CBSE Class 9 Science Notes Chapter 12: CBSE Class 9 Science Notes Chapter 12 gives students a solid basis. They will be better able to recognize their interest and follow it in the more advanced classes. At this point, having a solid scientific foundation is essential. Sound is one of the important topics in this syllabus that you should read. The subject's twelfth chapter requires more of the student's attention. They will gain knowledge about the origin of sound waves and how they move through different media.

They will study energy waves and how they act in a medium for the first time. The science professors have prepared CBSE Class 9 Science Notes Chapter 12 as an easy-to-follow guide to help clarify these new ideas.

They have explained each of these ideas in straightforward terms. They understand the typical questions and challenges that students have when studying this chapter. Therefore, the ideal guide to follow and prepare the chapter appropriately will be the CBSE Class 9 Science Notes Chapter 12. You can download and use these CBSE Class 9 Science Notes Chapter 12 offline whenever it's most convenient for you. When you have the greatest CBSE Class 9 Science Notes Chapter 12 to refer to before an exam, you don't need to worry.

CBSE Class 9 Science Notes Chapter 12 Overview

A summary of the key subjects covered in CBSE Class 9 Science Notes Chapter 12 Sound is provided below. It is recommended that students go through these to have a sense of the topics they will need to read about in-depth in the CBSE Class 9 Science Notes Chapter 12.

- Sound-Production and Propagation
- Characteristics of Sound
- Medium
- Wave and its Types
- Audible Frequency
- Reflection of Sound - Applications
- Reflection and Laws of Sound

CBSE Class 9 Science Notes Chapter 12

You now know that sound is a particular kind of energy. It occurs due to vibrations. Sound waves are longitudinal waves. They need to be transmitted through a material medium because they are elastic waves. They are unable to converse when apart from one another. They can pass through gases, liquids, and solids. Their velocity is lowest in gases and largest in solids.

We hear a wide range of sounds in our daily lives, including loud noises, high-pitched sounds, noisy, pleasant tones referred to as musical sounds, and so forth.

This chapter will examine what makes a sound pleasant or unpleasant, as well as the factors that affect pitch, loudness, and other properties of sound.

