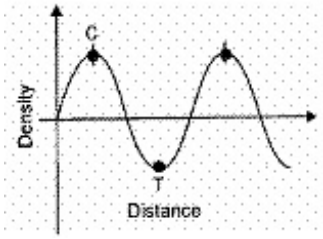
CBSE Test Paper 02

Chapter 12 Sound

1. The correct statement in the following is: **(1)**

   a. Sound waves and light waves are both longitudinal waves
   b. Sound waves are longitudinal and light waves are transverse
   c. Sound waves are transverse and light waves are longitudinal
   d. Both sound waves and light waves are transverse

2. The separation between T and C in the figure given is **(1)**



   a. $\frac{\lambda}{2}$
   b. λ
   c. 4λ
   d. 2λ

3. Statement A: Porpoises use ultrasound for navigation and location of food in dark
   Statement B: When you listen to music or watch TV at home, the noise level is 100-120 decibels.
   Which of the two statements is true? **(1)**

   a. Neither A or B.
   b. Statement A
   c. Both A and B
   d. Statement B

4. Which of following is incorrect-
   (A) SI Unit of frequency is hertz
   (B) SI Unit of wavelength is ms^{-1}

(C) SI Unit of velocity is ms^{-2}

(D) SI unit of time period is sec

a. (A) and (B) are incorrect
b. (A), (B) and (C) are incorrect
c. (B) and (C) are incorrect
d. All of these

5. SI unit of frequency is:- **(1)**

a. $(second)^2$
b. second
c. $second^{-2}$
d. Hertz

6. Light is a:- **(1)**

a. Transverse wave
b. Longitudinal wave
c. None
d. Both

7. Match the following with correct response. **(1)**

Column A	**Column B**
(1) Sound waves	(A) Shock waves
(2) Radio waves	(B) Longitudinal waves
(3) Supersonic jet	(C) Elastic waves
(4) Mechanical waves	(D) Transverse waves

a. 1-D, 2-A, 3-C, 4-B
b. 1-B, 2-D, 3-A, 4-C
c. 1-A, 2-C, 3-B, 4-D
d. 1-C, 2-B, 3-D, 4-A

8. Why is sound wave called a longitudinal wave? **(1)**

9. What are mechanical waves? **(1)**

10. What do you understand by low pitched and high pitched sound? **(1)**

11. Distinguish between loudness and intensity of sound. **(3)**

12. Two children are at opposite ends of an aluminium rod. One strikes the end of the rod with a stone. Find the ratio of times taken by the sound wave in air and in aluminium to reach the second child. **(3)**

13. The wavelength of waves produced on the surface of water is 20 cm. If the wave velocity is 24 ms^{-1}, calculate **(3)**
    (a) the number of waves produced in one second
    (b) the time required to produce one wave.

14. A boy hears the echo of his own voice from a distant hill after 0.8 second. If the speed of sound in air is 340 m/s, calculate the distance of hill from the boy. **(3)**

15. Describe how the human ear works. **(5)**

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Answers

1. b. Sound waves are longitudinal and light waves are transverse
   Explanation: Sound waves are mechanical and elasticity based and hence longitudinal. Light waves are electromagnetic and are transverse.
2. a. $\frac{\lambda}{2}$
   Explanation: Wavelength is the length between two consecutive peaks, i.e. crest or two consecutive valleys, i.e. trough of a wave. Wavelength is represented by Greek letter λ (lambda). So, the separation between T and C is $\frac{\lambda}{2}$.
3. b. Statement A
   Explanation: Bat and porpoises use ultrasound for navigation and location of food in the dark. They contain ultrasound producing organs and receiver that help them to judge the position and location of food and predator.
   Music and TV sounds that we hear have noise level below 90 decibels.
4. c. (B) and (C) are incorrect
   Explanation: SI unit of wavelength is metre (m) and velocity is ms^{-1}.
5. d. Hertz
   Explanation: The SI unit of frequency is the hertz (Hz), named after the German physicist Heinrich Hertz; one hertz means that an event repeats once per second.
6. a. Transverse wave
   Explanation: Light is a transverse wave because its components vibrate perpendicular to the direction of propagation.
7. b. 1-B, 2-D, 3-A, 4-C
   Explanation: Sound waves in air (and any fluid medium) are longitudinal waves.
   Waves that vibrate at right angles to their direction of propagation are transverse waves. Radio waves are one kind of transverse wave.
   Sonic booms are the result of shockwaves created by aircraft flying through the

