

Study Notes: CBSE Class 8th Physics (Sound)

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- Production of sound
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- Oscillatory motion, Frequency, Amplitudes
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- Inaudible and audible sounds
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- In our daily life we hear sounds from various sources like human birds, bells, machines, vehicles, televisions, radios etc. Sound is a form of energy which produces a sensation of hearing in our ears. In this chapter we study how sound is produced and how it is transmitted through a medium and reduced by our ear.

Production of sound

Sound is produced by a vibrating body e.g. when a tightly stretched band is plucked, it vibrates and produces sound. When it stops vibrating, it does not produce any sound as shown in figure.



Fig (1)
(Production of sound due to vibration)

- In most cases, the vibrations are easily visible to us. But in some cases, their **amplitude** is so small therefore we cannot see them, but we can feel them.
- Musical instruments (like veena, tabla, flute etc.) are also good examples for the production of sound. The vibrating parts of veena, tabla, flute are stretched string, stretched membrane, air column. These parts produce sound in musical instruments.
- In humans, sound is produced by the **voice box** or the **larynx**. Put your fingers on the throat and find a hard bump that seems to move when you swallow. This part of the body is known as the voice box. This is at the upper end of the **wind pipe**. Two **vocal cords** are stretched across the voice box or larynx in such a way that it leaves a narrow slit between them.

for the passage of air. When the lungs force air through the suit the vocal cords vibrate, producing sound.

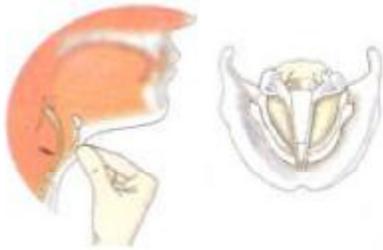


Fig (2)
(voice box in human)

Note: - The vocal cords in men are about 20 mm long. In women these are about 5 mm shorter. Children have very short vocal cords. This is the reason why the voices of men, women and children are different.

- Sound needs a medium (like solid, liquid and gas) for propagation. If air has been removed completely from a vessel, it is said that there is a **vacuum** in the vessel. The sound can not be propagate through a vacuum.

The sound traveling from water to solid are given below: -



Fig (3)
(sound propagate through water)



fig (4)
(sound propagate through solid)

Humans hear sound

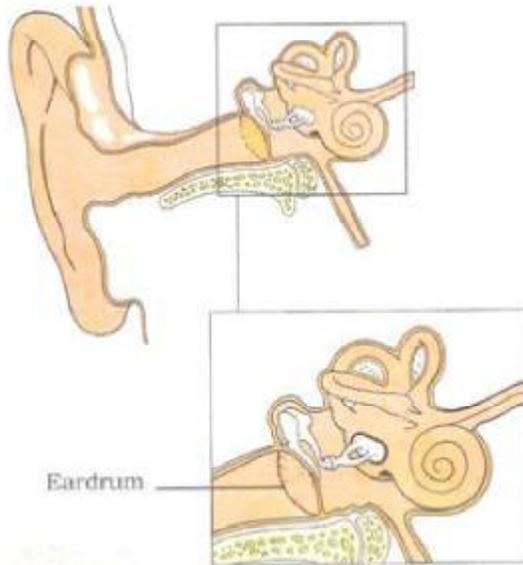


fig (5)
(ear drum)

The shape of the outer part of the ear is like a funnel. When sound enters it, it travels down a canal at the end of which a thin membrane is stretched lightly. It is called the **eardrum**.

- Eardrum is like a stretched rubber sheet. Sound vibrations make the eardrum sends vibrations to the inner ear. From these, the signal goes to the brain. That is how we hear sound.
- The to and fro motion of an bject is known as vibration. This motion is also called **oscillatory motion**.

- The number of oscillations per second is called the **frequency**. It is expressed in hertz. Its symbol is **Hz**.

Amplitude and frequency are important properties of any sound.

- The loudness of sound depends on its amplitude. It is proportional to the square of the amplitude of the vibration producing the sound. When the amplitude of vibration is large, the sound produced is **loud**. When the amplitude is small the sound produced is **feeble**. The loudness is expressed in a unit called decibel(dB). Above 80 dB the noise becomes physically painful.
- The frequency determines the **shrillness** or **pitch** of the sound. When the frequency of the vibration is higher, then the sound has a higher pitch. When the frequency of vibration is lower, then the sound has a low pitch.

Note :- the frequency of the voice of a child is higher than that of an adult. The voice of a woman has higher frequency and is shriller than that of a man.

- The sounds of the frequencies less than about 20 vibrations per second (20 Hz) are called **inaudible sounds**. Such sound can not be detected by the human ear.
- The sound of frequencies higher than about 20,000 vibrations per second (20 kHz) are called the audible sounds.
- For human ear, the range of audible frequencies is roughly from 20 to 20,000 Hz
- The ultrasound equipment works at frequencies higher than 20,000 Hz it is used in medical problems.
- The unpleasant sounds produced by different sources are called **noise**. The sound produced by musical instruments (like harmonium, sitar, tabla etc..) are called **musical sound**.



Fig 7
(Musical sound)

- Presence of unwanted sound in the environment is called **noise pollution**. Major causes of noise pollution are sounds of vehicles, explosions, including bursting of crackers, machines, loudspeaker etc.. To control noise must control the sources of noise.