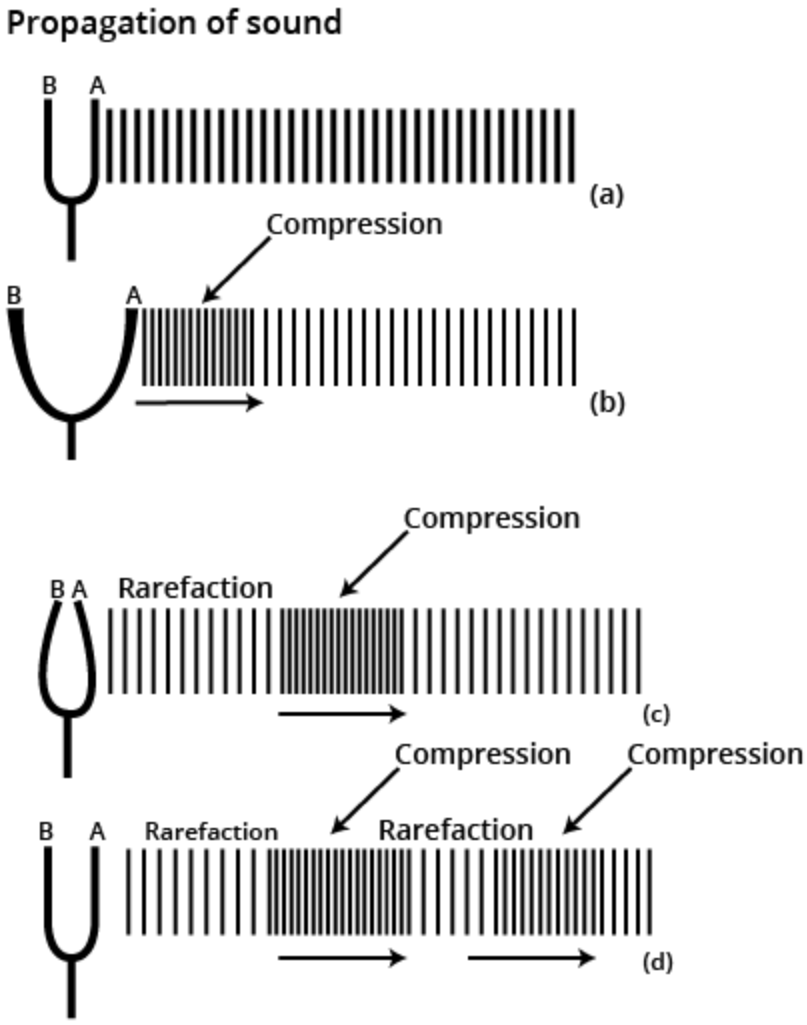
Sound as a Wave

We distinguish extremely different sounds between a thunderclap, rock music, laughter, and a ringing bell. All noises are the same, though, because they are all waves. Let's examine the application of wave characteristics to sound.

Our ears pick up sound, which is a type of energy that travels in waves. When we speak, our vocal chords vibrate. A guitar's spring generates music as we pluck the strings. A tuning fork's vibrations can also produce sound. A body vibrates, and vibrations produce sound. Sound waves must pass through a material medium since they are unable to move in a vacuum.

Your eardrums vibrate as sound waves enter your ears, which is how you can hear. Nerves then transmit the vibrations to your brain. The brain converts the messages into sound.

Propagation of Sound



Propagation of sound waves in air from a tuning fork

A longitudinal wave is one in which the medium's particles oscillate concerning their mean positions along the wave's direction of propagation.

Sound waves most commonly occur as longitudinal waves. Let's examine the propagation of sound waves. Holding a tuning fork, shake it while concentrating on a single prong, let's say prong A. The diagram (a) shows the initial state of air particles and the typical position of the tuning fork. The compression of air particles surrounding prong A causes it to move to the right, as seen in Fig (b). Vibrating air layers cause this compression to go onward as a disturbance.

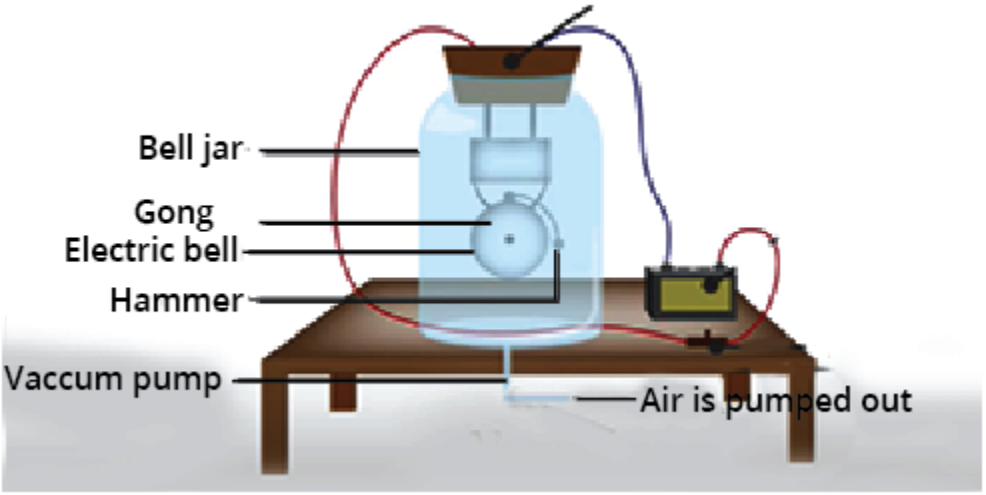
As prong A moves back to its original position, the pressure on its right decreases, causing a rarefaction. This rarefaction moves ahead like compression as a disturbance. Figure (d) illustrates how waves of alternating compressions and rarefactions travel through the air as the tuning fork keeps vibrating. Sound waves are categorized as longitudinal waves because they

move in the same direction as air particles. As they go, longitudinal waves assume the forms of compressions and rarefactions.

