CBSE Test Paper 03

Chapter 12 Sound

1. Match the following with correct response. **(1)**

(1) Speed of sound in Aluminium.	(A) 326 ms^{-1}
(2) Speed of sound in water.	(B) 1484 ms^{-1}
(3) Speed of sound in air.	(C) 6420 ms^{-1}
(4) Speed of sound in oxygen gas.	(D) 343 ms^{-1}

   a. 1-D, 2-A, 3-C, 4-B
   b. 1-C, 2-B, 3-D, 4-A
   c. 1-A, 2-C, 3-B, 4-D
   d. 1-B, 2-D, 3-A, 4-C

2. The distance between a consecutive crest and trough is x. The wavelength of the wave is **(1)**
   a. 4x
   b. 2x
   c. $\frac{x}{2}$
   d. x

3. The audible range for a normal human being is **(1)**
   a. 10 Hz to 20,000 Hz
   b. 20 Hz to 20 kHz
   c. 10 Hz to 50 kHz
   d. 20 Hz to 1000 Hz

4. Calculate the wavelength of a sound wave whose frequency is 220 Hz and speed is 440 ms^{-1} in a given medium. **(1)**
   a. 0.5 m
   b. 2 m
   c. 4 m
   d. 8 m

5. Compressions and rarefactions are formed in a _____ wave. **(1)**

a. Longitudinal
b. Transverse
c. Infrasonics
d. Both longitudinal and Transverse

6. Sound is a:- **(1)**
   a. Longitudinal wave
   b. Neither longitudinal wave not transverse wave
   c. Both longitudinal wave and transverse wave
   d. Transverse wave
7. The audible range of hearing for rabbit is _____ than humans. **(1)**
   a. equal
   b. lesser
   c. higher than or equal to
   d. higher
8. What is sound and how is it produced? **(1)**
9. Guess which sound has a higher pitch: guitar or car horn? **(1)**
10. What do you mean by a wave? **(1)**
11. What is relation between time period and frequency? **(3)**
12. Why can we hear echoes in long galleries and big halls? **(3)**
13. Cite an experiment to show that sound needs a material medium for its propagation. **(3)**
14. Sound waves of wavelength λ travel from a medium in which its velocity is v m/s into another medium in which if velocity is 3 v m/s. What is the wavelength of the sound λ in the second medium? **(3)**
15. A person standing between two vertical cliffs and 640 m away from the nearest cliff shouted. He heard the first echo after 4 seconds and the second echo 3 seconds later. Calculate **(5)**
    i. the velocity of sound in air, and
    ii. the distance between the cliffs.

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Answers

1. b. 1-C, 2-B, 3-D, 4-A

   Explanation: The speed of sound is not always the same. Speed of sound in different for different mediums.

   i. Speed of sound in Aluminium is 6420ms^{-1}.

   ii. Speed of sound in water is 1484ms^{-1}.

   iii. Speed of sound in air is 343ms^{-1}.

   iv. Speed of sound in oxygen gas 326ms^{-1}.

2. b. 2x

   Explanation: Wavelength is the distance between two consecutive crest or trough in case of transverse wave. Here, distance between the consecutive crest and trough is x, so, wavelength will be $2x$.

3. b. 20 Hz to 20 kHz

   Explanation: The audible range of an average human ear lies between 20 Hz to 20,000 Hz. Humans cannot hear sounds having frequency less than 20 Hz and greater than 20,000 Hz.

4. b. 2 m

   Explanation: Frequency = 220Hz

   Wave speed = 440 ms^{-1}.

   Since, wavelength= wave speed / frequency

   $\Rightarrow$ Wavelength = 440/220 = 2 m.

5. a. Longitudinal

   Explanation: A compression is a region in a longitudinal wave where the particles are closest together. A rarefaction is a region in a longitudinal wave where the particles are furthest apart.

6. a. Longitudinal wave

   Explanation: The wave formed because of the oscillation; parallel to the

disturbance; is called longitudinal wave. Sound is a longitudinal wave as the wave particles of sound travel parallel to the direction of motion by forming compression and rarefaction.

7. d. higher
   Explanation: The audible range of sound for human and rabbit is 20 Hz to 20,000 Hz and 1000 Hz to 1,00,000 respectively.

