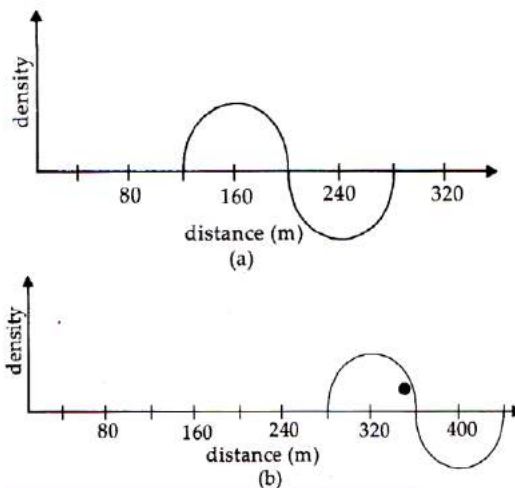


Sound

EXERCISE

Multiple Choice Questions

- Which is not the condition for hearing sound?
(a) There must be a vibrating body capable of transferring energy.
(b) There must be a material medium to pick up and propagate energy.
(c) The medium must have a large density.
(d) There must be receiver to receive the energy and interpret it.
- An instrument commonly used in laboratory to produce a sound of some particular frequency is
(a) sonar (b) electric bell
(c) tuning fork (d) a stretched wire
- When a sound wave travels in air, the physical quantity which is transferred from one place to the other is
(a) mass (b) force
(c) momentum (d) energy
- In case of longitudinal waves, the particles of medium vibrate
(a) in the direction of wave propagation
(b) opposite to the direction of wave propagation
(c) at right angles to the direction- of wave propagation
(d) none of the above
- In case of transverse waves the particles of a medium vibrate
(a) in the direction of wave propagation
(b) opposite to the direction of wave propagation
(c) at the right angles to the direction of wave propagation
(d) none of the above
- In the region of compression or rarefaction, in a longitudinal wave the physical quantity which does not change is
(a) pressure (b) mass
(c) density (d) volume
- A slinky can produce in laboratory
(a) transverse waves only
(b) longitudinal waves only
(c) both (a) and (b)
(d) none of the above
- The change in density/pressure of a medium from maximum value to minimum value and again to maximum value, due to the propagation of a longitudinal wave is called a complete
(a) oscillation (b) frequency
(c) amplitude (d) none of the above
- If the frequency of a wave is 25 Hz, the total number of compressions and rarefactions passing through a point in 1 second is
(a) 25 (b) 50
(c) 100 (d) none of the above
- A stretched slinky is given a sharp push along its length. A wave travels from one end to another. The wave so produced is
(a) transverse wave (b) longitudinal wave
(c) stationary wave (d) none of the above
- The sound waves having a frequency more than 20,000 Hz are called
(a) infrasonic waves (b) supersonic waves
(c) ultrasonic waves (d) hypersonic waves
- A boy sitting in a boat fires a gun. An observer P is at a distance of 50 m from the boat. Another observer Q is a diver, who is 50 m under water.
Both hear the sound of gun
(a) P hears the sound first
(b) Q hears the sound first
(c) Both P and Q hear the sound at the same time
(d) none of the above
- Calculate the wavelength of radio waves of frequency 109 Hz. The speed of radio waves is $3 \times 10^8 \text{ m s}^{-1}$
(a) 60 cm (b) 40 cm
(c) 30 cm (d) 10 cm
- A wave pulse moving through air causes Change in the density of the air. The variation of density at two different instants are shown in the figure. The figure (a) corresponds to, $t = 10 \text{ s}$ and figure (b) to $t = 10.5 \text{ s}$.



