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B -147, Sector -6 Noida, UP - 201301,
www.askiitians.com
Email: info@askiitians.com
Tel: 1800-2000-838

Class: 9
Subject: Physics
Topic: Sound and oscillation
No. of Questions: 22

Q1. Explain how bats use ultrasound to catch a prey?

Ans: Bats search out for prey and fly in dark night by emitting and detecting reflections of ultrasonic waves. The high pitched ultrasonic squeaks of the bat are reflected from the obstacles or prey and returned to bat's ear. The nature of reflection tells the bat where the obstacle or prey is and what it is like.

Q2. Explain how moths of certain families are able to escape capture from a bat ?

Ans: Moths of certain families have very sensitive hearing equipment. These moths can hear the high frequency squeaks of the bat and know where a bat is flying nearby and are able to escape capture.

Q3. (a) Why are sound waves called mechanical waves ? List two practical applications of reflection of these waves.
(b) A stone is dropped from the top of a tower 125 m high into a pond of water at the base of the tower. When is the splash heard at the top ?

Ans: Sound waves are called mechanical waves as they require material medium for propagation.
Megaphones, horns, musical instruments as trumpets, stethoscope etc.
(b) Speed of sound = 340 m/s; g = 10 m/s2; u = 0 ; h =125 m; t = ?
$h = ut + 1/2\ gt^2$ => $125 = 0 + 1/2 \times 10 \times t^2$ => => t =5 s
Let T be the time taken by sound to reach the top after splash
T = 125m /340 m/s = 0.37 s
Splash will be heard after t + T = (5 + 0.37)s = 5.37 s

Q4. Describe an activity to show that sound needs a material medium for its propagation.

Ans: Take an electric bell in an air tight bell jar. It is connected to a vacuum pump. If you press the switch, you are able to hear sound. As vacuum pump takes out air, sound becomes fainter. After some time, when less air is left inside, you'll hear very feeble sound.

Q5.What is an echo? When can we distinctly hear the echo of a sharp sound? Why cannot we hear an echo in small halls?

Ans: An echo is the reelection of sound.
We can distinctly hear the echo of a sharp sound if, speed of sound which is 350 m/s and persistence of sound is 1/10 second, minimum distance between the observer and reflecting surface is at least 17.5 m.
We cannot we hear an echo in a small halls as in a small room the distances is less than 17.5 m.

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Q6. (a) List in tabular form two distinguishing features between longitudinal waves and transverse waves. Give an example of each.
(b) State and define three characteristics associated with sound waves

Ans: Longitudinal waves.
(1) The individual particles of the medium move in a direction parallel to the direction of propagation of the disturbance
(2) Compressions and rarefaction are formed e.g. Sound waves

Transverse waves

The individual particles of the medium move about their mean positions in a direction perpendicular to the direction of Wave propagation. Crests and troughs are formed.
e.g. Light Waves.

Three characteristics associated with sound waves

Pitch :- How the brain interprets the frequency of an emitted sound is called its pitch.
Amplitude :- The magnitude of the maximum disturbance in the medium on either side of the mean value is called the amplitude.
Timber :- Timber or quality of sound is that characteristic which enables us to distinguish one sound form another having the same pitch and loudness

Q7. Give two examples of each longitudinal and transverse waves

Ans: Sound waves and waves in a stretched spring are example of longitudinal waves.
Light wave and radio wave are transverse waves

Q8. A ship sends out ultra sound that returns from the seabed and is detected after 4s. If the speed of ultra sound through sea water is 1550 m/s, find the distance of the seabed from the ship.
Ans:
Distance travelled by the ultrasound = 2x depth of the sea =2d
2d = Speed of sound x time =1550 x 4 => d = 1550 x 2 m = 3100 m
This the distance of the seabed from the ship is 3100 m.

Q9. What is meant by reverberation? State the advantages of curved ceilings of cinema halls and conference halls.

Ans: A sound created in a big hall persists by repeated reflection from the walls. This phenomenon is called reverberation.
Cinema halls and conference halls are generally have curved ceilings as curved ceilings reflect the sound

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and spread it evenly across the width of the hall.

