Sound

Multiple Choice Questions

1. Note is a sound
(a) of mixture of several frequencies
(b) of mixture of two frequencies only
(c) of a single frequency
(d) always unpleasant to listen
Ans. (a) of mixture of several frequencies
Explanation: Note is a sound of mixture of several frequencies and is pleasant of hear.

2. A key of a mechanical piano struck gently and then struck again but much harder this time. In the second case
(a) sound will be louder but pitch will not be different
(b) sound will be louder and pitch will also be higher
(c) sound will be louder but pitch will be lower
(d) both loudness and pitch will remain unaffected
Ans. (a) sound will be louder but pitch will not be different
Explanation: The pitch depends on frequency of the particular key which is being hit and hence there would be no change in pitch of sound. Loudness depends on amplitude which will be more if key is struck harder.

3. In SONAR, we use
(a) ultrasonic waves
(b) infrasonic waves
(c) radio waves
(d) audible sound waves
Ans. (a) ultrasonic waves

4. Sound travels in air if
(a) particles of medium travel from one place to another
(b) there is no moisture in the atmosphere
(c) disturbance moves
(d) both particles as well as disturbance travel from one place to another.
Ans. (c) disturbance moves
Explanation: Propagation of sound does not require movement of particles. It only requires movement of disturbance from one particles to the next.

5. When we change feeble sound to loud sound we increase its
(a) frequency
(b) amplitude
(c) velocity
(d) wavelength
Ans. (b) amplitude

Explanation: Loudness of sound depends on amplitude and it increases when amplitude is increased.

6. In the curve (Fig.12.1) half the wavelength is

(a) AB
(b) BD
(c) DE
(d) AE

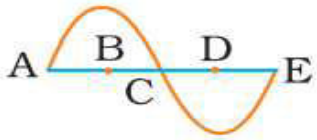


Fig. 12.1

Ans. (b) BD

Explanation: The distance between two consecutive peaks or two consecutive troughs is called wavelength. The figure shows one peak and one trough. Sum of widths of a peak and trough is also same as wavelength; which is AE in this case. Hence, BD is half the wavelength.

7. Earthquake produces which kind of sound before the main shock wave begins

(a) ultrasound
(b) infrasound
(c) audible sound
(d) none of the above

Ans. (b) infrasound

Explanation: It is due to infrasound that some animals get advanced warning of earthquake and show strange changes in their behaviour.

8. Infrasound can be heard by

(a) dog
(b) bat
(c) rhinoceros
(d) human beings

Ans. (c) rhinoceros

Explanation: Rhinoceros communicate using infrasound of as low frequency as 5 Hz.

9. Before playing the orchestra in a musical concert, a sitarist tries to adjust the tension and pluck the string suitably. By doing so, he is adjusting

(a) intensity of sound only
(b) amplitude of sound only
(c) frequency of the sitar string with the frequency of other musical instruments
(d) loudness of sound

Ans. (c) frequency of the sitar string with the frequency of other musical instruments

Explanation: Frequency of a particular musical instrumental should be in tune with that of other musical instruments. This helps in production of pleasant music. That is why artists usually adjust the frequencies at the start of a musical concert.

Sound

Short Answer Questions

10. The given graph (Fig.12.2) shows the displacement versus time relation for a disturbance travelling with velocity of 1500 ms^{-1}. Calculate the wavelength of the disturbance.

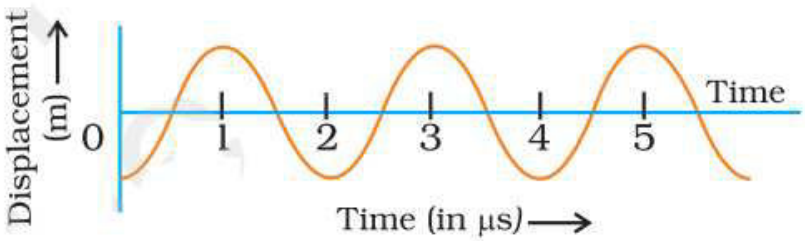


Fig. 12.2

Ans. From the graph
Time period, T = 2×10^{-6} s.
Frequency, v = 1/T = 5×10^5 Hz.
Wavelength, $\lambda = v / \nu = 5 \times 10^5 m.$

11. Which of the two graphs (a) and (b) (Fig.12.3) representing the human voice is likely to be the male voice? Give reason for your answer.

