

PHYSICS CLASS-7
CHAPTER- 6: SOUND
SUMMARY

- Sound is a form of energy, which gives us a sensation of hearing in our ears.
- Sound is longitudinal wave that is produced by a vibrating body, but all the vibrating bodies do not produce sound which we can hear.
- Sound can be created or transmitted only in a medium, such as a gas, liquid, or solid.
- Sound cannot exist in vacuum.
- Sound is not a mass movement of air; such as occurs on a windy day. Each molecule executes oscillatory motion about a fixed location.
- Any object that vibrates mechanically produces sound.
- As a body vibrates it pushes the air near its surface, thereby producing compressions (high density regions) and rarefactions (low density regions).
- When the pressure wave reaches the ears it presses the eardrum which begins to vibrate, producing the sensation of hearing. Some of the sources of sound are human vocal cords, tuning fork, stringed instruments, drums, bells, etc.
- Sound is produced by a vibrating body but not all vibrating bodies produce sound which we can hear.
- Each cycle of a sound wave includes one compression and one rarefaction.
- Many experiments have shown that generally humans can hear sound frequencies in the range from approximately 20 to 20,000 Hz (20 kHz). This range of frequency is called the audible range.
- Sound can be generated whose frequency lies below 20Hz or above 20kHz, although humans normally do not hear it.
- Sound waves whose frequencies lie above 20 kHz are called ultrasonic waves, while those with frequencies below 20 Hz are called infrasonic waves.
- Some dogs hear frequencies as high as 30 kHz and can respond to dog whistles that human cannot hear. These whistles are called Galton whistle.
- Bats can hear higher frequencies and depend on higher frequency sound for locating prey and navigating. While, lower frequencies (infrasonic sound waves) are produced by a vibrating pendulum, whales, elephants and earthquakes.
- The larynx is the body's voice box, containing the vocal cords, which vibrate to produce speech. The vocal cords vibrate when someone speaks and the sounds produced are modified by the throat, nose and mouth.
- The chambers which give resonance to voice include the whole mouth chamber, the nose, the pharynx and a lesser degree the chest cavity.
- The pitch of sound is changed by the muscles attached to the vocal chords. When the vocal chords are taut and thin, sound of high frequency (or shrill sound) is produced and when the vocal chords are relaxed and thick, low frequency (or bass) sound is produced.
- Sound is a mechanical wave that is created by vibrating object.
- Longitudinal waves are waves in which the motion of the individual particles of the medium are in a direction that is parallel to the direction of energy transport.
- Sound waves in air are longitudinal waves because particles of the medium through which the sound is transported vibrate parallel to the direction that the sound wave moves.

- Vibration involves to-and-fro motion of the diaphragm of a speaker about a fixed point, called the mean position.
- The region of high pressure, the density of air is higher than normal, is called a compression.
- The region of low pressure, the density of air is lower than the normal, is called a rarefaction.
- The to-and-fro motion of its diaphragm creates a series of compressions and rarefactions in the air between the diaphragm and the listener.
- The amplitude 'a' of a wave is the distance from the mean position of the wave to the top of a crest or to the bottom of a trough. It is measured in metre (m).
- The loudness of sound depends on the amplitude of vibration producing that sound.
- The greater the amplitude of vibration, louder is the sound.
- The amplitude is perceived by our ears as loudness.
- The frequency, f , of a wave is the number of waves passing a point in a certain time. It is measured in Hertz (Hz).
- Those sounds which have a high frequency are called high pitch sounds and those having a low frequency are called low pitch sounds. In a music band, the bass drums' sound is a low pitch while the shrill tinkle is high pitched sound.
- The sounds which have a high intensity are called loud sounds while those which have low intensity are called soft sounds. Chirping of birds is soft sound while Jet plane flying low produces a loud sound.
- Similar to mechanical waves, sound also requires a medium to propagate. It cannot propagate in vacuum.
- Since there is no medium on moon, so one cannot hear the sound produced by the other on moon.
- A sound wave can be controlled in one of the three different ways- it can be reflected, diffused or absorbed.
- Sound is bounced off a surface. This is termed as reflection of sound.
- The sound, which comes back after reflection from far off object, is known as an echo.
- If you can always control the way sound is reflected, then this type of soundproofing can be effective. Reflective barriers are a good way to block out exterior noise.
- When a sound wave hits a particular surface, the kinetic energy driving it is converted into a small amount of heat energy which dissipates, taking power from the sound wave and causing it to die faster. This is a kind of sound insulation provided by things like foam and rubber.
- Absorption performance varies a lot based on the frequency of the sound and the absorptive capabilities of the material.
- Hard materials like metallic sheets, hard plywood, plane mirrors, tiles, marble slabs, etc. are good reflectors of sound, whereas porous and soft materials like thermocol, carpet, paper, clothes, etc. are good absorbers of sound.
- The applications of sound are: speaking tube, ear trumpet and sound boards. The phenomenon of reflection of sound is put into use in these instruments.
- Sound travels slowest in gases, faster in liquids and fastest in solids.
- Sound travels better in liquids than in air.
- The speed of sound in air is about 343 m/s.
- Sound travels more than four times faster in water and more than seven times faster in steel than does in air.
- The speed of sound in air depends upon on the nature of the medium, its temperature, its density and its humidity.