Sound Needs a Medium to Travel

Sound always comes from a vibrating body. In certain circumstances, the source's vibrations could be so little or so massive that it is impossible to detect them. This kind of vibration is produced by tuning forks, drums, bells, guitar strings, and other instruments. The human voice is produced by vibrations in the vocal cords, while musical instrument sound is produced by vibrations in the air columns. Sound waves must be propagated through a material medium for them to move as longitudinal waves.

Experiment to show that sound waves (mechanical waves) require a material medium for its propagation



Electric bell suspended inside an airtight glass bell jar

An electric bell suspended within a sealed glass bell jar has a vacuum pump attached to it. When the electric bell circuit is complete, the sound is audible. When the bell jar's air is gradually removed using a vacuum pump, the sound intensity gradually diminishes until it is completely silent. We would watch while the hammer kept hitting the gong.

This indicates unequivocally that a material must be present for sound to propagate. Sound is not limited to passing through gases; it may also pass through solids and liquids. Certain materials are good at moving sound energy from one place to another, like water, iron, and air. Conversely, materials like heavy curtains and comforters absorb much of the sound energy.

Basic Terms Connected to Waves

The four essential concepts in the study of waves are wavelength, amplitude, frequency, and wave velocity.

The wavelength is the separation between two successive points on a wave that is in the same phase. (The same vibrational state is indicated by the same phase.)

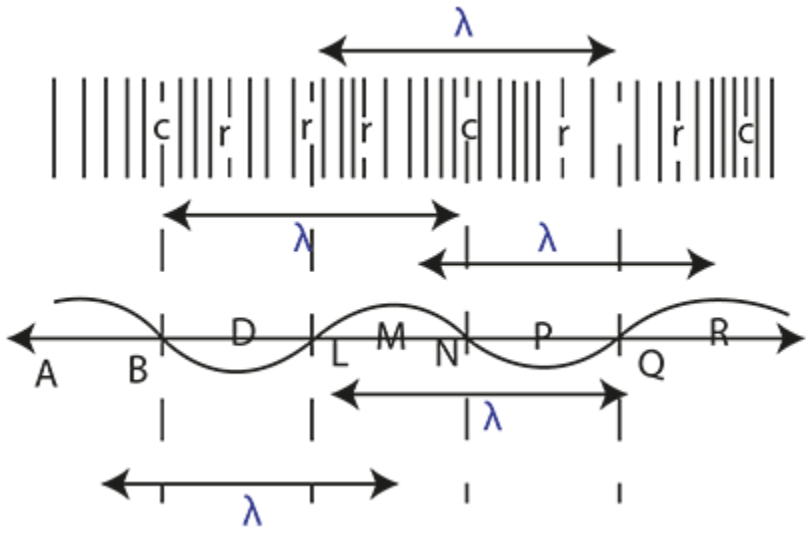
Amplitude is the term used to describe a particle's greatest deviation from its mean position. Frequency is defined as the total number of periodic oscillations that occur in a second. The regularity

f = 1/T

f = 1/T

where 'T' is the time it takes for one oscillation to complete. The hertz Hz

Hz is the unit of measurement. The wave velocity 'v' is the rate at which energy propagates through a medium.



Sound wave

The product of the wavelength and frequency gives us the wave velocity because wavelength is the distance travelled during one oscillation and frequency is the number of oscillations per second.

Distance travelled in

1 s =

1 s = number of waves in one second x wavelength

Wave velocity = Frequency × Wavelength

or,

v = f (x)

v = f (x)

Speed of Sound

Even though they happen simultaneously, the lightning strike brought on by cloud interaction is seen far earlier than the thunder. The reason for this is that light travels at a quicker pace than sound. The properties of the medium that sound travels through dictate how fast sound travels. Elasticity, density, pressure, and temperature of the medium are all subject to change. Sound loses velocity when it transitions from a solid to a gaseous state.

The speed of sound does, however, increase with temperature in all media. The sound speed in various media at various temperatures is displayed in the table.

