

Sound

1. A mechanical wave travels in a medium. Which of the following quantities is transferred from one place to another with the wave?
(a) Mass (b) Speed
(c) Density (d) Energy
2. On a slinky, which of the following is produced?
(a) A longitudinal wave but not a transverse wave
(b) A transverse wave but not a longitudinal wave
(c) A longitudinal wave as well as a transverse wave
(d) Neither a longitudinal nor a transverse wave
3. In which of the following media can non-mechanical waves travel?
(a) in vacuum as well as in a medium
(b) In vacuum but not in a medium
(c) In a medium but not in vacuum
(d) Neither in a medium nor in vacuum
4. What is the distance between a crest and a trough in a wave?
(a) λ (b) $\frac{\lambda}{2}$
(c) $\frac{\lambda}{4}$ (d) $B\lambda$
5. A wave source produces 20 crests and 20 troughs in 0.2 s. Find the frequency of the wave.
(a) 200 Hz (b) 500 Hz
(c) 100 Hz (d) 300 Hz
6. The time period of a periodic wave is 0.02 seconds. At a particular position there is a crest at $t = 0$. At what value of 't' will the next trough appear at this position?
(a) 0.05 s
(b) 0.01 s
(c) 0.15 s
(d) 0.25 s
7. A longitudinal wave travels from east to west in air in which direction do the particles of air move?
(a) East to west
(b) East to west and north to south
(c) North to south
(d) South to north
8. A long spring is fixed at one end. A person holding the other end compresses the spring with a jerk. The compression travels along the length of the spring. Which kind of wave is travelled along the length of the spring?
(a) Electromagnetic waves (b) Transverse waves
(c) Longitudinal waves (d) Both (a) and (c)
9. Which of the following statements is NOT correct?
(a) The characteristic of sound that distinguishes a shrill noise from a grave one is called pitch,
(b) Pitch is not frequency/ but it changes with frequency.
(c) The voice of a girl is shriller than that of a boy.
(d) The roaring of a lion is shriller than the buzz of an insect

- 10.** Find the time period of a wave whose frequency is 400 Hz ?
 (a) 0.0012 s (b) 0.0025 s
 (c) 0.0015 s (d) 0.0010 s
- 11.** What is the minimum distance between two crests called?
 (a) Wavelength (b) Amplitude
 (c) Displacement (d) Wave pulse
- 12.** A stone is dropped from the top of a tower of height 300 m into a pond at the base of the tower. When will the sound of the splash be heard at the top? (Velocity of sound $= 340\text{ m s}^{-1}$ and $g = 9.8\text{ m s}^{-2}$)
 (a) 5.6 s (b) 8.7 s
 (c) 5.4 s (d) 6.7 s
- 13.** What does a sound wave consist of?
 (a) A number of compression pulses one after the other
 (b) A number of rarefaction pulses one after the other
 (c) Compression and rarefaction pulse separated by a distance equal to the wavelength
 (d) Compression and rarefaction pulses
- 14.** If the density of air at a point through which a sound wave is passing is maximum at an instant, what will be the pressure at that point?
 (a) Minimum
 (b) Equal to the density of air
 (c) Equal to the atmospheric pressure
 (d) Maximum
- 15.** An object is moving at a speed greater than that of sound. What is the speed with which the object is moving?
 (a) Ultrasonic speed (b) Sonic speed
 (c) Infrasonic speed (d) Supersonic speed
- 16.** Which of the following is an elastic wave?
 (a) Sound waves (b) Light waves
 (c) X-rays (d) Radio waves
- 17.** In which of the three media does sound travel the fastest?
 (a) Air (b) Water
 (c) Steel (d) same in all media
- 18.** A sound wave has a frequency of 1000 Hz and a wavelength 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
- 19.** An object is 11 km below the sea level. A research vessel sends down a sonar signal to confirm its depth. How long will it take for the echo to reach the vessel? [Take the speed of sound in sea water as $1,520\text{ ms}^{-1}$].
 (a) 15.30 s
 (b) 14.47 s
 (c) 12.20 s
 (d) 11.13 s

