

**M.SC. SECOND SEMESTER  
ENVIRONMENTAL SCIENCE**

**UNIT-4**

**PAPER-201**

School of Studies in Environmental Science  
Jiwaji University Gwalior

# NOISE

Noise is defined as unwanted sound. Sound which pleases the listeners, is music and that which cause pain and annoyance is noise.

At times what is music for some can be noise for others.

## NOISE POLLUTION

Noise pollution can be defined as any disturbing or unwanted noise that interferes or harms humans or any kind of living being.

# CLASSIFICATION OF NOISE

Noise pollution can classify in a number of ways:-

1)

- a) Community noise
- b) Occupational noise

2)

- a) Indoor noise
- b) Outdoor noise

# SOURCES

## Transport

- Rail transport
- Road transport
- Air transport

Loud speakers

Industrial noise

Occupational noise

Construction noise

Neighborhood noise

Etc.



90  
DECIBELS

CONSTRUCTION



80  
DECIBELS  
LIGHT  
TRAFFIC

100  
DECIBELS  
HEAVY TRAFFIC



100  
DECIBELS

WILD  
FROGS CROAK



110  
DECIBELS

TRAIN HORN



80  
DECIBELS

WILD BIRDS

DECIBELS are  
measured on a scale  
what may look like just a  
couple decibels can be  
**2X as loud**

# NOISE LEVEL AND STANDARDS

S.No.	Area Code	Category of Area	Limits in dB	
			Day time (6am to 9pm)	Night time (9pm to 6am)
1.	A	Industrial Area	75	70
2.	B	Commercial Area	65	55
3.	C	Residential Area	55	45
4.	D	Silence Zone	50	40

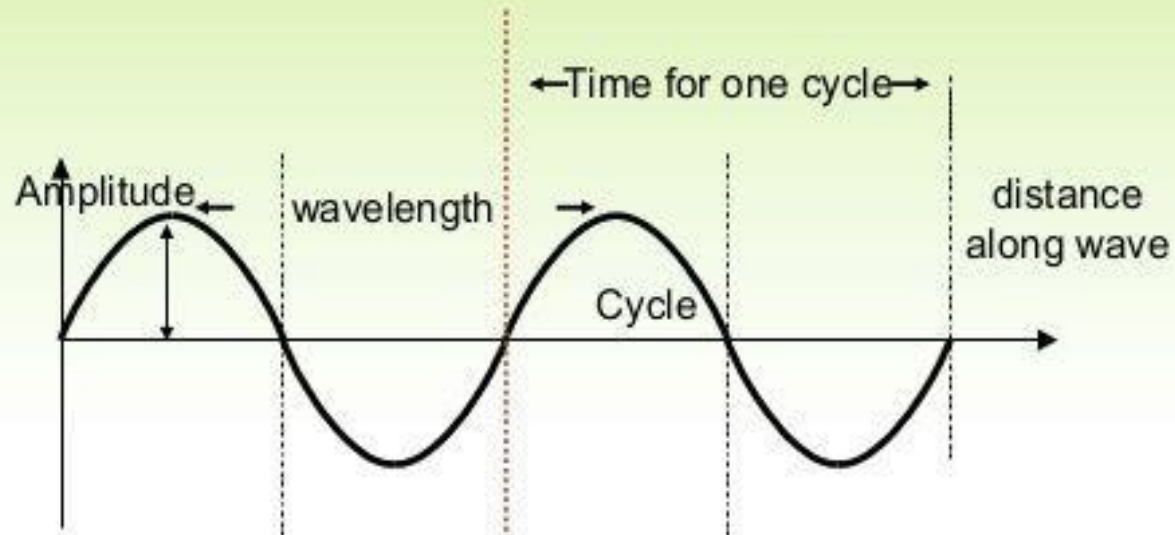
# PROPERTIES OF SOUND

Physically, sound is a mechanical disturbance propagated as a wave motion in air and other elastic or mechanical medias such as water and steel.