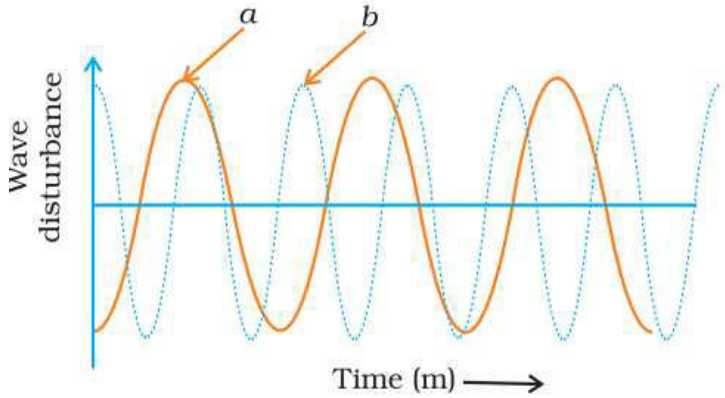


Fig. 12.3

Ans. Graph (a) represents the male voice. Usually the male voice has less pitch (or frequency) as compared to female.

12. A girl is sitting in the middle of a park of dimension 12 m × 12 m. On the left side of it there is a building adjoining the park and on right side of the park, there is a road adjoining the park. A sound is produced on the road by a cracker. Is it possible for the girl to hear the echo of this sound? Explain your answer.

Ans. If the time gap between the original sound and reflected sound received by the listener is around 0.1 s, only then the echo can be heard.

The minimum distance travelled by the reflected sound wave for the distinctly listening the echo.
= velocity of sound × time interval
 344×0.1
 $34.4m$
But in this case the distance travelled by the sound reflected from the building and then reaching to the girl will be (6 + 6) = 12 m, which is much smaller than the required distance. Therefore, no echo can be heard.

13. Why do we hear the sound produced by the humming bees while the sound of vibrations of pendulum is not heard?

Ans. Humming bees produce sound by vibrating their wings which is in the audible range. In case of pendulum the frequency is below 20 Hz which does not come in the audible range.

14. If any explosion takes place at the bottom of a lake, what type of shock waves in water will take place?

Ans. Longitudinal waves; because sound waves are longitudinal waves.

15. Sound produced by a thunderstorm is heard 10 s after the lightning is seen. Calculate the approximate distance of the thunder cloud. (Given speed of sound = 340 ms^{-1}.)

Ans. Speed of sound = 340 m/s and time = 10 s
Distance = speed × time = 340 × 10 = 3400 m

16. For hearing the loudest ticking sound heard by the ear, find the angle x in the Fig.12.4.

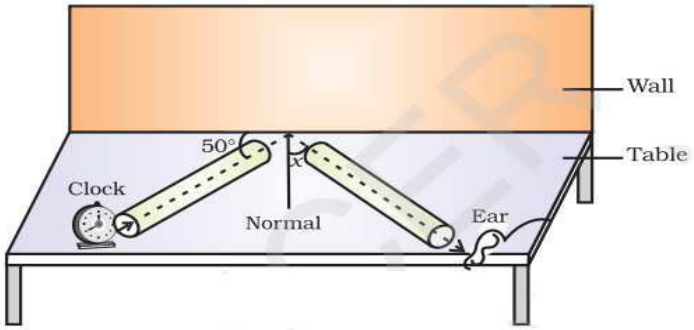


Fig. 12.4

Ans. Incident line is making an angle of 50^o with reflecting surface.
So, angle of incidence = $90^o - 50^o = 40^o$
Angle of reflection = angle of incidence
Hence, $\angle x = 40^o$

17. Why is the ceiling and wall behind the stage of good conference halls or concert halls made curved?

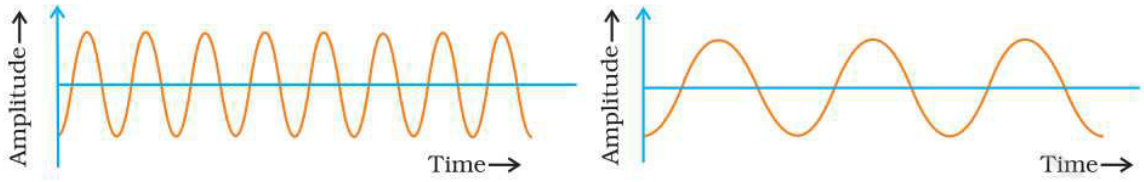
Ans. Ceiling and walls are made curved so that sound after reflection reaches the target audience.