The speed of the wave pulse is

- (a) 520 m s^{-1} (b) 320 m s^{-1}
(c) 300 m s^{-1} (d) 200 m s^{-1}
15. A wave source produces 20 crests and 20 troughs in 0.2 sec. Find the frequency of the wave.
(a) 200 Hz (b) 500 Hz
(c) 100 Hz (d) 300 Hz
16. If the density of air at a point through which a sound wave is passing is maximum at an instant, the pressure at that point will be
(a) minimum
(b) same as the density of air
(c) equal to the atmospheric pressure
(d) maximum
17. An object moving at a speed greater than that of sound is said to be moving at
(a) ultrasonic speed (b) sonic speed
(c) infrasonic speed (d) supersonic speed
18. Ultrasonic waves are used for detecting objects under water. What technique/device is used for this?
(a) Ultrasonography
(b) Echocardiography
(c) Phakoemulsification
(d) Sonar
19. In which of the three media; air, water and steel does sound travel the fastest?
(a) air (b) water
(c) steel (d) none of these
20. A sound wave has a frequency of 1000 Hz and a wave length of 34 cm. How long will it take to travel 1 km?
(a) 3.20 s (b) 2.94 s
(c) 5.94 s (d) 3.10 s
21. An object is 11 km below sea level. A research vessel sends down a sonar signal to confirm this depth. After how long can it expect to get the echo? (Take the speed of sound in sea water as $1,520\text{ m s}^{-1}$.)
(a) 15.30 s (b) 14.47 s
(c) 12.20 s (d) 11.13 s
22. Which of the following is an elastic wave?
(a) Sound waves (b) Light waves
(c) X-rays (d) Radio waves
23. A big explosion on the moon cannot be heard on the earth because
(a) the explosion produces high frequency sound waves which are inaudible
(b) sound waves required a material medium for propagation
(c) sound wave are absorbed in the moon's atmosphere
(d) sound waves are absorbed in the earth's atmosphere
24. Two waves having sinusoidal waveforms have different wavelengths and different amplitude. They will be having
(a) same pitch and different intensity
(b) same quality and different intensity
(c) different quality and different intensity
(d) same quality and different pitch
25. A source of sound of frequency 600 Hz is placed inside water. The speed of sound in water is 1500 m s^{-1} and in air is 300 m s^{-1} . The frequency of sound recorded by an observer who is standing in air is
(a) 200 Hz (b) 300 Hz
(c) 120 Hz (d) 600 Hz
26. Each of the properties of sound listed in column A primarily depends on one of the quantities in column B. Choose the matching pairs from two columns.
- | Column A | Column B |
|---|---------------------------------------|
| Pitch | Waveform |
| Quality | Frequency |
| Loudness | Intensity |
| (a) Pitch-waveform, Loudness-intensity | Quality-frequency, Quality-waveform, |
| (b) Pitch-frequency, Loudness-density | Loudness-density, Quality-waveform, |
| (c) Pitch-intensity, Loudness-frequency | Quality-waveform, Loudness-frequency |
| (d) Pitch-waveform, Loudness-frequency | Quality-intensity, Loudness-frequency |
27. A light pointer fixed to one prong to a tuning fork touches a vertical plate. The fork is set vibrating and the plate is allowed to fall freely. If eight oscillations are counted when the Plate falls through 10 cm, the frequency of the tuning fork is
(a) 360 Hz (b) 280 Hz
(c) 560 Hz (d) 56 Hz
28. A person is listening to a tone of 500 Hz, sitting at a distance of 450 m from the source of sound. The time interval between successive compressions from the source is
(a) 0.2 s (b) 0.02 s
(c) 0.002 s (d) 2.0 s