Q10.(a) List two factors on which speed of sound depends.
(b) Distinguish between intensity of sound and loudness of sound.
(c) The frequency and wavelength of sound wave are 2 kHz and 0.35 m respectively. Find the time it will take to travel a distance of 1.5 km.

Ans: (a) Speed of sound depends upon (i) Medium (ii) Temperature
(b) The amount of sound energy passing each second through unit area is called the intensity of sound. Loudness is a measure of the response of the ear to the sound.
(c) Frequency = 2 KHz = 2000 Hz ; Wavelength = 35 cm = 0.35 m ; speed v = 0.35 x 2000 = 700 m/s
Now time taken by a wave to travel a distance of 1.5 km = 1500 /700 = 2.1 s

Q11. How does the ear drum of human ear vibrate ?

Ans. 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.

Q12.What is the role of hammer bone, anvil bone, stirrup bone and cochlea of human ear in hearing a sound ?

Ans: The vibrations due to ear drum is amplified several times by three bones in the middle ear. The pressure variations in the inner ear turned in to electrical signals by the cochlea.

Q13. What kind of waves can be produced on a slinky?

Ans: Under different conditions, a slinky can produce both transverse and longitudinal waves on slinky. In a single disturbance the velocity of a pulse in a string will be constant in a string

Q14. What is the velocity of pulse for slinky when it takes 5 sec to travel from point A to B and back to A. Distance between A to B is 5 m

Ans : Wave length = d = 5 + 5 = 10m and t = 5 sec. and V = d/t = 10m/ 2 sec = 2m/s

Q15.Two slinky A and B of the same length are made up of two different materials. The times taken by 20 pulses to travel in both of them are 70 s and 90 s respectively. It concludes that:
(a) The pulse travels faster in B than in A. (b) The pulse travels faster in A than in B.
(c) Pulse travels slower in B than A. (d) Pulse travels with the same speed in A and B

Ans: (b) The pulse travels faster in A than in B.

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Q16. A strong transverse pulse is created in one end of a string. It completes 10 journeys along its length, before fading out. The initial reading of the stop clock used in the experiment was 25s and the final reading was 75s. If the length of the string for one journey is L meter, what is the speed of the pulse through the string?

Ans: The time taken for one journey is (75 -25)/10 second.
The length of the string is L meter,
So, the speed of the pulse, through the string, is: L/5

Q.17.How does the stethoscope help the doctors in listening to the sound of the patients heart beat?

Ans. In a stethoscope, the sound produced within the body of a patient is picked up by a sensitive diaphragm and then reaches the doctor's ear by multiple reflections
.

Q.18. Explain how defects in a metal block can be detected using ultrasound.

Ans. To detect minor cracks or flaws in metal block, ultrasonic waves are allowed to pass through metal blocks and detectors are used to detect the transmitted waves. If there is a crack in metal block, these waves get reflected back

Q.19. How is ultrasound used for cleaning?

Ans. The object to be cleaned is put in a tank fitted with ultrasonic vibrator. The tank is filled with cleaning solution. As the ultrasonic vibrator is switched on, high frequency vibrations are set up and the dust, grease and dust particles get detached and the object gets thoroughly cleaned.

Q.20. What is echo ranging? State any one application of this technique.

Ans: Echo ranging is the process of detecting underwater objects using sound signals. The minimum distance between source and the reflecting body should be 17 metres for the formation of an echo. This technique is used to measure depth of sea with the help of Sonar.

Q.21. A person is listening to a tone of 500 Hz sitting at a distance of 450 m from the source of the sound. What is the time interval between successive compression from the source ?

Ans. Here, f = 500 Hz. The time interval between successive compression means the time period.
T =1/f =1/500 = 0.002 s

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Q.22. Write the full name of SONAR. How will you determine the depth of a sea using echo ranging?

Ans: The full name of SONAR is Sound Navigation and Ranging. Sonar is based on the principle of reflection of sound wave. Powerful pulses of ultrasound are sent out at regular intervals from a transmitter mounted on a ship. When these pulses are intercepted by submerged objects, they get reflected. The reflected sound or echo is detected by an underwater receiver, which is also mounted on the ship. If speed of ultrasound be v and t is the elapsed time between the transmission and the reception of the ultrasound signal, the depth of the submerged object underwater is $h = (v \times t)/2$