III. SHORT ANSWER TYPE QUESTIONS

Question 1. What is a medium? Give two examples.
Answer: The matter or substance through which sound is transmitted is called a medium. It can be solid, liquid or gas. Example, air, water, metals.

Question 2. Define wave-motion.
Answer: A wave is a disturbance that moves through a medium when the particles of the medium set neighbouring particles into motion. The particles of the medium do not move forward but the disturbance is carried forward.

Question 3. What is 'sonic boom'?
Answer: When an object just attains a supersonic speed, it causes shock waves in air. As a result there is large change in air pressure. This results in sonic boom.

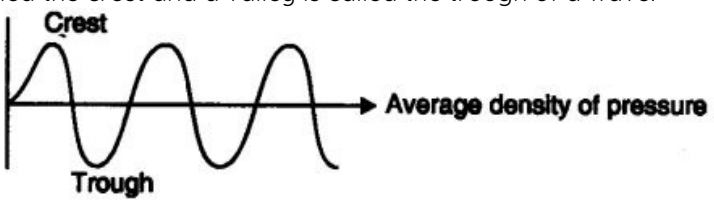
Question 4. Why does sound become faint with distance?
Answer: Sound is a form of energy. As it moves away from the source its amplitude as well as its loudness decreases. The energy also get transformed in vibration of the particles of the medium.

Question 5. Why do we say that sound waves are longitudinal?
Answer: Longitudinal waves need medium for propagation. The sound energy travel in the same line as the particles oscillate.
---------- > Sound energy
<----------> Particles oscillation
It forms compression and rarefaction for the longitudinal wave motion. Sound wave shows all the characteristics of longitudinal wave so it is called as longitudinal wave.

Question 6. Differentiate between longitudinal wave and transverse wave.
Answer:

Longitudinal Wave	*Transverse Wave*
1. It needs medium for propagation. 2. Particles of the medium move in a direction parallel to the direction of propagation of the disturbance. *Example,* sound wave.	1. It may or may not need medium for propagation. 2. Particles of the medium move in perpendicular direction of propagation of the disturbance. *Example,* light wave, seismic wave.

Question 7. What is crest and trough?
Answer: When a wave is propagated as represented below. A peak is called the crest and a valley is called the trough of a wave.

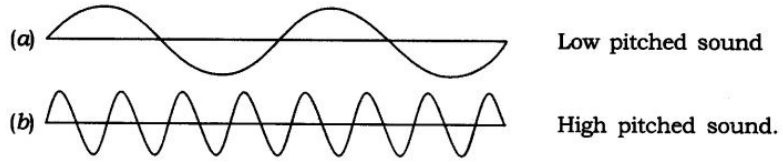


Question 8. The maximum oscillation disturbance of particles of air forms crest and trough. What is echo? Why don't we get echo in small room?
Answer: The distinct sound heard after reflection of sound from the

source is called echo. For echo, the distance of reflecting surface from the source should be more than 17.2 m.

Question 9. What is velocity of sound? Why does sound travel faster in summer season than in winter?
Answer: Velocity of sound is- the speed of sound in a given medium at a given temperature. As the temperature increases the speed of sound also increases, hence in summer the sound travels faster than in winter.

Question 10. Draw a graphical representation of the wave shape for (a) low pitched sound and (b) a high pitched sound.
Answer:



Question 11. Give two applications of echo/reflection of sound.
Answer: (i) Ships use reflection of sound technique "SONAR" which helps in locating the depth, distance, direction and speed of underwater objects.
(ii) Ceilings of concert halls are curved so that sound after reflection reaches all comers of the hall.

Question 12. Define amplitude time period and frequency of sound wave.
Answer: Amplitude: The magnitude of the maximum disturbance in the medium on either side of the mean value is called amplitude of the wave. Its unit is meter.
Time Period: The time taken by two consecutive compressions or rarefactions to cross a fixed point is called the time period of the wave.
Frequency: The number of oscillation, occurring per unit time is called the frequency of sound wave.