29. An echo is returned in 3 s. If the speed of sound is 342 m s^{-1} , then the distance between the source of sound and the reflecting body is
(a) 351 m (b) 513 m
(c) 153 m (d) none of the above
30. A submarine emits a sonar pulse, which returns from under water cliff in 1.02 s. If the speed of sound in water is 1531 m s^{-1} , the submarine is at a distance of
(a) 780.8 m from cliff (b) 718.8 m from cliff
(c) 714.8 m from cliff (d) none of the above
31. The minimum hearing range for a normal ear is 20 Hz. The wavelength associated with this range when velocity of sound is 344 m s^{-1} is
(a) 16.2 m (b) 17.2 m
(c) 17.4 m (d) 17.3 m
32. A person can hear a sound of maximum frequency 20,000 Hz. If the speed of sound in air is 344 m s^{-1} , the wavelength is
(a) 0.176 m (b) 0.178 m
(c) 0.0172 m (d) 0.0176 m
33. The wavelength of ripples produced on the surface of water is 0.14m. If the speed of ripples is 42 m s^{-1} , the number of ripples produced per second are
(a) 290 (b) 310
(c) 300 (d) 280
34. The highest frequency produced by a man is 1700 Hz and that of a woman is 2780 Hz. The ratio of wave lengths of sound of man and woman are (speed of sound is 340 m s^{-1})
(a) 1 : 0.60 (b) 1 : 0.61
(c) 1 : 0.62 (d) 1 : 0.59
35. The wavelength and frequency of a sound wave in medium A is 20 cm and 1650 Hz. Keeping the medium same, if wavelength is changed to 16 cm, then new frequency is
(a) 2060 Hz (b) 2062.5 Hz
(c) 2061 Hz (d) 2063.0 Hz
36. A boy stands 66.4 m in front of a high wall and then blows a whistle. If speed of sound is 332 m s^{-1} , the echo is heard after
(a) 0.45 s (b) 0.48 s
(c) 0.40 s (d) 0.46 s
37. A man stands between two cliffs and fires a gun. He hears two successive echoes after 3 s and 5 s. The distance between two cliffs is
(a) 1310 m (b) 1320 m
(c) 1315m (d) 1312m
38. A boat at anchor is rocked by the waves, such that the distance between two consecutive crests is 100 m. If the wave velocity is 20 m s^{-1} the frequency of rocking boat is
(a) 2 Hz (b) 1 Hz
(c) 0.5 Hz (d) 0.2 Hz
39. Water waves are
(a) longitudinal (b) transverse
(c) both longitudinal and transverse
(d) neither longitudinal nor transverse
40. Human ear cannot hear those mechanical waves whose frequency lies in the frequency range
(a) less than 100 Hz but greater than 10000 Hz
(b) between 1000 Hz and 5000 Hz
(c) between 500 Hz and 20000 Hz
(d) less than 20 Hz and more than 20000 Hz
41. An echo repeats two syllables. If the velocity of sound is 330 m s^{-1} , then the distance of The reflecting surface is
(a) 66.0 m (b) 33.0 m
(c) 99.0 m (d) 16.5 m
42. A plane wave of sound travelling in air is incident upon a plane water surface. The angle of incidence is 30° . If the velocity of sound in water is 1400 m s^{-1} , and the velocity of sound in air is 330 m s^{-1} , there will be
(a) Reflection only
(b) Refraction only
(c) both reflection and refraction
(d) neither reflection nor refraction
43. Which one of the following properties of sound is affected by change in the air temperature?
(a) frequency (b) amplitude
(c) intensity (d) wavelength
44. In a stationary wave, the particle velocity at the nodal point is
(a) zero (b) maximum
(c) minimum but non zero
(d) none of the above
45. The distance between any two consecutive nodes or antinodes in a stationary wave of wavelength λ is
(a) λ (b) $\lambda / 2$
(c) $\lambda / 4$ (d) $\lambda / 8$
46. If you go on increasing the stretching force on a wire in a guitar, its frequency
(a) increases (b) decreases
(c) remains unchanged
(d) none of the above