Physiologically, sound is an auditory sensation evoked by this physical phenomenon.

However not all sound waves evoke an auditory sensation e.g. ultrasound has a frequency too high to excite the sensation of hearing.

# Characteristic of Sound Waves





# PHYSICAL PROPERTIES AND MEASUREMENT

Sound waves involve a succession of expansion and rarefaction of an elastic medium such as air. These waves are characterized by amplitude of pressure changes, their frequency and the velocity of propagation.

The speed of sound, the frequency and the wavelength are related by the equation:

$$\text{wavelength} = \text{speed of sound} / \text{frequency}$$

# THE SPEED OF SOUND

The speed of sound in air, at a temperature of 20 °C, is approximately 344 m/s.

Sound travels much faster in solids than in air. For example, the speed of sound is 3.962 m/s in wood and 5.029 m/s in steel.

# FREQUENCY OF SOUND

The frequency of sound is defined as the number of compressions and rarefactions per unit time (second).

Unit of frequency is Hz (Hertz).

Human hearing is sensitive to frequencies in the range of about 20-20000 Hz (the audio frequency range)

# SOUND PRESSURE

Sound pressure is the fundamental measure of sound (amplitude) as it is measurable directly by instruments.

Sound pressure level measured as:

$$L_p = 10 \log_{10} (P/P_r)^2$$

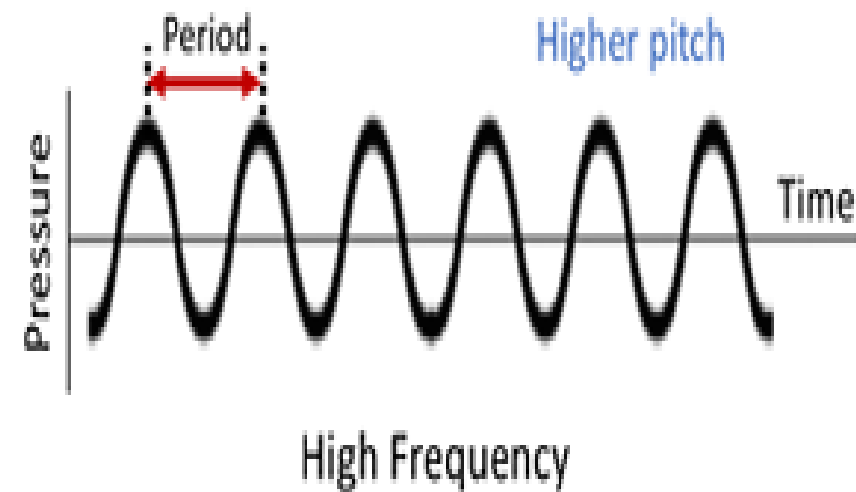
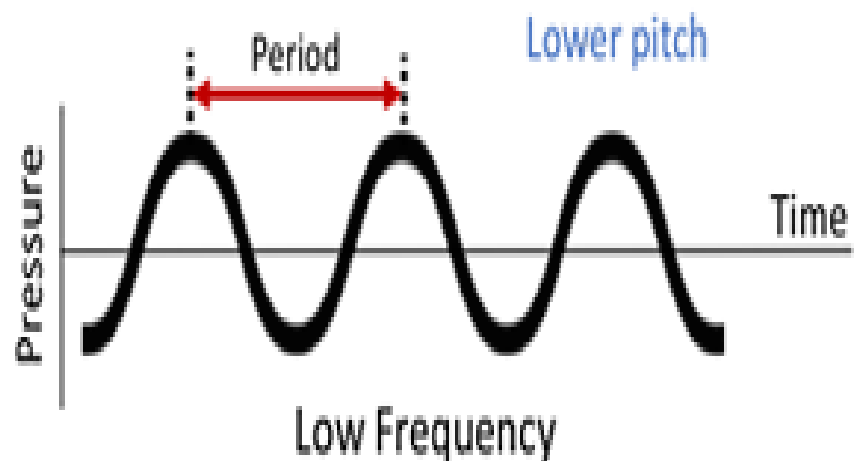
Where  $L_p$  = Sound pressure level dB

