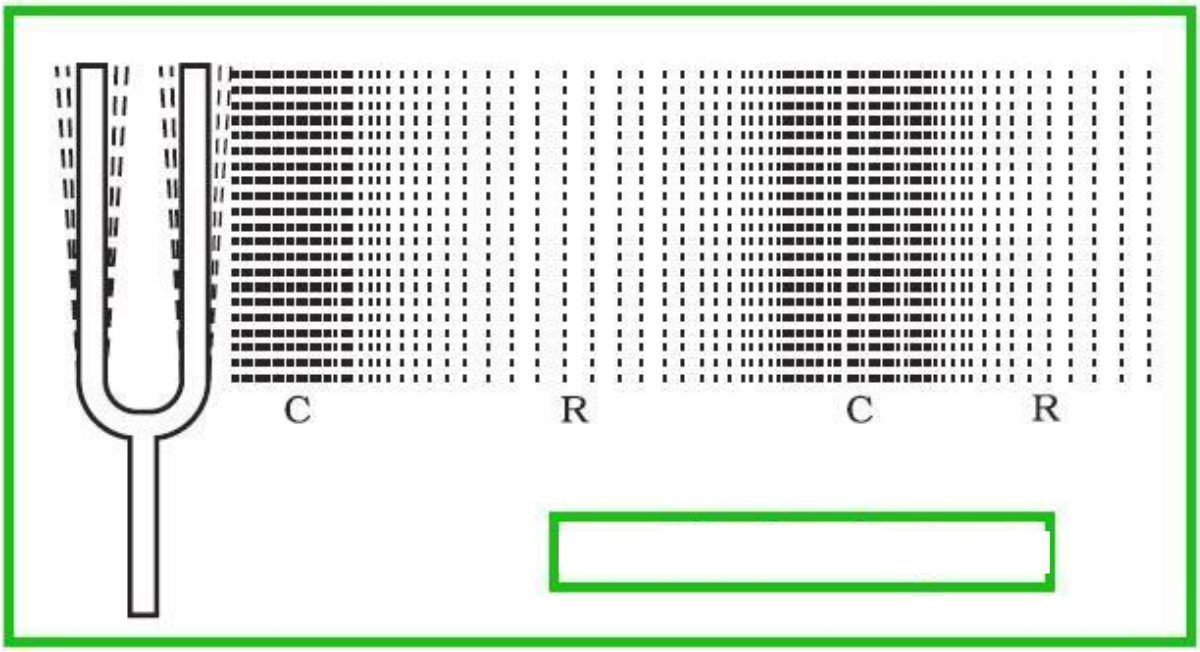
Page 162

Question 1:

How does the sound produced by a vibrating object in a medium reach your ear?

Answer 1:

When a body vibrates the air in its neighborhood is alternately compressed and rarefied. The compressed air has higher pressure than surrounding air. It therefore pushes the air particles near it causing compression to move forward. A rarefaction or low pressure is created at the original place. These compressions and rarefaction causes particles in the air to vibrate about their mean position. The energy is carried forward in these vibration. This is how sound travels.



Question 1:

Explain how sound is produced by your school bell?

Answer 1:

When the gong strikes the bell, vibrations are produced in the bell which are transmitted through the air to our ears. These vibration produce sensation of sound in our ears.

Question 2:

Why are sound waves called mechanical waves?

Answer 2:

Sound waves are called mechanical waves because they need a material medium to travel.

Question 3:

Suppose you and your friend are on the moon. Will you be able to hear any sound produced by your friend?

Answer 3:

On the moon, sound cannot travel as there is no atmosphere. Sound cannot travel in vacuum so we will not be able to hear any sound.

Question 1:

Which waves property determines

(a) loudness **(b)** pitch?

Answer 1:

a) Loudness is determined by the amplitude of the sound. Greater the amplitude more will be the loudness.

b) Pitch is determined by frequency. Higher is the frequency, greater will be the pitch.

Question 2:

Guess which sound has a higher pitch: guitar or car horn?

Answer 2:

Guitar

Question 1:

What are wavelength, frequency, time period and amplitude of a sound wave?

Answer 1:

Wavelength: The distances between two consecutive compressions or rarefaction of a wave. Its S.I unit is meter.

Frequency: One compression and one rarefaction constitutes one vibration. The number of vibration in a second is called frequency. Its unit is Hertz.

Amplitude: When waves are produced, the particles vibrate about their mean position. The maximum displacement from its mean position of a particle is called its amplitude. It is measured in meters.

Time period: The time taken by the wave to complete one oscillation i.e., the time between two consecutive compressions or rarefactions is called time period.

Question 2:

How are the wavelength and frequency of a sound wave related to its speed?

Answer 2:

Speed = Wavelength x frequency

$V = \lambda \times \nu$

Question 3:

Calculate the wavelength of a sound wave whose frequency is 220 Hz and speed is 440 m/s in a given medium.

Answer 3:

f = 220 Hz, V = 440 m/s

$\lambda = \frac{V}{f} = \frac{440}{220} = 2$ m

Question 4:

A person is listening to a tone of 500 Hz sitting at a distance of 450 m from the source of the sound. What is the time interval between successive compressions from the source?

Answer 4:

ν = 500 Hz.

Therefore T = $\frac{1}{500} s$ = 0.002 s

Question 1:

Distinguish between loudness and intensity of sound?

Answer 1:

Loudness and intensity both depend upon the amplitude of sound. But loudness is the physiological response of our ears to a particular frequency. Our ears are more sensitive to some frequencies as compared to others. Intensity is the amount of sound energy passing per second per unit area. It is proportional to square of amplitude.

Question 1:

In which of the three media, air, water or iron, does sound travel the fastest at a particular temperature?

Answer 1:

Sound travels faster in iron and slowest in air.

Question 1:

An echo returned in 3 s. What is the distance of the reflecting surface from the source, given that the speed of sound is 342 ms^{-1}?

Answer 1:

Time for echo = 3 s

v = 342 m/s

Therefore distance: d = v × t = 342×3 m = 513 m.

Question 1:

Why are the ceilings of concert halls curved?

Answer 1:

The ceilings of concert halls are curved so that after reflections from the surface, sound can reach each and every part of the hall.

Question 1:

What is the audible range of the average human ear?

Answer 1:

Audible range 20 Hz − 20,000 Hz

Question 2:

What is the range of frequencies associated with (a) Infra sound? (b) Ultrasound?

Answer 2:

(a) Infra-sound less than 20 Hz

(b) Ultra-sound greater than 20, 000 Hz.

Question 1:

A submarine emits a sonar pulse, which returns from an underwater cliff in 1.02 s. If the speed of sound in salt water is 1531 m/s, how far away is the cliff?

Answer 1:

$t = 1.02$ s, $v = 1531$ m/s

distance $d = v \times t = 1531 \times 1.022$ m $= 780.81$ m