CLASS IX – SCIENCE PRACTICE PAPER (2026-27)

Chapter 10: Sound Waves – Characteristics and Applications

Max. Marks: 40 **Time Allowed: 1 hour 30 minutes**

General Instructions:

(i) This question paper consists of **20 questions** in **5 sections (A to E)**. All questions are compulsory. Internal choice is given in some questions.

(ii) **Section A** has 10 questions of 1 mark each: Q1–8 are Multiple Choice Questions and Q9–10 are Assertion–Reason questions.

(iii) **Section B** has 4 Very Short Answer questions of 2 marks each (about 30–40 words).

(iv) **Section C** has 3 Short Answer questions of 3 marks each (about 50–60 words).

(v) **Section D** has 2 Case-Based questions of 4 marks each.

(vi) **Section E** has 1 Long Answer question of 5 marks with an internal choice.

(vii) Questions are competency-based and application-oriented. Show all steps, with units, in numerical questions. Take the speed of sound in air as 340 m s^{-1} unless another value is given.

(viii) **Questions 2, 6, 12, 16, 19 and 20 are figure-based** and refer to Fig. 1 to Fig. 6.

SECTION A – Objective Questions (10 × 1 = 10 marks)

1 Sound **cannot** travel through: **1**

(A) air
(B) water
(C) steel
(D) vacuum

2 **[Figure-based]** Fig. 1 shows the air particles in a tube when a sound wave passes through it. The regions marked Q and R are respectively: **1**

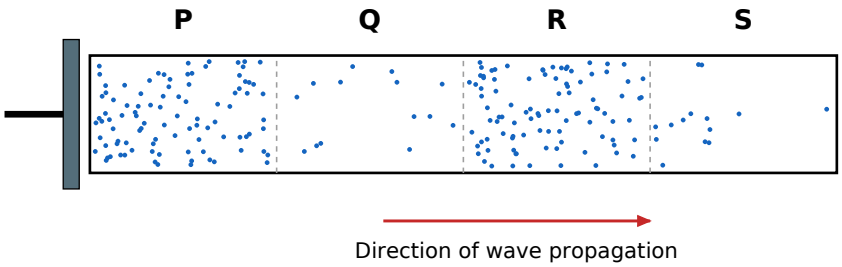


Fig. 1: Air particles in a tube during a sound wave

(A) compression and rarefaction
(B) rarefaction and compression
(C) compression and compression
(D) rarefaction and rarefaction

3 A sound wave travelling in air is a: **1**

(A) longitudinal mechanical wave
(B) transverse mechanical wave
(C) longitudinal electromagnetic wave
(D) transverse electromagnetic wave

4 40 density oscillations pass a point in 8 seconds. The frequency of the sound wave is: **1**

(A) 320 Hz
(B) 0.2 Hz
(C) 5 Hz
(D) 48 Hz

5 Sound waves of frequency above 20 kHz are called: **1**

(A) infrasonic waves
(B) ultrasonic waves
(C) audible waves
(D) subsonic waves

6 **[Figure-based]** Fig. 2 shows the variation of density with distance for a sound wave travelling at 340 m s^{-1}. The frequency of the wave is: **1**

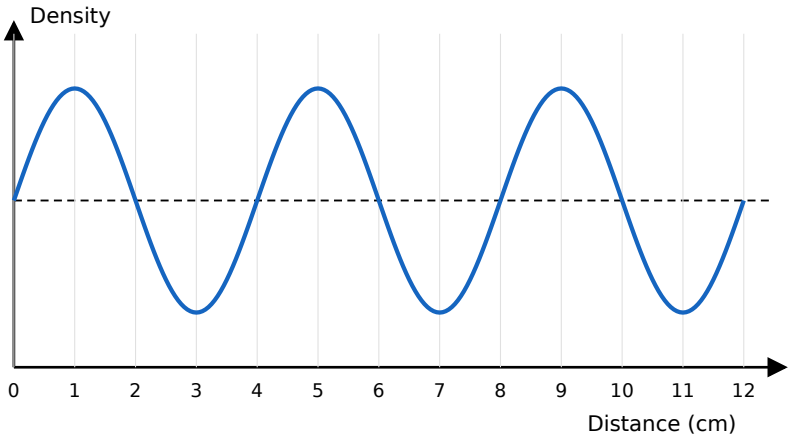


Fig. 2: Density versus distance for a sound wave

(A) 8500 Hz
(B) 850 Hz
(C) 85 Hz
(D) 13600 Hz

7 The time period of a sound wave is 0.004 s. Its frequency is: **1**

(A) 2500 Hz
(B) 0.004 Hz
(C) 250 Hz
(D) 4 Hz

8 Taking the speed of sound as 340 m s^{-1}, the minimum distance of a reflecting wall from a person for a clear echo is: **1**

(A) 34 m
(B) 17 m
(C) 8.5 m
(D) 68 m

Questions 9 and 10 consist of two statements: Assertion (A) and Reason (R). Choose the correct option:
(A) Both A and R are true, and R is the correct explanation of A.
(B) Both A and R are true, and R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

9 **Assertion (A):** Astronauts on a spacewalk cannot talk to each other directly. **1**

Reason (R): Sound waves need a material medium, and outer space is almost a vacuum.

