| **INDIAN SCHOOL AL WADI AL KABIR**		
Class: IX	DEPARTMENT: SCIENCE 2025-26 SUBJECT- PHYSICS	DATE: 31/01/2026
WORKSHEET No-5	TOPIC: SOUND	Note: A4 FILE FORMAT
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

I. MULTIPLE CHOICE QUESTIONS (1 MARK)

1. The speed of light or electromagnetic wave is higher than the speed of sound in air by
    (a) 10^6 times
    (b) 10^8 times
    (c) 10^7 times
    (d) 10^5 times

2. We can distinguish between a man's voice and a woman's voice of the same loudness even without seeing them. This is due to a characteristic of sound that measures the shrillness of sounds. Can you choose the correct unit of the quantity on which this characteristic of sound depends?
    (a) meter
    (b) unitless
    (c) unit
    (d) hertz

3. On increasing the temperature, the speed of sound in air:
    (a) Increases
    (b) Decreases
    (c) Does not change
    (d) First increases, then becomes constant

4. We can easily distinguish between the sounds of the different singers even without having seen them. This is all due to the different quality of timber of their sounds. On what factor does the quality of sound depend?
    (a) Wavelength
    (b) Waveform
    (c) Wave frequency
    (d) Wave amplitude

5. Infrasonic (fi), Audible (fa), and Ultrasonic (fu) frequencies of sound are related as
    (a) fi < fa < fu
    (b) fa < fi <fu
    (c) fi > fa > fu
    (d) fa < fu < fi

6. The bats can fly in the darkness of night without colliding with other objects by emitting special sounds while flying. Which characteristic of sound is used by the bats to navigate?
   (a) Wavelength of sound
   (b) Reflection of sound (Echolocation)
   (c) Volume/loudness of sound
   (d) Pitch/ frequency variation

7. The sound travels from particle to particle in the form of vibrations and has different speeds in different media.
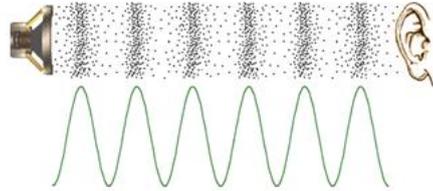
   The maximum speed of vibrations that produce audible sound will be in:
   (a) Sea water
   (b) Ground glass
   (c) Human blood
   (d) Dry air

8. If the speed of a wave is 380 m/s and its frequency is 1900 Hz, then the wavelength of the wave will be:
   (a) 20 m
   (b) 2 m
   (c) 200 m
   (d) 0.2 m

9. Wave motion transfers
   (a) momentum
   (b) velocity
   (c) energy
   (d) mass

10. The minimum size of a room required to hear an echo of sound with a speed of 300 m/s is
   (a) 16 m
   (b) 15 m
   (c) 14 m
   (d) 17 m

11. When we change a feeble sound to a loud sound, we increase its
   (a) frequency
   (b) amplitude
   (c) velocity
   (d) wavelength

12. Earthquakes produce which kind of sound before the main shock wave begins
   (a) Audible sound
   (b) As a supersonic wave

(c) Ultrasound
(d) Infrasound

13. Sound travels in air if
    (a) particles of medium travel from one place to another
    (b) there is no moisture in the atmosphere
    (c) disturbance moves
    (d) both particles and disturbances travel from one place to another.

II. ASSERTION-REASONING QUESTIONS (1 MARK)

For the following questions, two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the options.
(a), (b), (c), and (d)as given below:
   (a) Both A and R are true, and R is the correct explanation of the Assertion.
   (b) Both A and R are true, but R is not the correct explanation of the Assertion.
   (c) A is true, but R is false.
   (d) A is false, but R is true.

14. **Assertion:** Thunder is heard after lightning is seen during a storm.
    Reason: The speed of sound is much less than the speed of light.

