LESSON 13:SOUND

CLASS – VIII

SUBJECT- SCIENCE

MODULE 2

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AECS -3,MUMBAI

CLASS VIII
CHAPTER-13

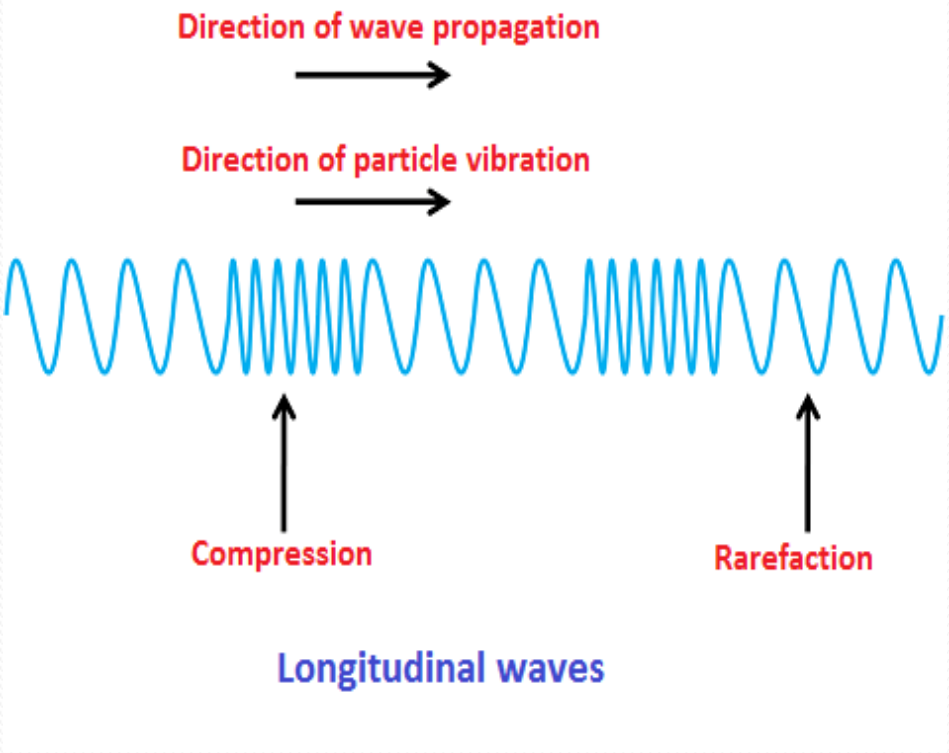
SOUND

SOUND TRAVELS IN AIR IN THE FORM OF LONGITUDINAL WAVES

- Sound is a form of energy because it is produced when a body vibrates. The sound energy in air is transmitted from one place to another place by wave motion. In wave motion, the particles of the medium do not leave their mean positions but they vibrate about their mean positions.
- When a body vibrates, the particles of air surrounding it start vibrating about their mean positions. During vibrations, they push or pull nearby particles and transfer some energy to them. Then they start vibrating faster and transfer energy to the next surrounding particles. The process continues till the vibrations reach the ear of a person.
- Such vibrations in the direction of propagation of sound form longitudinal waves.

Propagation of sound as longitudinal waves.

- Waves are made of compressions and rarefactions. Compression happens when particles are pressed together. Rarefaction happens when particles are allowed to expand.



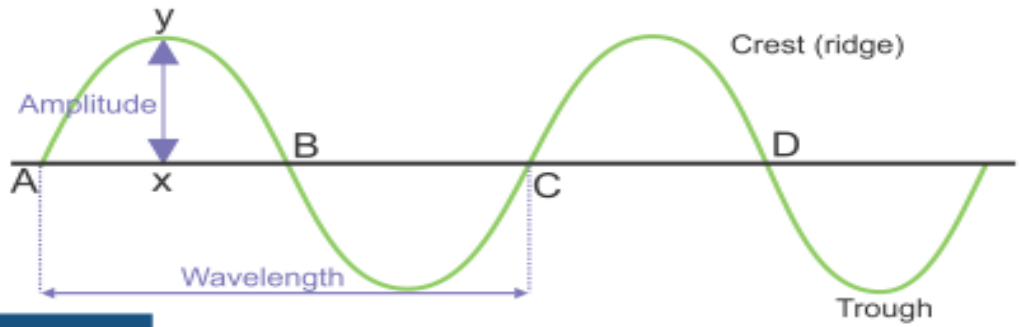
SOME TERMS RELATED TO WAVE

- One vibration : The to and fro motion which constitutes one full wave is called one vibration. One wave is from one rarefaction to the next rarefaction or from one compression to the next compression.
- Wavelength : The length of a wave corresponding to one vibration is known as its wavelength. it is measured in meter.
- Amplitude: The maximum displacement of a wave on either side of its mean position is known as the amplitude.