10 **Assertion (A):** A sound wave of larger amplitude is heard louder. **1**

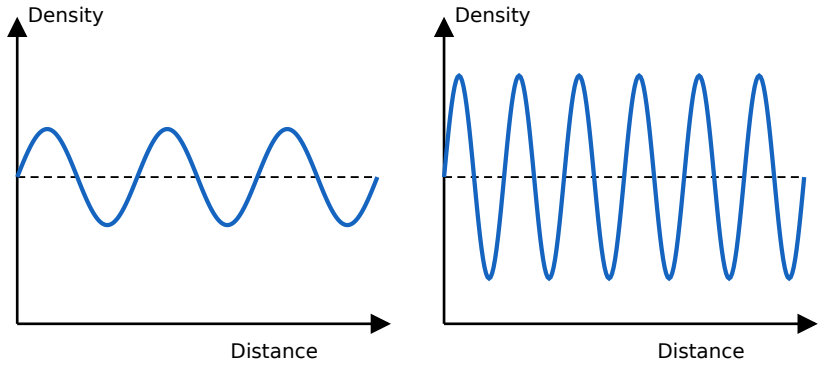
Reason (R): The loudness of a sound depends only on the frequency of the wave.

SECTION B – Very Short Answer Questions (4 × 2 = 8 marks)

11 (a) Define the frequency of a sound wave and state its SI unit. (1) **2**

(b) A tuning fork vibrates at 50 Hz. Find the time period of the sound it produces. (1)

12 **[Figure-based]** Fig. 3 shows the density variation of two sound waves (a) and (b) on graphs with the same scales on both axes. **2**



(a) **(b)**

Fig. 3: Two sound waves drawn to the same scale

(a) Which wave has the higher frequency? Give a reason. (1)

(b) Which wave produces the louder sound? Give a reason. (1)

13 A bat emits ultrasonic waves of frequency 50 kHz and an elephant produces an infrasonic sound of frequency 10 Hz. Find the wavelength of each in air. (1 + 1) **2**

14 *Attempt either option A or B.* **2**

A. Distinguish between an echo and reverberation. (1 + 1)

OR

B. State **two** applications of ultrasonic waves. (1 + 1)

SECTION C – Short Answer Questions (3 × 3 = 9 marks)

15 A student says, “When a tuning fork is struck near my ear, the air particles next to the fork travel all the way to my ear.” (i) Correct this statement by describing the motion of the air particles. (ii) What actually travels from the fork to the ear? (iii) What type of wave is a sound wave? (1 + 1 + 1) **3**

16 **[Figure-based]** A ship sends an ultrasonic signal into seawater, as shown in Fig. 4. The signal is reflected from a sunken wreck and the echo is received 2.4 s after it was sent. The speed of sound in seawater is 1500 m s^{-1}. **3**

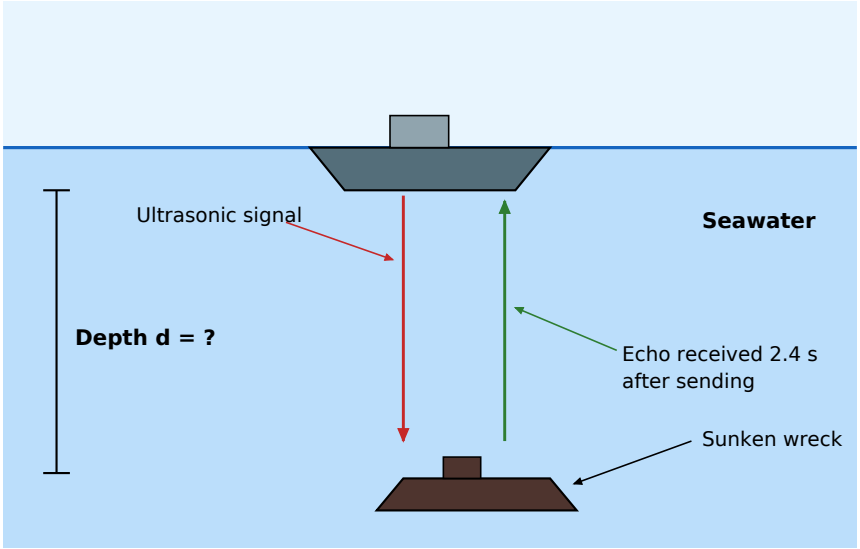


Fig. 4: Sonar used to find the depth of a wreck

(i) Find the total distance travelled by the signal. (1)

(ii) Find the depth d of the wreck. (1)

(iii) Name the process used by bats to locate objects, which works on the same principle. (1)

17 *Attempt either option A or B.* **3**

A. Describe the vacuum bell jar experiment and state the conclusion drawn from it. (3)

OR

B. A sound of frequency 250 Hz travels through steel (5000 m s^{-1}) and through air (340 m s^{-1}). Find its wavelength in each medium and state which quantity stays the same. (1 + 1 + 1)

SECTION D – Case-Based Questions (2 × 4 = 8 marks)

18 **Case Study: Notes on a Tanpura** **4**

In a music class, a teacher uses a mobile app to record two notes of the same tanpura string. The lower note has a frequency of 200 Hz and the note one octave higher has a frequency of 400 Hz. A flute played at the same note and loudness sounds different from the tanpura.