Reflection of Sound

Sound waves reflect like light when they hit a solid or liquid surface. Sound waves are subject to the same laws of reflection and refraction. We need a large surface or obstacle for sound waves to reflect. For instance, successive reflections from clouds and surface features induce thunder to roll.

The rule of sound reflection states that the directions at which sound is incident and reflected make equal angles with the normal to the reflecting surface, and all three lie in the same plane.

Echoes

Like all waves, sound waves can be reflected. There are massive obstacles that reflect sound waves. A sound that is produced when a large obstruction reflects a sound wave is known as an echo. Because the reflected sound is blended in with the original sound, echo is typically imperceptible. Certain conditions must be satisfied to hear an echo (as a separate sound). Any sound's experience lasts about

0.1 moments in our auditory organs. This is known as the persistence of hearing. If the echo is detected inside this window of time, the original sound and its echo cannot be distinguished. T

As a result, the following conditions could be listed for echo formation:

For sound to be reflected, the obstruction or reflector needs to be large about the wavelength of the incident sound.

To ensure that the echo is audible clearly after the original sound has ended, there should be a minimum of 17 meters separating the reflector and the source of the sound.

For the reflected sound to be audible when it reaches the ear, the sound's intensity or loudness needs to be sufficient. There shouldn't be any more original sound than a few seconds.

Echoes' Benefits and Drawbacks

Echoes can be useful or bothersome. Echoes could ruin a performance in a music hall if the walls and roof are not constructed properly.

If the walls are either too hard or too flat to reflect sound waves, then echoes can be a useful source of important information. High-frequency sound waves are emitted by a ship's sonar equipment, which uses sound navigation ranging (Sonar) to measure the distance between the ship and the seafloor. Similar principles apply to the operation of an ultrasound scanner, which is most famous for creating images of unborn children.

Bats use echoes to guide them as they soar through the night. It functions similarly to ultrasound and sonar scanners. The bat makes a succession of high-pitched, little squeaks that reverberate off the items in its path. The bat adjusts its path to avoid the obstructions after hearing the echoes. Large ears are a common feature of bats, helping them to hear as much reflected sound as they can.

The use of echoes by animals such as dolphins and bats is known as echo finding. They make use of it to navigate and seek prey. Certain animals utilize echolocation to pinpoint objects in their environment in terms of size and location.

Bats fly at night using echolocation as a navigational aid. A sequence of tiny "clicks" are fired by them, and after they bounce off objects, they return to the bat. It projects a "sound" image of the environment around it.

Reverberation

Because of light reflection, a sound produced in a vast hall will continue until its volume is reduced to the point where it is inaudible.

Reverberation is the continuation of detectable sound after the source has stopped creating it due to multiple reflections from nearby objects.

Avoiding too much reverberation is advised. To reduce reverberation, sound-absorbing materials such as rough plaster, compressed fiberboard, or draperies are typically applied to the auditorium's walls and roof.

Applications of Sound Reflection in Real-world Settings

Some applications of the principle of reflection of sound are:

- Megaphone
- Hearing Board
- Sound Boards

Megaphone: A megaphone resembles a tube with a horn-like shape. Consecutive reflections keep sound waves from propagating outside of the tube, so confining them to the air inside.

Hearing Board: People who have trouble hearing use devices called hearing aids. The hearing aid reflects sound waves into a smaller area that goes into the ear.

Sound Boards: Curved surfaces can reflect sound waves. This sound wave reflection is used in auditoriums to disperse sound waves uniformly around the room. Sound waves are reflected to the source using soundboards. The speaker's location on the soundboard serves as its main focal point.

Musical Sound and Noise

A musical sound is a pleasing, continuous, and uniform sound produced by regular, periodic vibrations.

