

EXERCISE

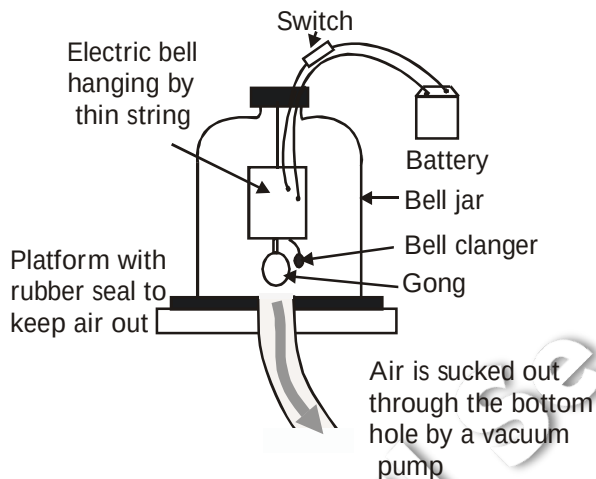
Multiple choice questions

- A longitudinal wave travels in water from west to east. The direction in which the particles of medium move
(1) east to west (2) west to east (3) north to south (4) south to north
- 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 complete
(1) oscillation (2) frequency (3) amplitude (4) none of the above
- Time period of a wave in a medium is the time taken by
(1) a compression to pass through a point
(2) a rarefaction to pass through a point
(3) an oscillation to pass through a point
(4) none of the above
- On the slinky, one can produce
(1) a longitudinal wave but not a transverse wave
(2) a transverse wave but not a longitudinal wave
(3) a longitudinal as well as a transverse wave
(4) neither a longitudinal nor a transverse wave
- If the speed of sound in air at 51°C is 360 ms^{-1} , find its speed at 88°C .
(1) 360 ms^{-1} (2) 370 ms^{-1} (3) 380 ms^{-1} (4) 390 ms^{-1}
- The minimum audible wavelength at room temperature in air, when speed of sound is 340 m/s , is about
(1) $0.2 \text{ \AA}$ (2) $5 \text{ \AA}$
(3) 200 cm (4) 17 mm
- For every 1°C rise in temperature, the velocity of sound waves
(1) increases by 61 cm/s (2) decreases by 61 cm/s
(3) increases by 61 m/s (4) decreases by 61 cm/s
- If in the above question, the pressure also increases by 1 atmosphere, the velocity of sound
(1) increases by 61 cm/s (2) decreases by 61 cm/s
(3) will remain unchanged (4) will increase by 61 m/s
- The temperature at which the speed of sound in air becomes double of its value at 27°C is
(1) 327°C (2) 127°C (3) 927°C (4) -123°C
- The wavelength of sound in air is 10 cm . If velocity of sound is 330 m/s , its frequency is
(1) 3.3 kc/s (2) 330 mega c/s (3) 330 c/s (4) $3 \times 10^{20} \text{ c/s}$
- The wavelength of ultrasonic waves in air is of the order of
(1) 1 cm (2) 10^{-2} cm (3) 10^{-4} cm (4) 10^{-8} cm
- The frequency of a tuning fork is 350 Hz . Find how many vibrations it executes while the sound produced by it travels a distance of 170 m . (Velocity of sound in air is 340 m s^{-1})
(1) 172 (2) 185 (3) 182 (4) 175