15. **Assertion:** Ultrasound is used to detect cracks in metal blocks.
    Reason: Ultrasound waves can bend around corners and obstacles easily.

16. **Assertion**: The minimum distance required to hear a distinct echo is 17.2 meters.
    Reason: The sensation of sound persists in our brain for about 0.1 seconds.

17. **Assertion:** The pitch of sound depends on the amplitude of the sound wave.
    Reason: A Higher amplitude produces a louder sound

18. **Assertion:** Auditoriums are covered with sound-absorbent materials on walls and ceiling.
    Reason: These materials help to reduce reverberation in the auditorium.

III. VERY SHORT ANSWER QUESTIONS (2 MARKS)

19. Define wavelength and frequency of a sound wave. Write the relationship between speed, wavelength, and frequency.
20. A person is listening to a tone of 500 Hz sitting at a distance of 450 m from the source of sound. What is the time interval between successive compressions from the source?
21. How does a stethoscope work? Why is it more effective than direct listening?
22. On which day, a hot day or a cold day, is an echo heard sooner? Why?
23. Suppose you and your friend are on the moon. Will you be able to hear any sound produced by your friend? Why?

IV. SHORT ANSWER QUESTIONS (3 MARKS)

24. A sound wave has a frequency of 1000 Hz and travels at a speed of 340 m/s in air.
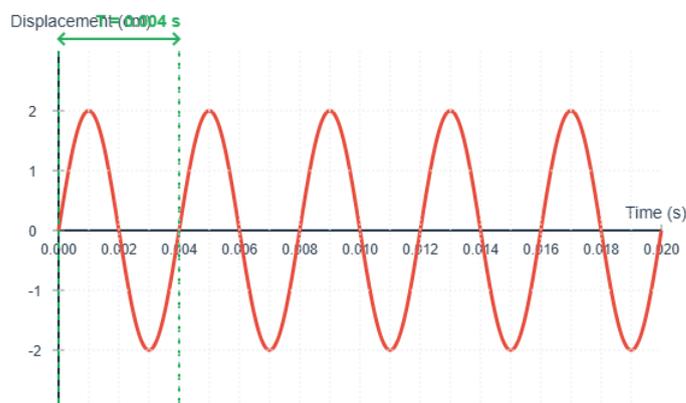
Calculate: (a) wavelength of the sound wave, (b) time period of the wave, and (c) distance travelled by the wave in 5 seconds.

25. Waves of higher frequencies are used to measure the depth of the sea.
    (a)Give the name of these waves.
    (b)Give the frequency of these waves.
    (c)Give one more use of these waves.

V. LONG ANSWER QUESTIONS (5 MARKS)

26. The graph below shows the displacement of air particles as a sound wave passes through them at a fixed point. Study the graph and answer the following:

From the graph, calculate:

(a) Time period of the sound wave.
(b) Frequency of the sound wave.
(c) If the speed of sound is 340 m/s, find the wavelength.
(d) Classify this sound (audible/infrasonic/ultrasonic).
(e) How many complete oscillations occur in 0.1 seconds?

27. Represent graphically by two separate diagrams in each case.
    (a) Two sound waves having the same amplitude but different frequencies.
    (b) Two sound waves having the same frequency but different amplitudes.
    (c) Two sound waves having different amplitudes and also different wavelengths.

28. A stone is dropped into a well, and the sound of splash is heard after 3.5 seconds. If the speed of sound in air is 340 m/s and acceleration due to gravity is 10 m/s², calculate:
    (a) The depth of the well (assume the time taken by sound to travel up is negligible)
    (b) If the actual time for sound to travel up is 0.2 seconds, what is the corrected depth?
    (c) What is the time taken by the stone to fall in the corrected case?

29. A tuning fork produces 320 complete vibrations in 0.8 seconds. The sound travels through air and reflects from a wall 170 m away.
    (a) Calculate the frequency of the tuning fork.
    (b) Find the wavelength of the sound wave in air (speed of sound = 340 m/s).
    (c) Calculate the time taken for the echo to return to the source.