Question 13. A sound wave causes the density of air at a place to oscillate 1200 times in 2 minutes. Find the time period and frequency of the wave.
Answer:

$$\text{Frequency} = \frac{1200}{2 \times 60} = 10 \text{ Hz.}$$

$$\text{Time period} = ? \quad \text{Frequency} = \frac{1}{T}$$

$$\therefore \quad T = \frac{1}{\text{Frequency}} = \frac{1}{10} = 0.1 \text{ s.}$$

Question 14. Give 3 uses of ultrasound.
Answer: Use of ultrasound:
1. Ultrasound is used to detect cracks and flaws in metal blocks.
2. It is used in 'echo-cardiography', the ultrasonic waves are made to reflect from various parts of the heart and form the image of the heart.
3. It is used in 'ultrasonography', to detect the image of organs or to detect the abnormalities in the organs. It is also used to examine the foetus during pregnancy to detect congenital defects.

Question: 15. What is the function of middle ear?
Answer: Middle ear consist of three small bones called hammer, anvil and stirrup. These three bones receive the sound vibrations and increase the strength of these vibrations to amplify the

vibrations received by ear-drum. These amplified vibrations are furthgr passed to the inner ear.
A ship sends out ultrasound that return from the seabed and is detected after 3.42 s.

Question 16. If the speed of ultrasound through seawater is 1531 m/s. What is the distance of the seabed from the ship?-
Answer: Time between transmission and detection t = 342 s.
Speed of ultrasound in seawater = 1531 m/s.

Distance travelled by the ultrasound = 2 × depth of sea = $2d$.

$$2d = \text{speed of sound} \times \text{time}$$
$$= 1531 \times 3.42 = 5236 \text{ m}$$
$$\therefore \quad 2d = 5236 \text{ m}$$
$$\therefore \quad d = \frac{5236}{2} = 2618 \text{ m}.$$

The distance of the seabed from the ship is 2618 m.

Question 17. Distinguish between tone, note and noise.
Answer: Tone: A sound of single frequency is called a tone.
Note: The sound which is produced due to a mixture of several frequencies is called a note.
Noise: The sound which is produced due to a mixture of several frequencies but is unpleasant to the ear is called noise.

Question 18: Establish the relationship between speed, wavelength and frequency of sound.
Answer: Speed of sound: The distance travelled by a wave or a point on a wave (compression or rarefaction) per unit time.

$$\text{Speed } v = \frac{\text{Distance}}{\text{Time}}$$
$$v = \frac{\lambda}{T}$$

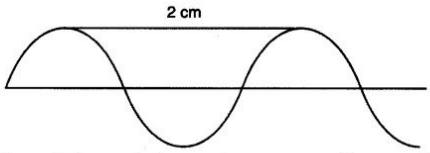
Distance = wavelength of the sound wave, it is the distance travelled by the sound wave in one time period (T) of the wave.

$$\therefore \quad v = \frac{\lambda}{T} \qquad \left(as\ v = \frac{1}{T}\right)$$
$$\therefore \quad v = \lambda v, \quad \text{Frequency} = \frac{1}{\text{Time period}}$$

Speed = Wavelength × Frequency.

Question 19. Which wave property determines(a) loudness? (b) pitch?
Name the characteristic of the sound which help you to distinguish your friend's voice while talking in a dark room.
Answer: (a) Loudness is determined by amplitude.
(b) Pitch is determined by frequency.
The quality or timber of sound helps us to distinguish our friend's voice while talking in a dark room.

Question 20. A sound produces 13 crests and 15 troughs in 3 seconds. When the second crest is produced the first is 2 cm away from the source? Calculate
(a) the wavelength (b) the frequency (c) the wave speed.
Answer:



(*a*) Wavelength = distance between two consecutive crests or troughs is 2 cm.

(*b*) Frequency = $\frac{\text{Number of troughs}}{\text{Time}} = \frac{15}{3} = 5\text{ Hz}$

(*c*) Wave speed = $\frac{\text{Distance}}{\text{Time}}$

Distance travelled by wave = 15 × 2 = 30 cm

Time = 3 seconds

$\therefore$ Wave speed = $\frac{30}{3} = 10$ cm/s.

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