

# Class 9 Science: Sound

All the chapters that are taught in Class 9 Science subjects impart fundamental concepts of Science in the most simplified manner, with loads of examples and exercises to make it interesting for the students. One such chapter that holds importance in Class 9, as well as advanced levels of Science, is sound under Unit 3: Motion, Force, and Work. In this Class 9 chapter 12, students would learn the definition of Sound, how it is produced, its characteristics, what are waves, how sound travels through air, the Laws of Reflection of Sound, and other relevant topics. Therefore, if you are a class 9 student and want radical solutions for science NCERT class 9 subject, especially for the chapter Sound, read this whole blog on sound notes for class 9 with a clear mind.

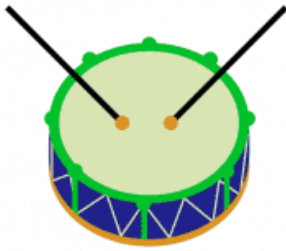
## Meaning of Sound

A form of energy that creates a sensation of hearing in our ears and makes us hear something is called sound. Sound can neither be created nor destroyed. A person can produce a sound by converting a form of energy into sound energy. For example, the sound produced by a ringing phone is possible when electrical energy is transformed into sound energy.

# What is Sound?

Sound is a form of energy which moves in the form of vibrations.

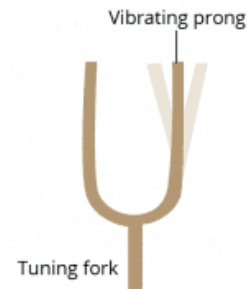
**Necessary condition for sound production = vibration of a particle**  
Vibration is to and fro movement of a particle from its initial position



When we hit the drum, membrane of the drum vibrates producing sound



When we play the guitar, the strings move to and fro producing sound.



Sound produced by the vibrating prong of a tuning fork.

## Production, Propagation, and Medium of Sound

When an object vibrates or a form of energy of some outside source, such as wind, hand, etc., assists in vibrating the object, a sound is produced or made. For instance, when the two vocal cords in a living being's throat vibrate, a sound is produced, which is known as the voice of the living being. A melodious sound from a flute is produced when its air column vibrates because of the air that passes through it.

Propagation of sound means traveling or movement of sound. And, the substance that helps sound travel is called the medium. The particles that are present in and around the medium causes motion in each other (and not forward or backward) which results in the traveling of sound. Since sound cannot travel in a vacuum, it requires a medium that can be in the form of solid, liquid, or even gas.


## Sound Waves and its Types

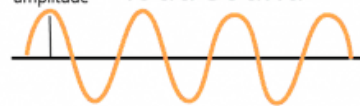
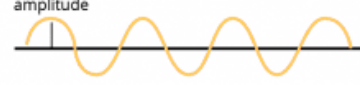
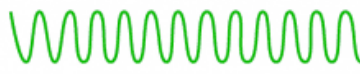
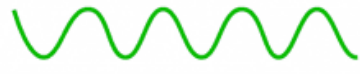


A disturbance that is produced in a sound's medium when its particles vibrate is known as a wave. The perfect examples of waves are Heat, Light, and sound. Based on the direction of propagation, there are two types of waves, i.e. Longitudinal Waves and Transverse Waves.

## Characteristics of Sound

As given in the solutions for science NCERT class 9, there are 5 characteristics of sound, namely Frequency, Wavelength, Amplitude, Time Period, and Velocity.

# Characteristics of Sound Waves



Loudness	Pitch	Timbre or Quality
<p>Loudness is the response of ear to the sound. Loudness is proportional to the square of the amplitude of the vibration body producing sound. The more the amplitude of vibration, the sound is the loud. The lesser the amplitude of vibration, the sound is feeble.</p> <p style="text-align: center; color: #00a0c0;">High amplitude - loud sound</p>  <p style="text-align: center; color: #00a0c0;">Low amplitude - feeble sound</p> 	<p>Frequency determines the shrillness or the pitch of the sound. Higher the frequency, higher the pitch or it is said that the sound is shrilling. Lower the frequency, lower the shrill or pitch. Eg: Babies voice has more frequency and thereby more shrill than an adult voice.</p> <p style="text-align: center; color: #e67e22;">High frequency - shriller sound shorter wavelength</p>  <p style="text-align: center; color: #e67e22;">Low frequency - flatter sound longer wavelength</p> 	<p>Timbre or sound quality is that characteristics by virtue of which we can distinguish between sounds of the same pitch and loudness produced by two different musical instruments or by different voices.</p> <p style="text-align: center; color: #27ae60;">Sound waves of guitar</p>  <p style="text-align: center; color: #27ae60;">Sound waves of sitar</p> 



The Greek letter “Lambda” ( $\lambda$ ) symbolizes Wavelength whose SI unit is meter (m)

Frequency is denoted by  $\nu$  (nu)

The letter “T” denotes Time Period, the reciprocal of which is the Frequency of a wave

which is,  $\nu = 1/T$

The flatness or shrillness present in a sound is called Pitch that is dependent on the frequency of

vibration

Loudness means measuring sound energy that reaches our ears every second. The measuring unit of Loudness is “decibel” (dB)

Parameter	Sound	Noise
Definition	Continuous vibrations that travel from one medium to another	Unpleasant sound that causes disturbance
Effects on health	Sound has a positive effect on the health	Noise has a negative effect on health like hearing loss, hypertension
Connotation	Sound carries a positive connotation as it is audible, distinctive, relevant and definitive	Noise carries a negative connotation as it is irrelevant, incompressible

## Speed of Sound in Different Mediums

The density of the medium through which sound travels decides the speed of the sound. A sound travels at its fastest speed through solids, faster when traveling through liquids, and slowest when using gases as its medium to travel. With a temperature rise, the speed of the sound increases too. Also, when there is an increase in the humidity of the air, there is an increase in the speed of sound as well.