- 20.** A construction worker working at a height of 78.4 m above the ground bends and his helmet slips falls down. He hears the sound of the helmet hitting the ground 0.23 seconds after it slipped. Find the speed of sound in air.
 (a) 512 m s^{-1} (b) 215 m s^{-1}
 (c) 341 m s^{-1} (d) 651 m s^{-1}
- 21.** Ultrasonic waves are used for detecting objects under water. What is the technique/device used for this?
 (a) Ultrasonography (b) Echocardiography
 (c) Phacoemulsification (d) Sonar
- 22.** Which of the following properties of sound is affected by a change in the air temperature?
 (a) Frequency (b) Amplitude
 (c) Intensity (d) Wavelength
- 23.** The frequency of a sound wave is 200 Hz and its wavelength is 150 cm . What is the distance travelled by the sound wave in the time taken to produce 150 waves?
 (a) 110 cm (b) 225 cm
 (c) 112.5 cm (d) 336.5 cm
- 24.** A worker lives at a distance of 1.32 km from the factory. If the speed of sound in air is 330 m s^{-1} , how long will the sound of factory siren take to reach the worker?
 (a) 1 s (b) 2 s
 (c) 3 s (d) 4 s
- 25.** A boy stands facing a high wall at a distance of 85 m from it and then blows a whistle. Calculate the time interval when he hears an echo. (Speed of sound = 340 m s^{-1}).
 (a) 1 s (b) 2 s
 (c) 0.5 s (d) 3 s
- 26.** What is the velocity of sound in vacuum?
 (a) 332 m s^{-1} (b) 330 m s^{-1}
 (c) 288 m s^{-1} (d) Zero
- 27.** Longitudinal waves cannot travel through
 (a) vacuum (b) solids
 (c) liquids (d) gases
- 28.** 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) It does not reach the earth
- 29.** What are the sound waves of frequency more than 20 kHz called?
 (a) Supersonics (b) Audible
 (c) Infrasonics (d) Ultrasonics
- 30.** A pendulum vibrates with a time period of 1 second. What kind of sound is produced by it?
 (a) Supersonic
 (b) Audible
 (c) Infrasonic
 (d) Ultrasonic

31. When sound waves travel from one medium to another, which of the following physical quantities does NOT alter?
 (a) Amplitude (b) Velocity
 (c) Frequency (d) Intensity

32. Flash and thunder are produced simultaneously. But the thunder is heard a few seconds after the flash is seen. Why?
 (a) The speed of sound is greater than the speed of light.
 (b) The speed of sound is equal to the speed of light.
 (c) The speed of light is greater than the speed of sound.
 (d) The speed of light is less than the speed of sound.

33. Match the entries in Column I with those in Column II correctly.

	Column-I		Column-II
a.	Microphone	1.	Wind energy into mechanical energy
b.	Speaker	2.	Mechanical energy into sound energy
c.	Reeds of a harmonium	3.	Electrical energy into sound energy
d.	Sails of a ship	4.	Sound energy into electrical energy

- (a) a - 4, b - 3, c - 1, d - 2
 (b) a - 1, b - 2, c - 3, d - 4
 (c) a - 4, b - 2, c - 3, d - 1
 (d) a - 4, b - 3, c - 2, d - 1

34. How are bats able to fly in the dark?
 (a) They produce infrasonic waves,
 (b) They can hear ultrasonic sounds.
 (c) They produce infrared waves»
 (d) They can hear infrared waves.

35. Which kind of waves are used in sonography?
 (a) Infrared waves (b) Micro waves
 (c) Sound waves (d) Ultrasonic waves

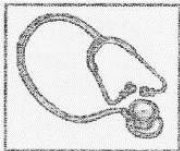
36. What types of waves are seismic waves?
 (a) Non-mechanical waves
 (b) Elastic waves
 (c) Mechanical waves
 (d) Electromagnetic waves

37. Arrange the following media in ascending order of the speed of sound in them,

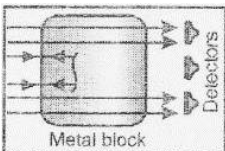
(i) Water
(ii) Steel
(iii) Nitrogen

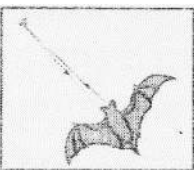
- (a) (iii), (ii), (i) (b) (i), (iii), (ii)
 (c) (iii), (i), (ii) (d) (ii), (i), (iii)