SOME TERMS RELATED TO WAVE

- Time period: The time taken by a wave to complete one vibration is known as its time period. It is always denoted by the letter T and is measured in second.
- Frequency: The number of vibrations produced by the source of sound wave in one second is known as its frequency. Its unit is hertz and is denoted by Hz.

SOUND AS WAVE



Terms related to a wave:

Oscillation
One complete to and fro motion, where one full wave is constituted. From fig, If a wave starts from 'A', it completes full wave at 'C', making one oscillation.

Wavelength
Length of a wave along x-axis, represented by 'λ' (lambda). From fig, AC is the wave length. It is measured in Angstrom unit (A).
$1\ A^0 = 10^{-10}m$

Amplitude
The maximum displacement of a wave on either side of its mean position. From fig, XY is the amplitude of the wave.

Time period
The time taken by a wave to complete one oscillation. It is denoted by **'T'.**

Frequency
The number of oscillations made by wave in one second. **It is denoted by 'n' or 'f'. Its unit is hertz (Hz).**

Relation between Time period and Frequency

Time period = 1/Frequency
Frequency = 1/Time period

CHARACTERISTICS OF SOUND

- A sound wave is characterized by its amplitude and frequency. Depending upon the amplitude and frequency of the sound wave, the two characteristics of sound are:
- **Loudness**
- **Pitch**

➢ Loudness : The loudness of a sound depends on the amplitude of vibration of the vibrating body producing the sound. Greater the amplitude of vibrations, louder is the sound produced.

ACTIVITY

Place a ping pong ball on the membrane of a drum. Beat the membrane gently with a drum stick. A feeble sound is heard and the ball hops up and down slowly.

Now beat the membrane harder with a drum stick. The drum produces louder sound and the ball jumps higher.

When amplitude of vibration is large, sound produced is loud. When amplitude is small, The sound produced is feeble.

- Pitch :The pitch of a sound depends on its frequency.

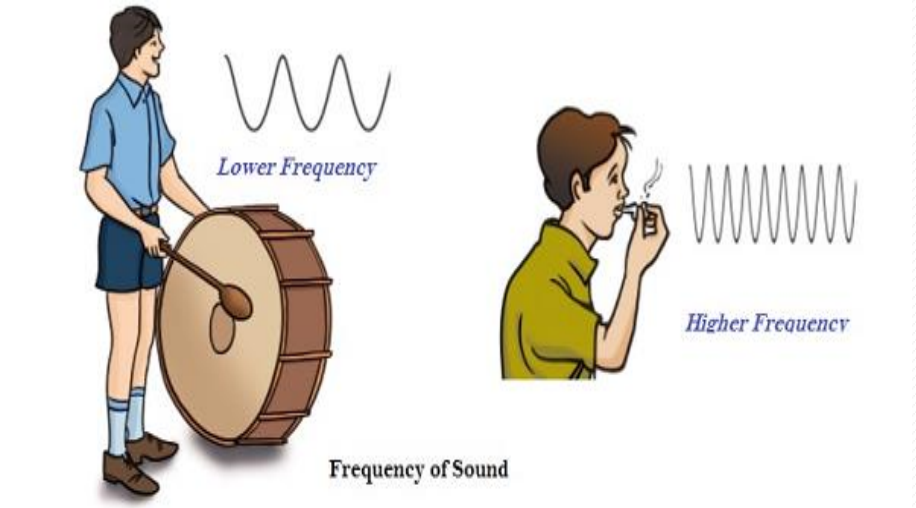
A sound of higher frequency is said to have a higher pitch. Higher the pitch, shriller is the sound. But if the pitch is low, the sound is flat .