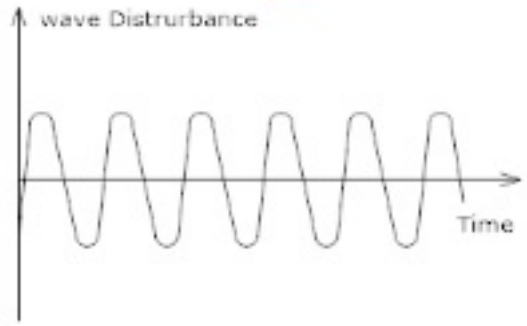
atmosphere faster than the speed of sound. Supersonic jets travels faster than the speed of sound.

Mechanical waves can be produced only in media which possess elasticity and inertia. Once this initial energy is added, the wave travels through the medium until all its energy is transferred. In contrast, electromagnetic waves require no medium, but can still travel through one.

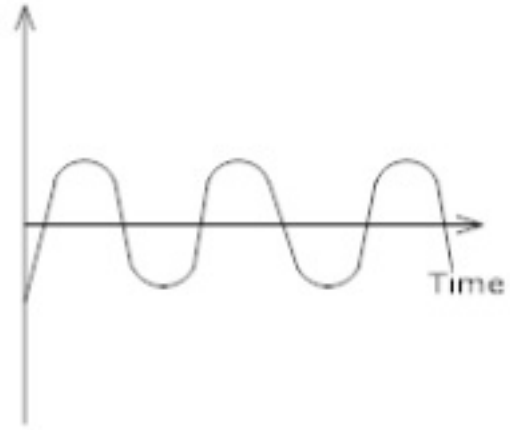
8. Sound wave is called a longitudinal wave because sound waves travel in the air through compressions and rarefactions.

9. Waves that are characterised by the motion of particles in a medium are called mechanical waves. Mechanical waves require material medium for their propagation.

10. High pitch sound is those sound which has a higher frequency that is in 1 second they complete a large number of vibrations.



Low pitch sound is those sound which has a lesser frequency that is in 1 second they complete less number of vibrations.



11.
- Sound intensity is a property of the sound source but loudness depends on the sound source, the medium and the receiver, as well.
- Sound intensity holds a small significance in problems involving human

hearing system, but loudness is a very important property to consider in such problems.

- Sound intensity is measured in Watt per square meter whereas loudness is measured in Sones.

12. Since speed of sound in air = 344 m/s
and speed of sound in aluminium = 6420 m/s
we know that v = distance/time therefore time = d/v
time taken by sound wave in air/time taken by sound wave in aluminium
= d/344: d/6420 = 6420/344 = 18.66/1
the sound will take 18.66 times more time through air than in aluminium in reaching other boy.

13. Given, wavelength, λ = 20 cm = 0 ? 20 m, wave velocity, v =24 ms^{-1}
(a) From the relation, $v = v\lambda$
$v = \frac{v}{\lambda}$
$\frac{24}{0.20}$ waves per second
(b) Time period, T = $\frac{1}{v}$ = $\frac{1}{120}$ second
= 8.33 $\times$ 10^{-3} seconds.

14. Let 5 be the distance of the hill from the boy and t the time of to and fro journey of sound waves, then from relation
Distance = Velocity $\times$ Time
We have,
$2s = vt$
s = $\frac{vt}{2}$
Here, v= 340 m/s, t = 0.8 s
s = $\frac{340 \times 0.8}{2}$
$340 \times 0.4m$
= 136 m

15. The outer ear is called ‘pinna’. It collects the sound from the surroundings. The collected sound passes through the auditory canal. At the end of the auditory canal there is a thin membrane called the ear drum or tympanic membrane. When a compression of the medium reaches the eardrum the pressure on the outside of the

membrane increases and forces the eardrum inward. Similarly, the eardrum moves outward when a rarefaction reaches it. In this way the eardrum vibrates. The vibrations are amplified several times by three bones (the hammer, anvil and stirrup) in the middle ear. The middle ear transmits the amplified pressure variations received from the sound wave to the inner ear. In the inner ear, the pressure variations are turned into electrical signals by the cochlea. These electrical signals are sent to the brain via the auditory nerve, and the brain interprets them as sound.