38. Who among the following are associated with SONAR?
 (a) Sonograph (b) Engineers
 (c) Astronauts (d) Navigators

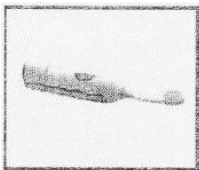
- 39.** Why do distant sounds such as those of traffic and loudspeakers become Souder during the night time than during the day time?
- Due to the reflection of sound waves
 - Due to the refraction of sound waves
 - Due to the absence of other sounds
 - Due to a clear perception of hearing
- 40.** During reflection of sound waves, which of the following properties change?
- Frequency and wavelength
 - Frequency and speed
 - Speed and wavelength
 - Frequency, wavelength and speed
- 41.** A wave source produces 10 oscillations in 100 m s . Find the time period of the wave.
- 1 second
 - 0.01 second
 - 10 second
 - 0.1 second
- 42.** Which of the following statements about sound waves is correct?
- Sound waves are not affected by the medium through which it travels.
 - Sound waves travel faster in air than in liquid.
 - Sound waves travel faster in a solid than in liquids and gases.
 - Sound waves cannot travel through a solid.
- 43.** Which of the following is NOT an application of ultrasound waves?
- 

(a)



(b)
- 

(c)



(d)
- 44.** Why are the regions of compressions and rarefactions of sound waves formed?
- A sound wave undergoes diffraction behind obstacles.
 - The reflected sound wave at a fixed end interferes with the incident wave.
 - The longitudinal movement of air molecules produces pressure fluctuations.
 - The speed of the sound wave changes as it travels through a medium.
- 45.** An ultrasonic wave is sent from a ship towards the bottom of the sea.-, It is. Found that the time interval between the sending and receiving of wave is 1.6 s . What is the depth of the sea, if the velocity of sound in sea water is?
- 1120 m
 - 60 m
 - 1400 m
 - 112 m
- 46.** A tuning fork of frequency 420 Hz completes 70 vibrations. Find the distance travelled by sound in air. ($v = 360 \text{ m s}^{-1}$)
- 20 m
 - 50 m
 - 60 m
 - 80 m

- 47.** A wave of frequency 500 Hz has a velocity of 360 m s^{-1} . Calculate the distance between two points that are 60° out of phase.
- (a) 12 cm (b) 18 cm
(c) 24 cm (d) 32 cm
- 48.** Which of the following is independent of the remaining three for a sound wave?
- (a) Frequency (b) Wavelength
(c) Velocity (d) Amplitude
- 49.** If the wavelength of a sound of frequency 350 Hz is 0.5 m . Find the velocity of sound.
- (a) 700 m s^{-1} (b) 175 m s^{-1}
(c) 17.5 m s^{-1} (d) 70 m s^{-1}
- 50.** The velocity of sound in air
- (a) decreases with an increase in temperature.
(b) increases with a decrease in temperature.
(c) decreases with a decrease in temperature.
(d) does not depend on temperature.

Answers With Solutions

1. (d) When mechanical waves travel, energy is transmitted.
2. (c) On a slinky, longitudinal waves as well as transverse waves can be produced.
3. (a) Waves that do not need a material medium to propagate are called non-mechanical waves.
4. (b) The distance between a crest and a trough is $\lambda / 2$.
5. (c) $v = \frac{\lambda}{T} = \frac{20 \text{ oscillations}}{0.2 \text{ s}} = 100 \text{ Hz}$
6. (b) The time period of a periodic wave i.e., the time difference between two consecutive crests is 0.02 s. The time difference between a crest and the next trough will be half the time period, i.e. 0.01 s.
7. (a) If the particles in the medium vibrate along the direction of the propagation of the wave, the waves are called longitudinal waves.
8. (c) If the compression travels along the length of the spring, then the wave is a longitudinal wave.
9. (d) The buzz of an insect is shriller than the roaring of a lion.
10. (b) $T = \frac{1}{n} = \frac{1}{400} = \frac{1}{4} \times 10^{-2} = 0.0025 \text{ s}$
11. (a) The distance between two consecutive crests of a wave is called the wavelength.
12. (b) $T_d = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 300}{9.8}} = \sqrt{61.2}$
 Let 't' be the time taken for the splash of sound to be heard.

$$t_d + t = \sqrt{\frac{2h}{g}} + \frac{300}{340} = \sqrt{61.2} + \frac{15}{17}$$
13. (d) A sound wave is a longitudinal wave that consists of compressions and rarefactions.

14. (d) As the density of air at a point is maximum, the pressure at that point is also maximum.
15. (d) Supersonic speed is the speed that is greater than the speed of sound.
16. (a) Sound waves are mechanical waves which need a material medium for their propagation. The medium must have inertia and elasticity for the propagation of these waves. So, sound waves are called elastic waves.
17. (c) Speed of sound is maximum in solids and steel is a solid.