13. A body vibrating with a certain frequency sends waves 15 cm long through a medium A and 20 cm long through a medium B. The velocity of waves in A is 120 cm/s. Find the velocity in B.
 (1) 180 cm/s (2) 160 cm/s (3) 150 cm/s (4) 170 cm/s
14. At what temperature the velocity of sound will be double of its value at 0°C?
 (1) 819°C (2) 918°C (3) 198°C (4) 819 K
15. 40 waves pass through a point in 0.5 s at 0°C. The distance between one compression and adjacent rarefaction is 8 m. Find the velocity of the sound wave at 2457 K.
 (1) 4260 m/s (2) 1280 m/s (3) 2457 m/s (4) 3840 m/s
16. At what temperature will the speed of sound be double its value at 273 K ?
 (1) 1029 K (2) 1092 K (3) 9021 K (4) 1290 K
17. An ultrasonic scanner produces waves with a speed of 1.7 kms⁻¹. If the operating frequency is 4.2 MHz, find its wavelength.
 (1) 2×10^{-2} m (2) 4×10^{-4} m (3) 6×10^{-4} m (4) 8×10^{-8} m
18. If v_u , v_i and v_a are the velocities of Ultrasonic, Infrasonic and Audible waves respectively
 (1) $v_u = v_i = v_a$ (2) $v_u > v_a > v_i$ (3) $v_u > v_i > v_a$ (4) $v_a > v_i < v_u$
19. The distance between 2nd crest and 6th trough of a wave produced by a rocking boat is 24 cm. If the wave velocity of the moving crests is 20 m s⁻¹, then frequency of rocking of the boat is
 (1) 24 Hz (2) 20 Hz (3) 375 Hz (4) 240 Hz
20. The velocity of sound in air at N.T.P. is 330 ms⁻¹. If the temperature is increased to 819°C, the velocity of sound is
 (1) 660 ms⁻¹ (2) 1320 ms⁻¹ (3) 990 ms⁻¹ (4) 220 ms⁻¹
21. If the speed of sound in air at 16°C is 340 ms⁻¹, find its speed at 51°C.
 (1) 330 ms⁻¹ (2) 340 ms⁻¹ (3) 350 ms⁻¹ (4) 360 ms⁻¹
22. The time period of a periodic wave is .02 seconds. At a particular position, there is a crest at $t = 0$. A trough will appear at this position when 't' is equal to
 (1) 0.005 s (2) 0.010 s (3) 0.015 s (4) 0.025 s
23. Waves used in sonography are
 (1) infrared waves (2) micro waves
 (3) sound waves (4) ultrasonic waves
24. The time period of a sound wave travelling in a medium is T. At a given instance ($t = 0$) a particular region in the medium has minimum density. The density of this region will be minimum again at
 (1) $t = T$ (2) $t = T/2$ (3) $t = T/3$ (4) $t = T/4$
25. The velocity of sound in a gas at a certain temperature $t^\circ\text{C}$ in terms of velocity of sound at 0°C (v_0) is

$$v_t = v_0 \left(1 + \frac{t}{546} \right)$$
 Find the increase in velocity of sound for 1°C rise in temperature in air.
 (The velocity of sound at 0°C is 330 m/sec)
 (1) 0.61 m/sec (2) 6.315 m/sec (3) 0.315 m/sec (4) 0.92 m/sec
26. The longitudinal waves can propagate only in :
 (1) solids (2) liquids (3) gases (4) all the above

27. 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.
- (1) P hears the sound first (2) Q hears the sound first
(3) Both P and Q hear the sound at the same time (4) none of the above.
28. In the setup shown here, there is an electric bell inside a vacuum jar. The bell is turned on and all the air is sucked out of the jar using a vacuum pump.



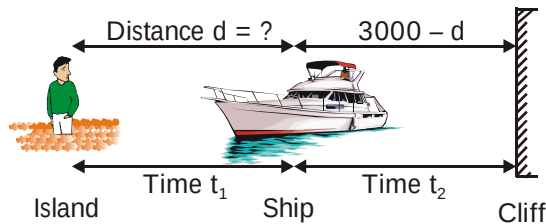
As the air is pumped out, the sound level of the ringing bell decreases until we cannot hear it anymore.

Which of these BEST explains why this happens ?