8. Sound is a form of energy that produces a sensation of hearing in our ears.
   Sound is produced when any object vibrates/oscillates.

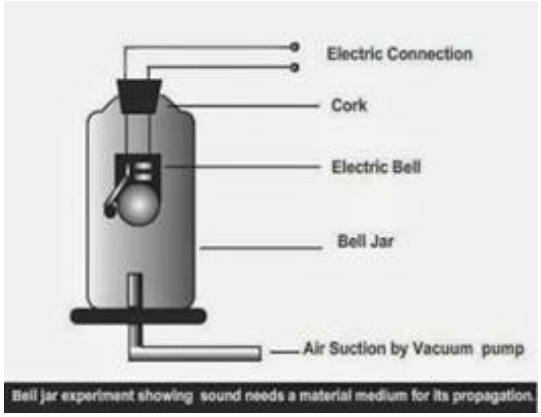
9. Sound of Guitar has a higher pitch.

10. A wave is a vibratory disturbance in a medium which carries energy from one point to another without being in direct contact between the two points.

11. Frequency = $\frac{1}{\text{Timeperiod}}$

12. For hearing echo, there should be at least a distance of 17 m between the source of sound and the body from which sound is reflected. In big rooms and galleries this is so, hence echoes are heard.

13. Take an electric bell and an airtight glass bell jar. The electric bell is suspended inside the airtight bell jar. The bell jar is connected to a vacuum pump If you press the switch you will be able to hear the bell. Now start the vacuum pump. When the air in the jar is pumped out gradually, the sound becomes fainter, although the same current is passing through the bell.
    After some time when less air is left inside the bell jar, you will hear a very feeble sound. Now if we evacuate the bell jar no sound is heard.



Bell jar experiment showing sound needs a material medium for its propagation.

Result: The above-mentioned activity shows that sound needs a medium to propagate.

14. Since velocity = wavelength $\times$ frequency

$\nu = \lambda f$

$f = \frac{\nu}{\lambda}$

Now, when waves moves from one medium to another, the frequency remains the same

$\frac{\nu_1}{\lambda_1} = \frac{\nu_2}{\lambda_2}$

Now, when velocity in first Medium = v

And, velocity in Second Medium = 3v

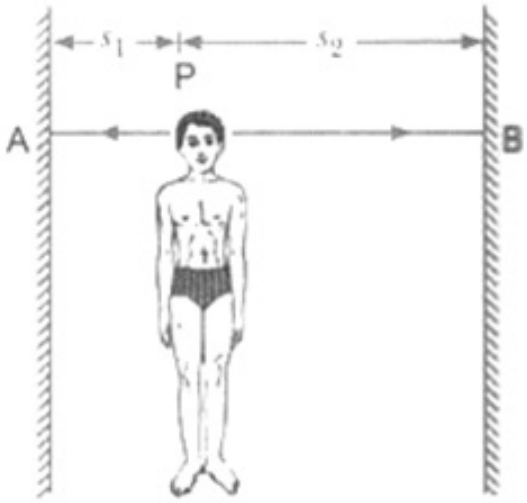
$\frac{\nu}{\lambda_1} = \frac{3\nu}{\lambda_2}$

$\frac{\lambda_1}{\lambda_2} = \frac{1}{3}$

$\lambda_2 = \frac{\lambda_1}{3}$

The wavelength of the sound in the second medium is one - third of the wavelength in the first Medium

15. i. Let P be the person standing between the cliffs A and B. Let s_1 be a distance of nearest cliff A from P and s_2 the distance of second cliff B from P. The first echo is heard when sound reaches the person after being reflected from cliff A.



Given, s_1 = AP = 640 m

Time interval of first echo, t_1 = 4 seconds

From relation, 2 s_1 = υ t_1, we have

The speed of sound, $\upsilon = \frac{2s_1}{t_1}$

$\frac{2\times640}{4}$

Therefore, Speed of sound in air, v = 320 m/s

ii. The second echo is heard when the sound reaches the person after being reflected from the cliff B.

Time interval of second echo, t_2 = 4 + 3 = 7 seconds

Therefore, From relation, 2 s_2 = v t_2,

We have, $\frac{vt_2}{2}$

$\frac{320\times7}{2}$

= 1120 m

Therefore, Distance between cliffs A and B,

s = s_1 + s_2 = 640 + 1120 = 1760 m