WORKSHEET

A. State whether the statement is true or false.

1. Sound waves are transverse waves.
2. In sound waves, movement of particles occurs.
3. Sound waves are material waves.
4. Direction of propagation of is a direction of energy.
5. Rarefactions are less dense regions of air particles.
6. The absorption of sound is known as echo.
7. We cannot talk on the surface of the moon.
8. The sound travels fastest in gases.
9. The sound cannot travel through vacuum.
10. With the increase in amplitude of the sound wave, loudness increases.

B. Choose the correct option:

1. Wave is a:
 - a) Movement of particles
 - b) Travelling of energy
 - c) Vibration of particles
 - d) Static energy

2. Direction of propagation of wave means:
 - a) Flow of wave
 - b) Direction in which energy of wave is moving
 - c) Direction of electric field
 - d) Direction of vibration

3. Compression means:
 - a) Movement of air molecules away from each other
 - b) Increase in density of air molecules
 - c) Decrease in density of air molecules
 - d) None of these.

4. Sound can travel through
 - a) Gases,
 - b) Solids,
 - c) Liquids,
 - d) Solids, liquids and gases.

5. The loudness of a sound is determined by
 - a) Amplitude of vibration
 - b) Ratio of amplitude and frequency of vibration
 - c) Frequency of vibration
 - d) Product of amplitude and frequency of vibration.

6. Sound cannot travel through
 - a) Gases,
 - b) Liquids,
 - c) Solids,
 - d) Vacuum.

7. The number of vibrations per unit time is called
 - a) Length,
 - b) Time period
 - c) Frequency
 - d) Loudness

8. Audible frequency range of human ear is:
 - a) 34 Hz – 34 kHz
 - b) 3.4 kHz – 30 kHz
 - c) 20 Hz – 20,000 kHz
 - d) None of these

C. Fill in the blanks:

1. Sound wave is a _____ wave.
2. Direction of propagation is a direction in which _____ travels.
3. Sound requires a _____ for propagation.
4. The reflected sound is called _____.
5. Sound travels faster in _____ than liquids.
6. Hard surfaces _____ sound.
7. Porous surfaces are good _____ of sound.
8. Those sounds having high _____ are called high pitch sounds.
9. Longitudinal wave is a wave in which direction of _____ is parallel to direction of _____ of particles.
10. Frequency of wave means number of _____ in _____.

D. Match the following:

<u>Column A</u>	<u>Column B</u>
1. Amplitude	(a) bouncing back of wave
2. Frequency	(b) range of wave
3. Wavelength	(c) loudness
4. Reflection	(d) Number of vibrations in 1 second
5. Absorption	(e) Sound wave
6. Longitudinal wave	(f) Porous surface

E. Choose the odd one out:

1. Longitudinal wave, light, sound.
2. 30 kHz, Galton Whistles, 20 kHz.
3. High pitch sound, relaxed, vocal cord, taut.
4. Speaking tube, reflection, absorption.
5. Compression, rarefaction, high pressure.
6. Air, 343 m/s, liquids, speed of sound.

F. Give one-word answer:

1. Bouncing off sound wave.
2. Distance from the mean position to the top of crest.
3. Number of waves passing through a point per second.
4. Region of low density.

G. Define:

1. Longitudinal wave
2. Pitch
3. Amplitude
4. Frequency
5. Wavelength
6. Propagation of wave

H. Short Answer Type Questions:

1. What is sound and how it is produced?
2. Why sound wave is called longitudinal wave?
3. What is the relation between amplitude and loudness of sound?
4. Compare the speed of sound in solids, liquids and gases.
5. Why speed of sound is maximum in solids?
6. How compressions are different from rarefactions?
7. Speed of sound depends upon which parameters?
8. Give reason:
 - i) Big auditoriums are carpeted.
 - ii) Sound cannot reach us from space.

I. Long Answered Type Questions:

1. How is sound produced by human beings?
 2. What are the applications of reflection of sound? Explain one application in details.
 3. Describe an experiment to prove that sound cannot travel through vacuum.
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