VI. CASE STUDY BASED QUESTIONS (4 MARKS)

30. Dolphins use a sophisticated biological sonar system called echolocation to navigate and hunt in murky waters. They produce ultrasonic clicks with frequencies ranging from 40 kHz to 130kHz. These sound waves travel through water at approximately 1500 m/s and reflect

    from objects, allowing dolphins to create a detailed sound picture of their environment.
    A dolphin produces clicks at an 80 kHz frequency while hunting. When the reflected waves return, the dolphin can determine the size, shape, distance, and even the internal structure of objects. This system is so precise that dolphins can distinguish between objects that differ by just a few centimeters.

    (a) What type of sound waves do dolphins use for echolocation? Justify your answer.
    (b) Name one human-made device that works on a similar principle to dolphin echolocation.
    (c) If a dolphin is 30 meters away from a fish, calculate the total time taken for the sound wave to travel from the dolphin to the fish and back.
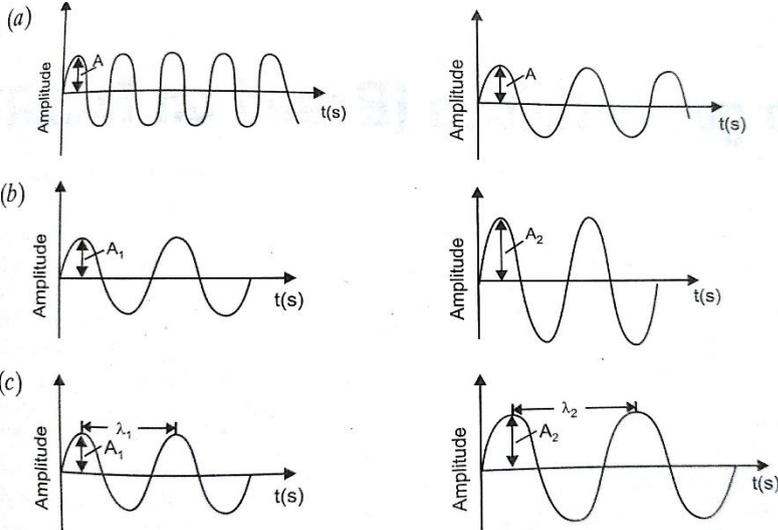
31. In the music room, Kavya experiments with different musical instruments. She notices that a flute produces a high-pitched sound, while a drum produces a low-pitched sound. When she plucks a guitar string tightly, it produces a higher pitch than when the string is loose. The music teacher explains that this is related to the frequency of vibrations.

    (a) What determines the pitch of a sound produced by any musical instrument?
    (b) Why does a tightly stretched guitar string produce a higher pitch than a loose string?
    (c) Compare the frequencies of sounds produced by a flute and a drum.

Q. No	ANSWERS
1.	(a) 10^6 times
2.	(d) hertz
3.	(a) Increases
4.	(b) Waveform
5.	(a) fi < fa < fu
6.	(b) Reflection of sound (Echolocation)
7.	(b) Ground glass
8.	(d) 0.2 m Explanation: $\lambda = v/f$
9.	(c) energy
10.	(b) 15 m
11.	(b) amplitude