- (1) The gong slowly stops vibrating as the air level decreases.
(2) Less energy is transmitted from the bell to the surroundings as the air decreases.
(3) Energy is increasingly absorbed by the glass of the bell jar as the amount of air decreases.
(4) The energy produced by the gong is absorbed completely by the vacuum that is produced.
29. A construction worker's helmet slips and falls down when he is 78.4 m above the ground. He hears the sound of the helmet hitting the ground 4.23 seconds after it has slipped. Find the speed of sound in air.
- (1) 512 m/s (2) 215 m/s (3) 341 m/s (4) 651 m/s
30. A bat emits ultra sonic sound of frequency 10^5 Hz in air. If this sound meets a water surface, what is the wave length of (i) the reflected sound (ii) the transmitted sound ? ($v_{\text{air}} = 340 \text{ ms}^{-1}$ and $v_{\text{water}} = 1486 \text{ ms}^{-1}$)
- (1) 3.4 mm; 14.86 mm (2) 4.2 mm; 15.66 mm
(3) 1.2 mm; 11.76 mm (4) 3.2 mm; 18.66 mm
31. When sound waves travel from one medium to the other, the physical quantity that does not alter is
- (1) amplitude (2) velocity (3) frequency (4) intensity
32. The sound produced by a tuning fork has a wavelength of 1.7 m in air. What would be wavelength in water if velocity of sound in air is 340 ms^{-1} and that in water is 1400 m/s ?
- (1) 2 m (2) 5 m (3) 7 m (4) 9 m
33. If the frequency of a wave is 25 Hz, the total number of compressions and rarefactions passing through a point in 1 second is
- (1) 25 (2) 50 (3) 100 (4) none of the above

34. Which of the following properties of a sound wave are affected by the change in temperature of air ?
(1) frequency (2) amplitude
(3) wavelength (4) intensity
35. The crack of thunder is heard after few seconds the lightning flash, because
(1) crack of thunder and lightning are not produced at same time
(2) light travels extremely fast as compared to sound
(3) sound waves slow down on passing through air
(4) none of the above
36. Speed of sound in air is
(1) $\propto \sqrt{P}$ (2) $\propto P$
(3) $\propto P^2$ (4) independent of pressure
37. The velocity of sound is not affected by changes in
(1) temperature of medium (2) moisture
(3) atmospheric pressure (4) density of medium
38. **Assertion** : Sound waves travel faster on a rainy day than on a dry day.
Reason : Moisture increases the pressure.
(1) Both assertion and reason are correct and reason is the correct explanation of assertion.
(2) Both assertion and reason are true but reason is not the correct explanation of assertion.
(3) Assertion is true but reason is false.
(4) Assertion is false but reason is true.
39. Which of the following statements are correct about intensity of sound ?
(1) It depends on amplitude of wave
(2) It varies from listener to listener
(3) Its practical unit is decibel
(4) both (1) & (3)
40. What is the meaning of 0 dB ?
(1) Intensity of sound is 10^{12} W/m^2 (2) Intensity of sound is 10^{-12} W/m^2
(3) Intensity of sound is 0 W/m^2 (4) None of these
41. The same notes being played on sitar and veena differ in
(1) quality (2) pitch
(3) both quality and pitch (4) neither quality nor pitch
42. An echo is heard only, if the original sound after reflection should reach the ear in
(1) less than $\frac{1}{100} \text{ s}$ (2) less than $\frac{1}{10} \text{ s}$ (3) more than $\frac{1}{10} \text{ s}$ (4) none of the above
43. The minimum distance to the obstacle to hear an echo is (V is speed of sound in air)
(1) $\frac{V}{10} \text{ m}$ (2) $\frac{V}{20} \text{ m}$ (3) $\frac{V}{30} \text{ m}$ (4) $\frac{V}{40} \text{ m}$

44. The survivor of a shipwreck lands on an island which is 3000 m from a vertical cliff as shown in figure. He sees a ship anchored between the island and the cliff. A blast from the ship's horn is heard twice with a time lapse of 4 s. (Speed of sound in air = 330 m/s)