47. A simple pendulum has a metal bob which is negatively charged. If it is allowed to oscillate above a positively charged metallic plate then its time period will
 (a) increase (b) decrease
 (c) remains the same (d) become zero
48. The velocity of sound in vacuum is
 (a) 332 m s^{-1} (b) 330 m s^{-1}
 (c) 288 m s^{-1} (d) 0
49. Longitudinal wave cannot travel through
 (a) vacuum (b) solids
 (c) liquids (d) gases
50. A bomb explodes on the moon. How long will it take for the sound to reach the earth?
 (a) 10 seconds (b) 1000 seconds
 (c) 1 day (d) none of these
51. A pendulum vibrates with a time period of 1 second. The sound produced by it is
 (a) supersonic (b) audible
 (c) infrasonic (d) ultrasonic
52. Flash and thunder are produced simultaneously. But thunder is heard a few seconds after the flash is seen. This is because
 (a) speed of sound is greater than speed of light
 (b) speed of sound is equal to the speed of light
 (c) speed of light is much greater than the speed of sound
 (d) none of these
53. During night, distant sounds such as that of the traffic and the loudspeakers become louder than during day. This is due to
 (a) reflection of sound waves
 (b) refraction of sound waves
 (c) absence of other sounds
 (d) clear perception of hearing
54. A source of wave produces 40 crests and 40 troughs in 0.4 seconds. Find the frequency of the wave?
 (a) 100 Hz (b) 50 Hz
 (c) 25 Hz (d) 10 Hz
55. A person is listening to sound of 50 Hz sitting at a distance of 450 m from the source of sound. What is the time interval between successive compressions of the sound from the source reaches him?
 (a) 0.02 s (b) 0.025 s
 (c) 0.0025 s (d) 0.15 s
56. A boat at anchor is rocked by waves whose consecutive crests are 100 m apart. The wave velocity of the moving crests is 20 m/s. What is the frequency of rocking of the boat?
 (a) 2 s^{-1} (b) 0.2 s^{-1}
 (c) 0.1 s^{-1} (d) 0 s^{-1}
57. A longitudinal wave is produced on a toy slinky. The wave travels at a speed of 30 cm s^{-1} and the frequency of the wave is 20 Hz. What is the minimum separation between the consecutive compressions of the slinky?
 (a) 1.0 cm (b) 1.5 cm
 (c) 2.5 cm (d) 3.0 cm
58. A gun is fired in the air at a distance of 660 m from a person. He hears the sound of the gun after 2 s. What is the speed of sound?
 (a) 330 m s^{-1} (b) 360 m s^{-1}
 (c) 370 m s^{-1} (d) 390 m s^{-1}
59. A child hears an echo from a cliff 4 seconds after the sound from a powerful cracker is produced. How far away is the cliff from the child? Velocity of sound in air at 20°C is 344 m s^{-1}
 (a) 688 m (b) 672 m
 (c) 660 m (d) 650 m
60. A ship sends on a high frequency sound wave and receives an echo after 1 second. What is the depth of the sea? Speed of sound in water is 1500 m/s.
 (a) 700 m (b) 750 m
 (c) 800 m (d) 850 m
61. Sound travels at a speed of 334 m s^{-1} in air. this means that
 (a) the source of sound moves 334 m in one second
 (b) the listener moves 334 m in one second
 (c) air moves 334 m in one second
 (d) the disturbance in air moves 334 m in one second
62. Non-mechanical wave can travel
 (a) in vacuum as well as in a medium
 (b) in vacuum but not in a medium
 (c) in medium but not in vacuum
 (d) neither in a medium nor in vacuum
63. A boat anchor is rocked by waves whose crests are 100 m apart and whose velocity is 25 m s^{-1} . The wave strike the boat once every
 (a) 2 s (b) 0.25 s
 (c) 3s (d) 4 s
64. A source of frequency 500 Hz emits waves of wavelength 0.2 m. How long does it take the wave to travel 300 m?

- (a) 7 s (b) 6 s
(c) 12 s (d) 3 s
65. When sound waves travelling in air enter into water, the following remains constant?
(a) amplitude (b) frequency
(c) wavelength (d) velocity
66. If ultrasonic, infrasonic and audio waves travel through a medium with speed v_1, v_2 and v_3 respectively, then
(a) $v_1 = v_2 = v_3$ (b) $v_1 > v_3 > v_2$
(c) $v_1 < v_3 < v_2$ (d) $v_3 \leq v_1$ and $v_1 = v_3$
67. Ultrasonic waves are produced by
(a) Piezoelectric effect (b) Peltier effect
(c) Doppler effect (d) Coulomb's law
68. The minimum distance between the source of sound and the obstacle for an echo to take place is
(a) 17.2 m (b) 1.72 m
(c) 17 cm (d) 34.4 m
69. The wavelength of a sound wave in air corresponding to a frequency of 20 Hz is
(a) 1.7 m (b) 17 m
(c) 1.7 cm (d) 17 cm
70. The wavelength of sound wave corresponding to a frequency of 20 kHz is
(a) 1.7 cm (b) 17 cm
(c) 1.7 m (d) 17 m
71. Sound waves of wavelength λ travel from a medium in which their speed is v into a medium in which their speed is $4v$. The wavelength of the sound in the second medium is
(a) λ (b) 2λ
(c) 4λ (d) 3λ
72. The amplitude of a sound is doubled and the frequency is reduced to one fourth. The intensity of sound at the same point will be
(a) increased by a factor of 2
(b) increased by a factor of 4
(c) decreased by a factor of 2
(d) decreased by a factor of 4

FILL IN THE BLANKS

- Sound waves are..... waves.
- waves consist of compressions and rarefactions.
- A wave of short duration is called a.....
- The frequency of a wave does not depend upon the..... of the medium through which it passes.