(i) Find the time period of each note. (1)

(ii) What is the relation between the frequencies of two notes an octave apart? (1)

(iii) Find the wavelength in air of the 400 Hz note. (1)

(iv) Name the quality of sound that makes the flute and tanpura sound different, and state what determines it. (1)

19 **Case Study: Echo at the Cliff** **4**

[Figure-based] Rohan stands 85 m from a cliff and claps (Fig. 5). He hears the echo after some time. Take the speed of sound as 340 m s^{-1}.

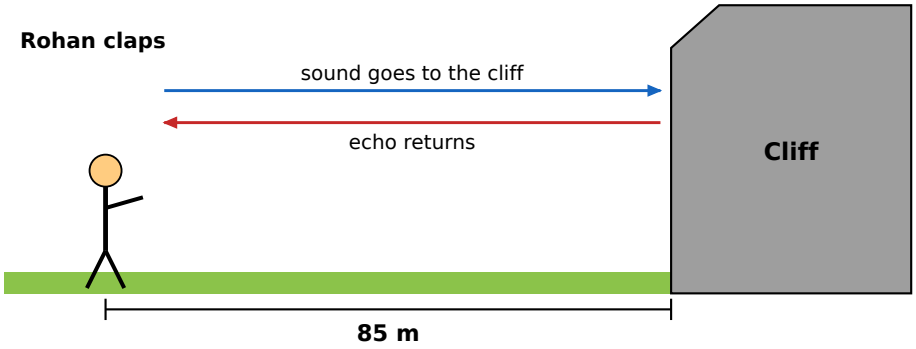


Fig. 5: Rohan claps in front of a cliff

(i) Find the time after which Rohan hears the echo. (1)

(ii) Will he hear it as a distinct echo? Give a reason. (1)

(iii) He walks towards the cliff until the echo takes only 0.1 s to return. How far is he from the cliff now? (1)

(iv) Why would the echo be much weaker if the cliff were covered with thick curtains? (1)

SECTION E – Long Answer Question (1 × 5 = 5 marks)

20 **[Figure-based]** Fig. 6 shows the variation of density with distance for a sound wave travelling in water at 1500 m s^{-1}. **5**

Attempt either option A or B.

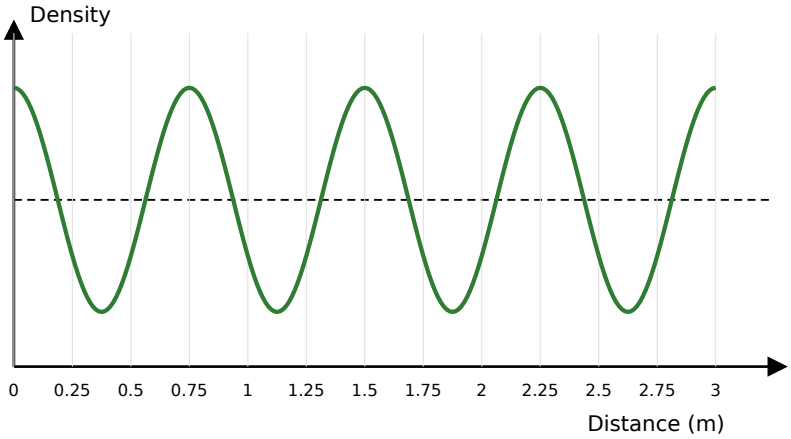


Fig. 6: A sound wave in water

A.

(i) Read the wavelength of the wave from the graph. (1)

(ii) Calculate its frequency. (1)

(iii) Calculate its time period. (1)

(iv) The same source now sends sound through air at 340 m s^{-1}. Find the wavelength in air. (1)

(v) Name the type of wave and describe how the particles of the medium move. (1)

OR

B. During a thunderstorm, thunder is heard 4 s after the lightning is seen.

(i) Find the distance of the lightning strike. (1)

(ii) Why is the lightning seen before the thunder is heard? (1)

(iii) Find the minimum distance of a reflecting surface needed to hear an echo. (1)

(iv) What is reverberation and how is it reduced in an auditorium? (1)

(v) A clap is followed by an echo after 0.6 s. Find the distance of the reflecting wall. (1)

***** END OF QUESTION PAPER *****