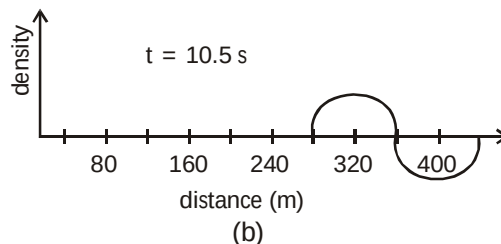
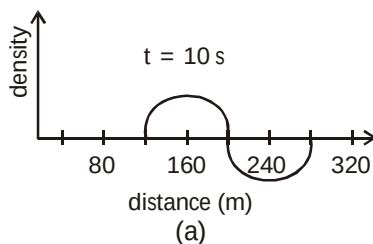


The distance of the ship from the island is

- (1) 2300 m (2) 6000 m (3) 3200 m (4) 2340 m
45. A road runs parallel to a vertical cliff at a distance of 495 m as shown in the figure. A car standing at A blows the horn and the driver of the car hears the echo after 3 s. But a person standing at B hears the sound of horn twice within an interval of 2 s. Find the distance between the car and the person.



- (1) 512 m (2) 206.25 m (3) 342 m (4) 412.5 m
46. A man standing between two cliffs hears the first echo of a sound after 2 seconds and the second echo 2 seconds after the initial sound. If the speed of sound be 330 m/s, the distance between the two cliffs should be
- (1) 1650 m (2) 990 m (3) 825 m (4) 660 m
47. The bat hunts its prey by emitting and receiving reflected
- (1) super sonic waves (2) ultrasonic waves
(3) sonic waves (4) infrasonic waves
48. An oil-tanker explodes in the sea. At that instant an aircraft and a submarine were present vertically above and below the oil-tanker respectively at equal distance from it. Find the ratio of the time taken by sound waves to reach them. (Speed of sound in air = 340 m/s. Speed of sound in sea water = 1520 m/s.)
- (1) 5.40 (2) 4.47 (3) 5.57 (4) 6.40
49. 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 m/s.)
- (1) 15.30 s (2) 14.47 s (3) 12.20 s (4) 11.13 s
50. 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 figures given below. The figure (a) corresponds to $t = 10$ s and figure (b) to $t = 10.5$ s.

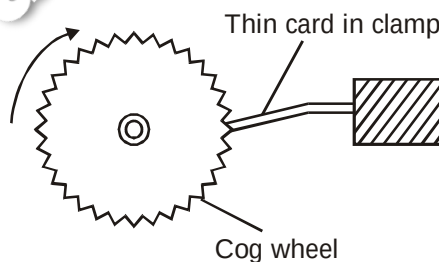
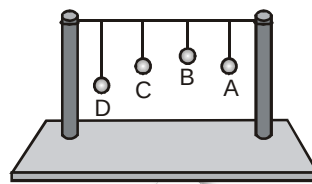