The voice of a girl is shriller than that of a boy because the voice of a girl is of a higher pitch.

Pitch is a characteristic of sound which distinguishes a shrill sound from a flat sound.

Low and high frequency sounds

E.g. A drum vibrates with a low frequency and so it produces a low pitched sound. On the other hand, a whistle has a high frequency and so produces a sound of higher pitch.



AUDIBLE AND INAUDIBLE SOUNDS

- We know that vibrations cause sound. But the human ear cannot hear sounds of all frequencies.
- We can hear frequencies in the range of 20Hz to 20,000Hz.
- We cannot hear sounds of frequency below 20Hz and above 20,000Hz.
- The range of frequency from 20Hz to 20,000Hz is called the audible range for the normal human ear.

ULTRASONIC SOUND

- Sounds of frequency higher than 20,000 Hz are called ultrasonic sound. Some animals like dogs,bats,monkeys,leopards,deer etc can hear ultrasonic sounds.Dogs can hear sounds of frequency up to 50,000Hz .
- Bats can hear sounds of frequency up to 100,000Hz.At night, they easily move about without colliding with any object as the ultrasonic sound they produce comes back after reflection from any object and helps them to detect any object in their way.

INFRASONIC SOUND

- Sounds of frequency lower than 20Hz are called infrasonic sound. We cannot hear them. For example, the pendulum of a clock makes one vibration in two second. The frequency of sound produced due to its vibrations is 0.5Hz.It is infrasonic sound and we can't hear it.

ULTRASONIC AND INFRASONIC SOUNDS

Sound waves with a frequency *too low* for the human ear to hear are called **infrasound**.

Sound waves with a frequency *too high* for the human ear are called **ultrasound**

INFRA SOUND

ULTRA SOUND

Animals such as whales, elephants and hippopotamus use infrasound to communicate over distances.

Animals such as dogs, bats, birds and insects can hear ultrasound.

MUSIC AND NOISE

MUSIC

NOISE

MUSICAL INSTRUMENTS

- All musical instruments produce sound due to vibrations. The different types of musical instruments are :-
- WIND INSTRUMENTS – Musical instruments like flute, clarinet ,trumpet etc produce sound when air is blown into them. The column of air inside them vibrates producing sound.

TYPES OF MUSICAL INSTRUMENTS

- STRINGED INSTRUMENTS : The stringed instruments such as sitar,guitar,piano,violin have strings stretched on them. The string vibrates when plucked and produces sound.

WIND INSTRUMENTS

STRINGED
INSTRUMENTS

TYPES OF MUSICAL INSTRUMENTS

- PERCUSSION INSTRUMENTS: In instruments like drum,tabla,dholak etc.the leather membrane is made to vibrate by striking it so as to produce sound.

NOISE

- Unpleasant sounds are called noise. Sounds coming from construction work, honking of vehicles, all the students speaking together in class are some examples of noise.
- Presence of excessive unwanted sounds in the environment is called Noise pollution.
- Causes of noise pollution- Loudspeakers, honking of vehicles, explosions,machines,bursting of crackers etc.

HARMS OF NOISE POLLUTION

- Health related problems due to noise pollution are:
- i) Lack of sleep
- ii)Hypertension
- iii)Anxiety
- iv)Temporary or permanent impairment of hearing etc.

Hazards of noise

- Hearing loss
- Distraction of workers
- Quickened pulse
- Increase blood pressure
- Constriction of blood vessels

Measures to limit noise pollution

- We can control noise pollution by :
- Installing silencing devices in vehicles, air craft engines, machines etc.
- All noisy operations to be carried away from residential areas.
- Plant more trees. Trees act as noise absorbers.
- Noise producing industries should be set up far from residential areas.
- Use of automobile horns should be minimized.
- Television and music systems should be run at low volume.
- Use of ear protection devices like earplugs for workers.

Measures to limit noise pollution

- Planting bushes and trees in and around sound generating sources is an effective solution for noise pollution.
- Regular servicing and tuning of automobiles can effectively reduce the noise pollution.
- Buildings can be designed with suitable noise absorbing material for the walls, windows, and ceilings.

EAR PROTECTION

THANK YOU