## Laws of Reflection of Sound

The striking or falling of sound waves upon a hard surface causes them to return through the same is a phenomenon known as a reflection of sound. *The laws of reflection of sound that obeys the laws of reflection of light are as follows:*

1. The angle of reflection is equivalent to the angle of incidence, and
2. The three sound waves at the point of incidence, i.e. normal, incident, and reflected lie or fall in the same place.

Numerous instruments work following multiple reflections of sound, such as loudspeakers; musical instruments, like shehnais, trumpets, etc.; stethoscope; large in size auditoriums, and halls.

## Echo

Another topic which is a part of class 9 Science Sound is Echo. When a person can hear back his/her sound, then such a situation is referred to as the echoing of sound. Sounds echo when it successively gets reflected from large and hard surfaces or obstacles. *There are two primary conditions to hear a sound echo:*

1. The time gap between the actual sound and the reflected sound must be of 0.1 seconds, and
2. To satisfy the above condition, the minimum distance between you and the reflecting surface must be 17.2 meters at 22°C. This minimum distance is also dependent on the room temperature.

## Reverberation

The persistence or repetition of sound waves for a prolonged period of time due to continuous (non-stop) reflections of sound is denoted as reverberation. If reverberation stays over a longer period of time, the sound gets impacted, which makes it confusing,



blurred, and distorted because of the overlapping of various sounds. Therefore, to avoid reverberation, materials that absorb soft sound, like plant fibre, curtains, carpets, compressed fiberboard, etc., are used in such places viz auditoriums.

## Range of Hearing

The audible range of hearing of a human ear is 20 Hz and 20,000 Hz. This means that a human can clearly hear those sound waves, which have a frequency of 20 Hz to 20,000 Hz. Sound frequencies that are lower than 20 Hz are called “infrasonic waves,” and those above 20 Hz are called “ultrasonic sound waves.” The examples given in sound notes for class 9 explains that an elephant, whales, earthquakes (before shock waves), the vibration of the pendulum produces infrasonic sound waves. Such sounds can only be heard by some animals. Whereas, only bats and rats can produce ultrasonic sounds, which are audible by them, dogs, dolphins, and porpoises.

## Ultrasound and its Application

Sound waves of frequencies higher than 20,000 Hz are defined as ultrasound. Such high-frequency sound waves that are produced in ultrasound have more energy that can penetrate to a very large extent. *This special attribute of ultrasound creates its utility for various purposes, some of which are as follows:*

1. Ultrasound is widely used in detecting deformities, like cracks in metal sheets or blocks.
2. Bats make an ultrasound to search their prey. The sound of their ultrasonic squeaks strikes the prey’s body or any other object that reflects the sound waves and returns to the bat’s ear. This way, bats come to know about the distance between them and their prey.
3. Ultrasound waves are a common surgical tool and a technique in medical therapy and diagnosis. Like, during the pregnancy period, it is through ultrasound that gynecologists can check the development of the fetus or break down the stones into small grains that are developed in the kidneys.
4. Ultrasonography
5. Echocardiography

## SONAR

Sound Navigation And Ranging, abbreviated as SONAR is a device that finds its use or application when looking for distance, speed, and direction of underwater objects, such as icebergs, water hills, submarines, valleys, sunken ships, etc. a SONAR device that is installed at the bottom/base of a ship comes with a transmitter and a receptor inside it.





The work of the transmitter is to produce and send ultrasonic waves, which travel through water and get reflected after it strikes the objects that are present on the floor of the sea. These reflections of ultrasonic waves are then received by the receptor. The detector converts these reflected waves into electric signals. The work of the SONAR device is to calculate the time that ultrasonic waves take to travel from ship to the seafloor and vice-versa, i.e. back to the ship.

So,  $2d = v \times t$ ,

where  $t$  = time interval between transmission of the ultrasound and its reception

$v$  = sound speed through seawater

$2d$  = the total distance that the waves travel

The above formula is called echo ranging.

## Structure of Human Ear

A human ear is made up of three parts viz outer ear, middle ear, and the inner ear. We know that the human ear is that sense organ of a human body that helps them hear a sound. The outer ear part of the human ear is called pinna that does the work of collecting sound from its surroundings. The outer ear passes this sound through the auditory canal, at the end of which you are a thin elastic membrane termed as a tympanic membrane or eardrum.

The second part, i.e. the middle ear comprises three bones that are hammer, anvil, and stirrup, which are all linked up with one another. The hammer bone has a free end that meets the eardrum and that part of the stirrup bone, which is connected with the membrane of the oval window present in the inner ear. There is a narrow "Eustachian Tube" at the lower segment of the middle ear.

The cochlea, a coiled tube, is situated in the inner ear, linked with the oval window. This cochlea is full of liquid that consists of nerve cells. The auditory nerve, which straight goes to the brain, is connected with the other side of the cochlea.

**The flow of sound in a human ear is as follows:**

***Sound → Pinna → Ear Canal → Eardrum → Hammer → Anvil → Stirrup → Oval Window → Cochlea → Auditory → Nerve Brain***



Thus, the above comprehensive yet precise sound notes for class 9 will serve as the best article to revise the whole chapter and get a stronghold over it. Seeing the importance of this concept, the marks distribution is high for this chapter. If you are looking for more such solutions for Science NCERT class 9 chapters, please visit [Leverage Edu](#).