The speed of the wave pulse is

- (1) 520 m/s (2) 320 m/s (3) 300 m/s (4) 220 m/s

51. Bats can fly in the pitch dark because
- they only produce ultrasonic waves
 - they only hear ultrasonic waves
 - they use ultrasonic waves transmitted by them in a three dimensional space
 - none of these
52. A sound is produced near two cliffs. An observer X standing between the two cliffs hears one echo after 2 s and the other after 6 s. Given that the velocity of sound is 330 m/s, the distance between the two cliffs is
- 990 m
 - 1980 m
 - 1320 m
 - 2050 m
53. A submarine emits a SONAR plus which returns from an underwater cliff in 1.02 s. If the speed of sound in salt water is 1531 m/s, how far away is the cliff ?
- 500 m
 - 1 km
 - 781 m
 - 600 m
54. Ships use sound waves to find the vertical distance to the seabed. A pulse of sound waves is sent out and the echoes are detected. A ship emits a pulse of waves lasting 0.50 s. The waves have a frequency of 3600 Hz. How many complete wavelengths does the pulse contain ?
- 1800
 - 3600
 - 7200
 - 18000
55. Vibrations of a stringed instrument in air are
- free vibrations
 - damped vibrations
 - natural vibrations
 - both (1) and (3)
56. Choose the correct statement
- In damped oscillation, the decrease in energy is compensated by doing positive work on that system.
 - In damped oscillation, at any instant the frictional force is proportional to the velocity of vibrating body.
 - The amplitude of forced vibration remains constant with time but its magnitude depends on the frequency of applied force.
 - All of the above.
57. Amplitude of vibrations remains constant in case of
- Free vibrations
 - Forced vibrations
 - Damped vibrations
 - Both (1) & (2)
58. A regiment of soldiers is crossing a suspension bridge. They are ordered to
- march in steps
 - break the steps
 - twist their bodies
 - do rock and roll
59. Resonance is a special case of
- free vibrations
 - damped vibrations
 - sustained vibrations
 - forced vibrations
60. At resonance
- The amplitude of vibration is very large
 - The amplitude of vibration is very small
 - The waves produced are ultrasonic
 - Frequency of vibration is double the frequency of applied force

61. Two sources of sound are said to be in resonance when
- (1) they are of equal size
 - (2) they produce sounds of same frequency
 - (3) they are situated at a particular distance from each other
 - (4) they are excited by the same agency
62. When a tuning fork is vibrated, another in the neighbourhood begins to vibrate. This is due to
- (1) Resonance
 - (2) Sympathetic vibration
 - (3) Forced vibration
 - (4) All of the above
63. Four pendulums A, B, C and D are hung from the same elastic support as shown in figure. A and C are of same length, while B is smaller than A, and D is larger than A. If A is given displacement, then at steady state
- (1) D will vibrate with maximum amplitude
 - (2) C will vibrate with maximum amplitude
 - (3) B will vibrate with maximum amplitude
 - (4) all the four will oscillate with equal amplitude
64. If you go on increasing the stretching force on a wire in a guitar, its frequency
- (1) increases
 - (2) decreases
 - (3) remains unchanged
 - (4) none of the above
65. An instrument commonly used in laboratory to produce a sound of some particular frequency is :
- (1) sonar
 - (2) electric bell
 - (3) tuning fork
 - (4) a stretched wire
66. A body travels with a velocity greater than the velocity of sound. The shape of the wave would be
- (1) elliptical
 - (2) spherical
 - (3) parabolic
 - (4) conical
67. A piece of thin card is held against the teeth of a cog wheel. When the wheel is turned at high speed, a note is heard. How can the pitch of the note be raised ?



- (1) By pressing the card against the teeth with a greater force.
 - (2) By turning the wheel more quickly.
 - (3) By using a thicker card.
 - (4) By using a wheel with fewer teeth.
68. A stone dropped from the top of a tower of height 30 m splashes into a pond of water at its base. When will the sound of the splash be heard at the top?
- (Velocity of sound = 340 ms^{-1} and $g = 9.8 \text{ ms}^{-2}$)
- (1) 5.6 s
 - (2) 2.55 s
 - (3) 5.4 s
 - (4) 6.7 s

69. Match the following and choose the correct answer.

- | | |
|-------------------------|--|
| 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 |

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

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

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

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

70. A stringed instrument produces high pitch if the string is

(1) longer, thinner, or tighter

(2) shorter, thicker, or tighter

(3) shorter, thinner, or tighter

(4) longer, thicker, or tighter

Padho Dil Se

ANSWERS

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	1	3	3	3	4	1	3	3	1	1	4	2	1	4	2	2	1	3	1
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	4	2	4	1	1	4	2	2	3	1	3	3	2	3	2	4	3	3	1	2
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	1	3	2	4	4	4	2	2	2	2	3	3	3	1	2	4	4	2	4	1
Que.	61	62	63	64	65	66	67	68	69	70										
Ans.	2	4	2	1	3	4	2	2	4	3										