Solutions for Class 9th Science: Chapter 12 Sound

Q.1. How the bats make use of ultrasonic waves to catch their prey? Explain?

Ans. The bat produces high pitched ultrasonic waves. The waves on striking the insect return back, which is heard by the bat. On hearing the echo the bat locates the insect and catches it.

Q.2.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.3. 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.4. 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.5. 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.6. 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

Q.7. 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 $h = (v \times t)/2$

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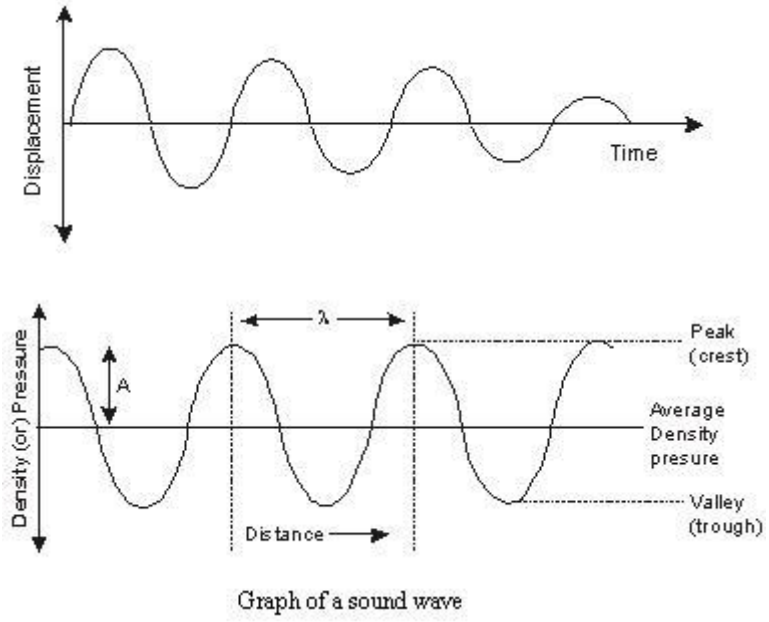
Q.8. Differentiate between a periodic wave and a pulse ?

Ans. Difference between a periodic wave and a pulse:

Periodic Wave	Pulse
1. A periodic wave is a continuous wave having a long duration.	Pulse is a wave having a short duration.
2. A periodic wave is a continuous disturbance in the medium.	A pulse is a single disturbance in the medium.
3. It is formed due to the displacement of every point or particle in a given part of the medium.	It is formed due to displacement of only a part of the medium from its mean position.

Q.9. Draw a displacement-time graph for ripples on the surface of water.
Ans. The ripples on the surface of water form a transverse wave. Displacement-time graph for ripples on the surface of water is as given below.



Graph of a sound wave

Q10. On what factors does the speed of sound in a gas depends ?

Ans. The speed of sound in a gas depends on the following factors:

1. Density. The speed of sound in a gas is inversely proportional to the square root of its density at constant pressure i.e., Speed of sound $\propto 1/\sqrt{}$Density of gas

2. Temperature. The speed of sound in a gas is inversely proportional to the square root of its absolute

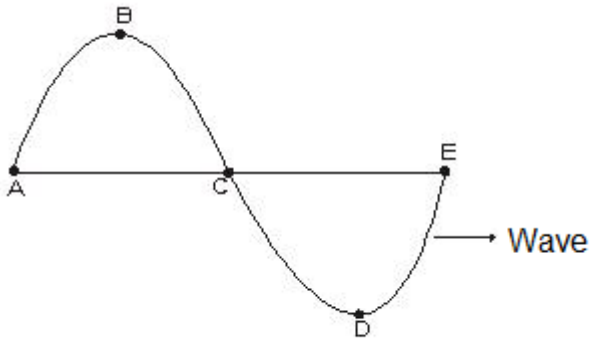
temperature, i.e., Speed of sound $\propto 1/\sqrt{}$ absolute temperature of gas

It means that speed of sound increases with the increase in temperature of the gas.

3. Humidity. The speed of sound is directly proportional to humidity i.e., sound travels faster in moist air than in dry air. Speed of sound $\propto$ Humidity

Q11. What is one oscillation?

Ans. When a wave starts from equilibrium position and after going through crest and trough retuns to the equilibrium position, it is said to have completed one oscillation.



Wave showing one oscillation

In the figure given above, the wave starts from equilibrium position A and after going through C and D returns to the equilibrium position E. The portion ABCDE represents one oscillation.

Q.12. A sound wave produces 20 compressions and 20 rarefactions in 0.040 seconds. What will be the frequency of the wave?

Ans. Time period = 0.045 s, number of vibrations produced = 20/0.040 = ≈ 500 HZ.

Q.13. Ocean waves of time period 0.01 s have a speed of 15 m/s. Calculate the wavelength of these waves. Find the distance between the adjacent crest and the trough?

Ans: T = 0.01 s; f = 1/T =1/0.01s= 100 Hz, v = 15 m/s;

λ = v/f = 15/100 x 100 cm = 15 cm

The distance between the adjacent crest and the trough =λ/2 = 15/2=7.5cm

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