12.	(d) Infrasound
13.	(c) disturbance moves
14.	(a) Both A and R are true, and R is the correct explanation of the Assertion.
15.	(c) Assertion is true, but reason is false
16.	(a) Both A and R are true, but R is not the correct explanation of the Assertion.
17.	(d) A is false, but R is true.
18.	(a) Both A and R are true, and R is the correct explanation of the Assertion.
	SHORT ANSWER QUESTIONS (2 MARK)
19	Wavelength (λ): The distance between two consecutive compressions or two consecutive rarefactions is called the wavelength. Its SI unit is the meter (m). Frequency (v): The number of complete oscillations per unit time is called frequency. Its SI unit is hertz (Hz). Relationship: $v = \lambda v$ (speed = wavelength × frequency)
20	Frequency (v) = 500 Hz The time interval between successive compressions is equal to the time period of the wave. Time period (T) = $1/v$ = $1/500$ = 0.002 s = 2×10^{-3} s
21	A stethoscope works on multiple reflections of sound. The heartbeat sound travels through tubes by repeated reflections from the inner walls and reaches the doctor's ears.
22	The speed of sound is faster on a hot day than on a cold day. Thus, the echo is heard sooner on a hot day.
23	No, it is not possible to hear any sound on the moon. There is no medium, such as air on the moon, to carry sound waves. Sound cannot travel through vacuum as it is a mechanical wave.

	SHORT ANSWER QUESTIONS (3 MARKS)
24	Given: Frequency (v) = 1000 Hz, Speed (v) = 340 m/s, Time = 5 s (a) Wavelength calculation**:** Using $v = \lambda v$; $\lambda = v/v = 340/1000 = 0.34$ m (b) Time period calculation**:** T = $1/v$ = $1/1000$ = 0.001 s (c) Distance in 5 seconds**:** Distance = Speed × Time = 340×5 = 1700 m

25	(a) Ultrasonic waves
	(b) Waves of frequency greater than 20 kHz
	(c) These waves are used in medical science for echocardiography and ultrasonography. These are used to detect flaws.

LONG ANSWER QUESTIONS (5 MARKS)

26	(a) From the graph, one complete oscillation (from one peak to the next peak) $=T$ Time Period (T) = 0.004 seconds.
	(b) $v = 1/T$; $v = 1/0.004 = 250$ Hz
	(c) $\lambda = v/v$ Given: Speed (v) = 340 m/s, Frequency (v) = 250 Hz; $\lambda = 340/250 = 1.36$ m
	(d) Since frequency = 250 Hz lies between 20 Hz and 20,000 Hz. This is an audible sound.
	(e) Number of oscillations = Total time / Time period Number of oscillations = 0.1 / 0.004 = 25

27	

28	(a) Using $s = \frac{1}{2}gt^2$, depth $= \frac{1}{2} \times 10 \times (3.5)^2 = 61.25$ m
	(b) Time for stone to fall = 3.5 - 0.2 = 3.3 s; Depth $= \frac{1}{2} \times 10 \times (3.3)^2 = 54.45$ m
	(c) Time taken by the stone to fall = 3.3 seconds

29	(a) Frequency = Number of vibrations/Time = 320/0.8 = 400 Hz
	(b) $\lambda = v/v$; $\lambda = 340/400 = 0.85$ m
	(c) Total distance $= 2 \times 170 = 340$ m; Time = Distance/Speed = 340/340 = 1 second

	CASE STUDY BASED QUESTIONS (4 MARKS)
30	(a) Dolphins use ultrasonic sound waves for echolocation. The frequency range (40 kHz to 130 kHz) is above the human audible range of 20 Hz to 20 kHz, so these are classified as ultrasonic waves. (b) SONAR (Sound Navigation and Ranging) used in ships and submarines works on the same principle as dolphin echolocation. (c) Given, Distance to fish = 30 meters Speed of sound in water = 1500 m/s Total distance traveled = 30 m (to fish) + 30 m (back) = 60 meters Time = Distance ÷ Speed Time = 60 ÷ 1500 = 0.04 seconds or 40 milliseconds
31	(a) The frequency of vibration determines the pitch. Higher frequency produces higher pitch, lower frequency produces lower pitch. (b) A tight string vibrates faster (higher frequency) due to increased tension, while a loose string vibrates slower (lower frequency) due to less tension. (c) The flute produces higher frequency sounds (high pitch) while the drum produces lower frequency sounds (low pitch).

Prepared by: *Ms Aleena Joseph*	*Checked by:* *HOD Science*