Sound

Long Answer Questions

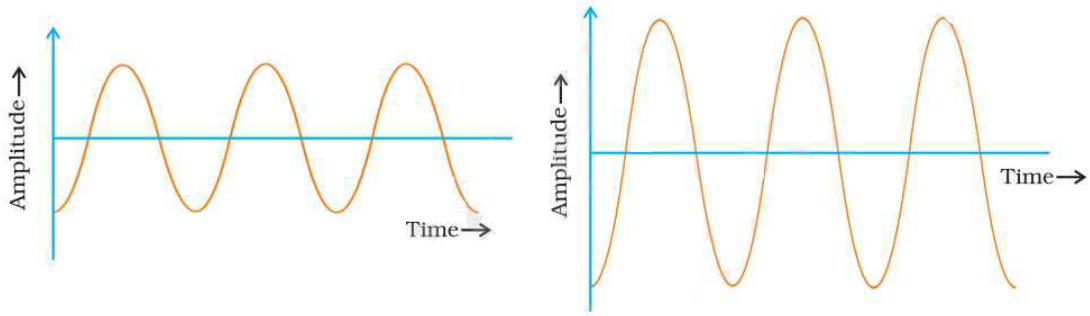
18. Represent graphically by two separate diagrams in each case
(i) Two sound waves having the same amplitude but different frequencies?
(ii) Two sound waves having the same frequency but different amplitudes.
(iii) Two sound waves having different amplitudes and also different wavelengths.

Ans. (i)



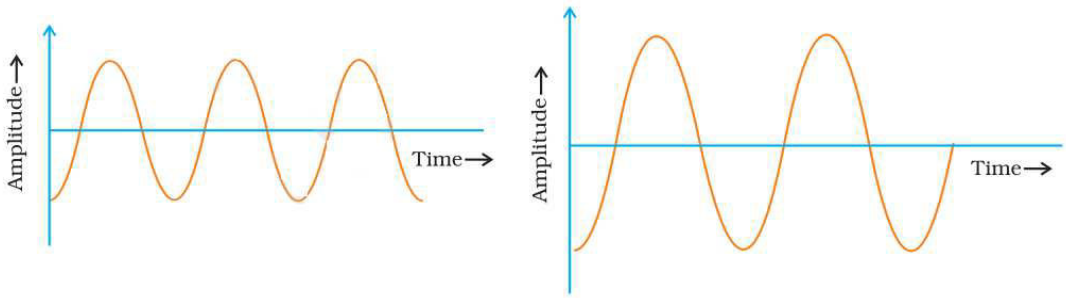
Same amplitude but different frequency

(ii)



Same frequency but different amplitude

(iii)



Different amplitudes and different wavelengths

19. Establish the relationship between speed of sound, its wavelength and frequency. If velocity of sound in air is 340 ms^{-1}, calculate
(i) wavelength when frequency is 256 Hz.
(ii) frequency when wavelength is 0.85 m.

Ans. Derivation of formula $v = \nu\lambda$.
(i) $340 = 256\lambda$

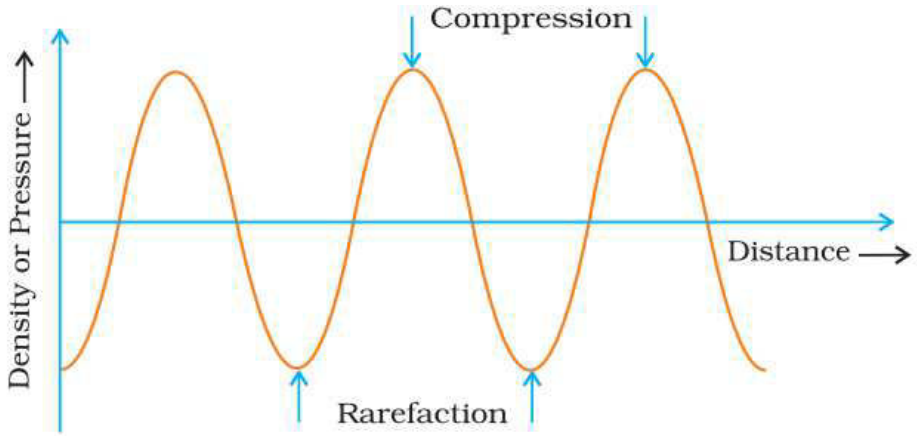
$\lambda = 1.33m.$

(ii) 340 = v (0.85)

$v = 400\,Hz$

20. Draw a curve showing density or pressure variations with respect to distance for a disturbance produced by sound. Mark the position of compression and rarefaction on this curve. Also, define wavelengths and time-period using this curve.

Ans.



Wavelength is the distance between two consecutive compressions or two consecutive rarefactions. Time period is the time taken to travel the distance between any two consecutive compressions or rarefactions from a fixed point.