

Lesson Plan: Sound Waves: Characteristics and Applications (CBSE Class IX 2026-27)

Teacher: _____

Class: IX

Subject: Science (Subject Code - 086)

Theme/Unit: Motion, Force and Work

Chapter: 10 – Sound Waves: Characteristics and Applications

Estimated Number of Periods: 12

1. Gist of the Lesson & Curricular Goals

- Core Syllabus:** Production of sound; Propagation of sound (compressions and rarefactions); Need for a material medium; Sound as a longitudinal wave; Characteristics of sound waves (wavelength, frequency, time period, amplitude, speed); Reflection of sound (echo and reverberation); Audible range; Infrasonic and ultrasonic waves; Applications like echolocation and SONAR.
- Educational Aim:** To explore the physical world and understand scientific principles based on observations (CG-2), developing the capacity to mathematically relate wave characteristics and apply them to real-life phenomena and acoustic technologies.

2. Teaching-Learning Plan & Pedagogy

Key Concepts	Competencies (C) & Learning Outcomes	Teaching-Learning Activities (Pedagogy)	Assessment Strategies
Production & Propagation of Sound	<p>C-2.7: Describes the origin and properties of sound.</p> <p>• <i>Outcome:</i> Students will demonstrate that</p>	<p>• Demonstration: Use a tuning fork and a rubber pad to touch the surface of water, showing vibrations creating sound.</p>	<p>• [Demonstrate Knowledge - VSA]: State why sound cannot travel through outer space.</p>

	<p>sound is produced by vibrations and requires a medium.</p>	<ul style="list-style-type: none"> • Scientific Inquiry: Discuss the Vacuum Bell Jar experiment to prove sound cannot travel in a vacuum, relating it to astronauts communicating in space. 	<ul style="list-style-type: none"> • [Application - SA]: <i>Explain</i> how sound is produced in the human larynx using vocal cords.
<p>Sound as a Longitudinal Wave</p>	<p>C-8.1: Develops accurate models to represent phenomena.</p> <ul style="list-style-type: none"> • Outcome: Students will map alternating compressions (C) and rarefactions (R). 	<ul style="list-style-type: none"> • Kinesthetic Activity (Activity 10.5): Use a stretched slinky on a table. Push and pull one end to show how disturbances travel parallel to particle vibration, defining longitudinal waves. 	<ul style="list-style-type: none"> • [Demonstrate Knowledge - Objective]: <i>Identify</i> the regions of maximum and minimum density in a sound wave. • [Formulate & Analyze - SA]: <i>Compare</i> the particle movement in longitudinal waves versus transverse waves.
<p>Wave Characteristics & Math</p>	<p>C-2.7: Mathematizes the relationship between wave properties.</p> <ul style="list-style-type: none"> • Outcome: Students will calculate speed using $v = \lambda f$ 	<ul style="list-style-type: none"> • Visual Mapping: Draw a Density vs. Distance graph. Label crests, troughs, amplitude, and wavelength (λ). • Digital Measurement: Use 	<ul style="list-style-type: none"> • [Application - SA]: <i>Calculate</i> the wavelength of a sound wave if its frequency is 100 Hz and speed is 5000 m/s in steel. • [Analyze & Evaluate - LA]:

	<p>ν times λ.</p>	<p>a mobile app like <i>Phyphox</i> to measure the frequency (ν) of different musical notes (Sa, Re, Ga).</p>	<p><i>Interpret</i> a given density-distance graph to extract amplitude and wavelength.</p>
<p>Reflection, Echo & Reverberation</p>	<p>C-2.7: Applies properties of sound to surroundings.</p> <p>• <i>Outcome:</i> Students will calculate the minimum distance required for an echo.</p>	<p>• Numerical Practice: Calculate the 17 m minimum distance required to hear an echo based on the 0.1 s persistence of hearing and a speed of 340 m/s.</p> <p>• Real-World Connection: Discuss the architectural design of auditoriums and the Whispering Gallery of Gol Gumbaz to manage reverberations.</p>	<p>• [Demonstrate Knowledge - VSA]: <i>Define</i> reverberation.</p> <p>• [Application - Case-Based]: <i>Calculate</i> the distance to a cliff if an echo is heard 0.5 s after clapping.</p>
<p>Ultrasonic Waves & SONAR</p>	<p>C-5.2: Examines case studies related to the use of Science.</p> <p>• <i>Outcome:</i> Students will explain echolocation and solve SONAR problems.</p>	<p>• Concept Mapping: Map the human audible range (20 Hz - 20 kHz) versus infrasonic and ultrasonic ranges.</p> <p>• Application: Explain how bats hunt and how ships</p>	<p>• [Demonstrate Knowledge - Objective]: <i>Identify</i> the frequency range used in medical ultrasonography.</p> <p>• [Formulate & Analyze - SA]: <i>Evaluate</i> the depth of a sunken ship if a</p>

		use SONAR to map the ocean floor by timing returning echoes.	SONAR signal takes 4 seconds to return.
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3. Assessment Structure & Weightage

Assessments are strictly modeled on the CBSE 2026-27 Theory Question Paper Design (80 marks):

- **Demonstrate Knowledge and Understanding (50%):** Assessed via questions asking students to *state, name, list, identify, define, suggest, describe, outline, and summarize* (e.g., defining amplitude, listing applications of ultrasound).
- **Application of Knowledge/Concepts (30%):** Assessed via questions asking students to *calculate, illustrate, show, adapt, explain, and distinguish* (e.g., calculating wave speed, distinguishing between pitch and loudness).
- **Formulate, Analyze, Evaluate and Create (20%):** Assessed via questions asking students to *interpret, analyze, compare, contrast, examine, evaluate, discuss, and construct* (e.g., interpreting complex sonar delays, evaluating density graphs).

4. Digital Integration & Portfolio Enrichment (Internal Assessment - 20 Marks)

- **Subject Enrichment (Practical Work - 5 Marks):** Evaluated strictly on the execution of the open-ground speed of sound experiment. Students will be assessed on their ability to accurately time the delay between *seeing* a balloon burst and *hearing* it over a fixed distance (e.g., 200 m), and properly calculating the average speed of sound in air.
- **Digital Integration Strategy:** To reinforce abstract auditory concepts ahead of Periodic Assessments, utilize the smartphone app *Phyphox* (Audio Scope feature). Students can whistle or speak into the microphone to digitally visualize how pitch correlates with frequency and loudness correlates with amplitude in real-time.
- **Portfolio Task (5 Marks):** Students will *investigate* the societal and biological impact of sound frequencies. They will prepare a brief research report on how specific animals (like elephants using infrasound or bats using ultrasound) navigate their environments. They will connect this to human technological adaptations like medical ultrasonography or drone audio surveillance, securely adding this cross-disciplinary study to their academic

portfolio.

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