- The SI unit of time period is.....
- is the SI unit of frequency.
- Sound navigation and ranging is abbreviated as.....
- Sound waves of frequency less than 20 Hz are waves.
- Wave motion carries..... from one place to another place in a medium.
- travel through air.
- When you hit a drum you make the skin.....
- Vibrations of high frequency have a larger..... than vibrations of lower frequency.
- Reflected sound waves are called.....
- Larger vibrations have..... amplitude.
- Jal tarangis an example of..... instruments.
- Sound travels fastest in..... and slowest in

TRUE OR FALSE

- During a wave motion, energy is transferred from one point to another.
- In any medium, the speed of electromagnetic waves is lesser than that of sound waves.
- A transverse wave consists of crests and troughs.
- Transverse waves can propagate through any medium.
- Sound waves require a medium for their propagation.
- All sound waves are caused by vibrations.
- In a metal, the sound waves that propagate are always transverse.
- Wavelength is measured in Hertz.
- Since sound waves can travel through air, and air can transmit only transverse waves, it follows that sound travels as transverse waves,
- Light is a longitudinal wave.
- Wave velocity is equal to particle velocity.
- Transverse waves cannot propagate in a gas.
- Wavelength is the distance between two particles of the same medium in the opposite phase.
- Louder sound travels faster in air than a feeble sound.
- Frequency of sound is related its pitch.
- Sound cannot be heard on moon.
- Pitch of sound is related to amplitude of vibrations.

18. We hear a bomb blast 10 seconds after it happens.
19. Sound waves are transverse waves.
20. Loudness determines the amplitude of vibrations.

Matrix Match Type

In this section each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in Column-I have to be matched with statements (p, q, r, s) in Column-II.

1.

Column-I	Column-II
(A) High pitch	(p) Faint sound
(B) Low pitch	(q) Loud sound
(C) Small amplitude	(r) High frequency
(D) Large amplitude	(s) Low frequency
2.

Column-I	Column-II
(A) Megaphone	(p) 17.2 m
(B) Minimum distance for echo	(q) 3000 m
(C) Depth of sea if ultrasonic wave come back in 4 sec.	(r) Multiple reflection of sound
(D) Echo heard after 5 sec distance of reflecting surface	(s) 855 m
3.

Column-I	Column-II
(A) Elephants	(p) Reflection of sound
(B) Ultrasound	(q) Infrasonic waves
(C) Sonar	(r) Multiple reflection of sound
(D) Reverberation	(s) Welding purpose
4.

Column-I	Column-II
(A) Slinky when jerked	(p) Longitudinal wave
(B) Quality of sound	(q) Loudness
(C) Slinky pushed or pulled	(r) Transverse wave
(D) Amplitude	(s) Timbre

ASSERTION & REASON QUESTIONS

Directions: In each of the following questions, A statement of Assertion (A) is given followed by a corresponding statement of Reason (R) just below it. Of the statements, mark the correct answer as
 (a) If both assertion and reason are true and reason is the correct explanation of assertion

- (b) If both assertion and reason are true but Reason is not the correct explanation of assertion
 (c) If assertion is true but reason is false
 (d) If assertion is false but reason is true.

1. **Assertion:** Two persons on the surface of moon cannot talk to each other.
Reason: There is no atmosphere on moon.
2. **Assertion:** The velocity of sound increases with increases in humidity.
Reason: Velocity of sound does not depends upon the medium.
3. **Assertion:** Compression and rarefaction involve changes in density and pressure.
Reason: When particles are compressed, density of medium increases and when they are rarefied, density of medium decreases.
4. **Assertion:** Transverse waves travel through air in an organ pipe.
Reason: Air possesses only volume elasticity.
5. **Assertion:** The velocity of sound in hydrogen gas is less than the velocity of sound in oxygen gas.
Reason: The density of oxygen is more than the density of hydrogen.
6. **Assertion:** Sound would travel faster on a hot summer day than on a cold winter day.
Reason: Velocity of sound is directly proportional to the square of its absolute temperature.
7. **Assertion:** Waves produced in a cylinder containing a liquid by moving its piston back and forth are longitudinal waves.
Reason: In longitudinal waves, the particle of the medium oscillate parallel to the direction of propagation of the wave.
8. **Assertion:** A vibrating tuning fork sounds louder when its stem is pressed against a desk top.
Reason: When a wave reaches another denser medium, part of the wave is reflected.
9. **Assertion:** Waves produced by a motor boat sailing in water are both longitudinal and transverse waves.
Reason: The longitudinal and transverse waves cannot be produced simultaneously.
10. **Assertion:** The speed of sound in solids is maximum though their density is large.
Reason: The coefficient of elasticity of solid is large.

11. **Assertion:** To hear distinct beats, difference in frequencies of two sources should be less than 10.
Reason: More the number of beats per sec more difficult to hear them.
12. **Assertion:** The velocity of sound changes as we go up in the atmosphere.
Reason: Pressure decreases as we go up in the atmosphere.