18. (b) $f = 1000 \text{ Hz}$, $\lambda = 34 \text{ cm} = \frac{34}{100} \text{ m}$

Wave speed

$$v = f \lambda = 1000 \times \frac{34}{100} = 340 \text{ m s}^{-1}$$

The time taken by the wave to travel 1 km is:

$$t = \frac{d}{v} = \frac{1 \text{ km}}{340 \text{ m s}^{-1}} = \frac{1000 \text{ m}}{340 \text{ m s}^{-1}} = 2.94 \text{ s}$$

19. (b) The total distance travelled by the sonar beam is $11 \times 2 = 22 \text{ km}$. The speed of the wave is

$$T = \frac{\lambda}{v} = \frac{22 \times 10^3 \text{ m}}{1520 \text{ m s}^{-1}} = 14.47 \text{ s}$$

20. (c) $\Rightarrow v = \frac{\text{Distance}}{\text{Time}} = \frac{78.4 \text{ m}}{0.23 \text{ s}} = 341 \text{ m s}^{-1}$

21. (d) Sonar is a device that uses underwater sound waves to detect and locate submerged objects or measure the distances under water.

22. (d) Wavelength is the property of sound that is affected by change in the air temperature.

23. (c) For 150 waves, the time taken is

$$v = \frac{\lambda}{f} = \frac{150}{200} \text{ s} = \frac{3}{4} \text{ s}$$

The distance travelled to produce 150 sound waves.

$$= \lambda \times T = 150 \text{ cm} \times \frac{3}{4} \text{ s} = 112.5 \text{ cm}$$

24. (d) $v = \frac{s}{t} \Rightarrow t = \frac{s}{v} = \frac{1320}{330} = 4 \text{ s}$
25. (c) $v = \frac{2d}{t} \Rightarrow 340 = \frac{2 \times 85}{t} \Rightarrow t = \frac{2 \times 85}{340} = 0.5 \text{ s}$
26. (d) Sound does not travel through vacuum. Hence, the velocity of sound is zero in vacuum.
27. (a) Sound is made up of longitudinal waves which cannot travel through vacuum.
28. (d) The sound produced by the bomb exploded on the moon cannot reach the earth as it does not travel in vacuum.
29. (d) Sound waves above the audible range are called ultrasonics.
30. (c) Sound waves of frequency less than 20 Hz are called infrasonic sound waves.
31. (c) Frequency does not change when sound waves travel through various media.
32. (c) The speed of light (flash) is much greater than the speed of sound.
33. (d) (a) Microphone – Sound energy into electrical energy.
(b) Speaker – Electrical energy into sound energy.
(c) Reeds of a harmonium – Mechanical energy into sound energy.
(d) Sails of a ship – Wind energy into mechanical energy.
a - 4, b - 3, c - 2, d - 1.
34. (b) Bats can fly in pitch darkness because they hear ultrasonic sounds to produce echoes and detect the surroundings.
35. (d) Ultrasonic waves are used in sonography
36. (c) The seismic waves are produced during an earthquake which are mechanical waves.
37. (c) The ascending order of the speed of sound is nitrogen, water and steel.
38. (d) Navigators are associated with SONAR.
39. (c) Due to the absence of other sounds of traffic during night time.

- 40.** (c) When sound waves are reflected, frequency remains unchanged.
- 41.** (b) The time period of a wave is the time taken to complete one oscillation.
Given 10 oscillations take

$$100 \text{ ms (i.e., 0.1 s)} = 100 \times \frac{1}{1000} \text{ s}$$
- 42.** (c) The speed of sound is faster in solids than in liquids and gases.
- 43.** (a) A stethoscope uses multiple reflections of sound.
- 44.** (c) Pressure fluctuations occur as high pressure is created during compression and low pressure during rarefaction of air molecules in a sound wave.
- 45.** (a) Distance = velocity of sound \times time

$$= 1400 \times 0.8 = 1120 \text{ m}$$
- 46.** (c) Distance travelled by sound in air

$$= \text{speed} \times \text{time taken}$$

$$= 360 \times \frac{70}{420} = 60 \text{ m}$$
- 47.** (a) The distance between the two consecutive compressions or rarefactions (wavelength) is out of phase by 360° .
 The distance between two points which is 60° out of phase

$$= \frac{1}{6} \times \text{wavelength} = \frac{1}{6} \times \frac{\text{velocity}}{\text{frequency}}$$

$$= \frac{1}{6} \times \frac{360}{500} = 0.12 \text{ m} = 12 \text{ cm}$$
- 48.** (d) The amplitude of a sound wave is independent of the frequency, wavelength and velocity of the wave.
- 49.** (b) $V = n\lambda = 350 \times 0.5 = 175 \text{ m s}^{-1}$
- 50.** (c) The velocity of sound in air decreases with a decrease in temperature.