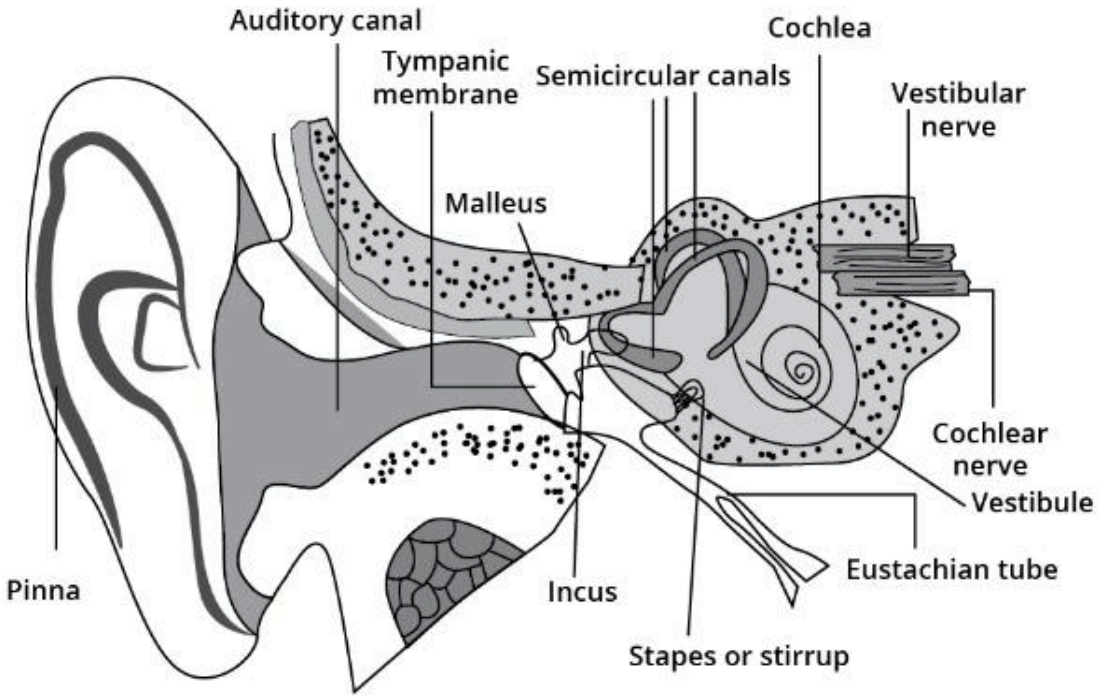
For example, a tuning fork, piano, guitar, and other musical instruments produce a nice sound.

An uneven sequence of discordant, unpleasant-to-the-ear disturbances is referred to as noise.

Bats and dolphins can detect the existence of a barrier by listening to the echo of their sound. This kind of work is called sound-ranging.

Structure of Human Ear

The Structure of the Human Ear The ear is a highly sensitive organ in humans that gives us the ability to hear. The three main parts of the ear are the middle ear, inner ear, and outer ear. Each part of the ear is in charge of hearing and processing sound uniquely. The outer ear is referred to as the pinna. It gathers and transports sound to the middle ear via the auditory canal.



The auditory canal terminates at the eardrum, sometimes referred to as the tympanic membrane. It is a thin membrane. The compression or rarefaction pushes both inside and outward until it reaches the eardrum. This causes vibrations in the eardrum. These vibrations are amplified by the hammer, anvil, and stirrup bones, which make up the middle ear.

The middle ear is responsible for sending these vibrations to the inner ear. Within the inner ear, the cochlea transforms vibrations and pressure changes into electrical signals. These electrical signals are sent to the brain by the auditory nerve, and the brain interprets them as sound.

Benefits of CBSE Class 9 Science Notes Chapter 12

Studying Class 9 Science Revision Notes on Chapter 12 Sound offers numerous benefits. But the most notable ones are as follows:

- In a nutshell: Quick, concise explanations of the chapter's main ideas provide it an effective overview.
- Simplified Learning: Hard subjects are simplified to make them easier to learn, leading to improved comprehension.
- Effective Last-Minute Study: An invaluable resource that offers crucial insights for last-minute test preparation.
- Enhanced Retention: Ensures that important information is retained by providing succinct, understandable explanations.