$P$  = Root mean square sound pressure, usually in  $\mu\text{N}/\text{m}^2$

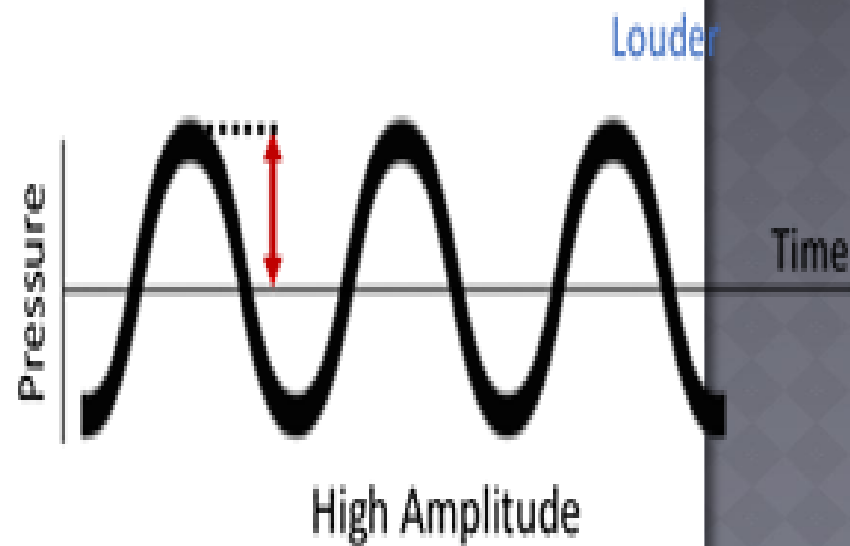
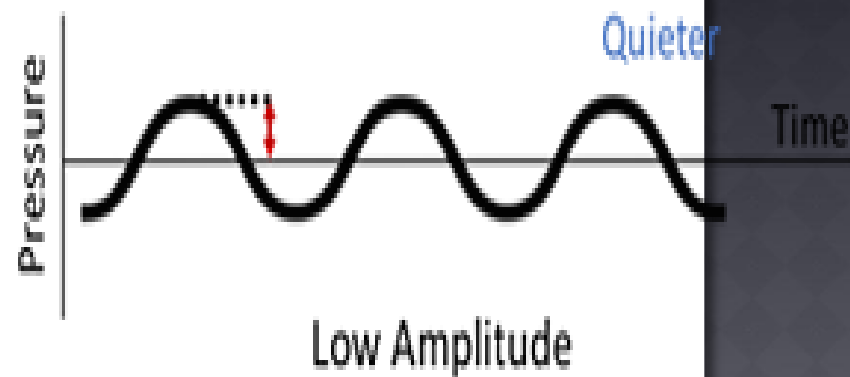
$P_r$  = Reference sound pressure

$\log_{10}$  = Logarithm to the base 10

## Frequency

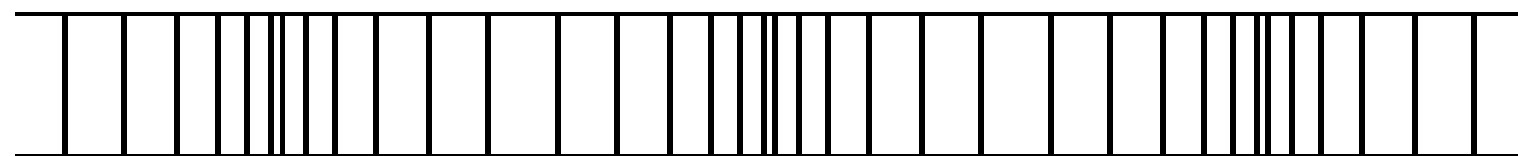
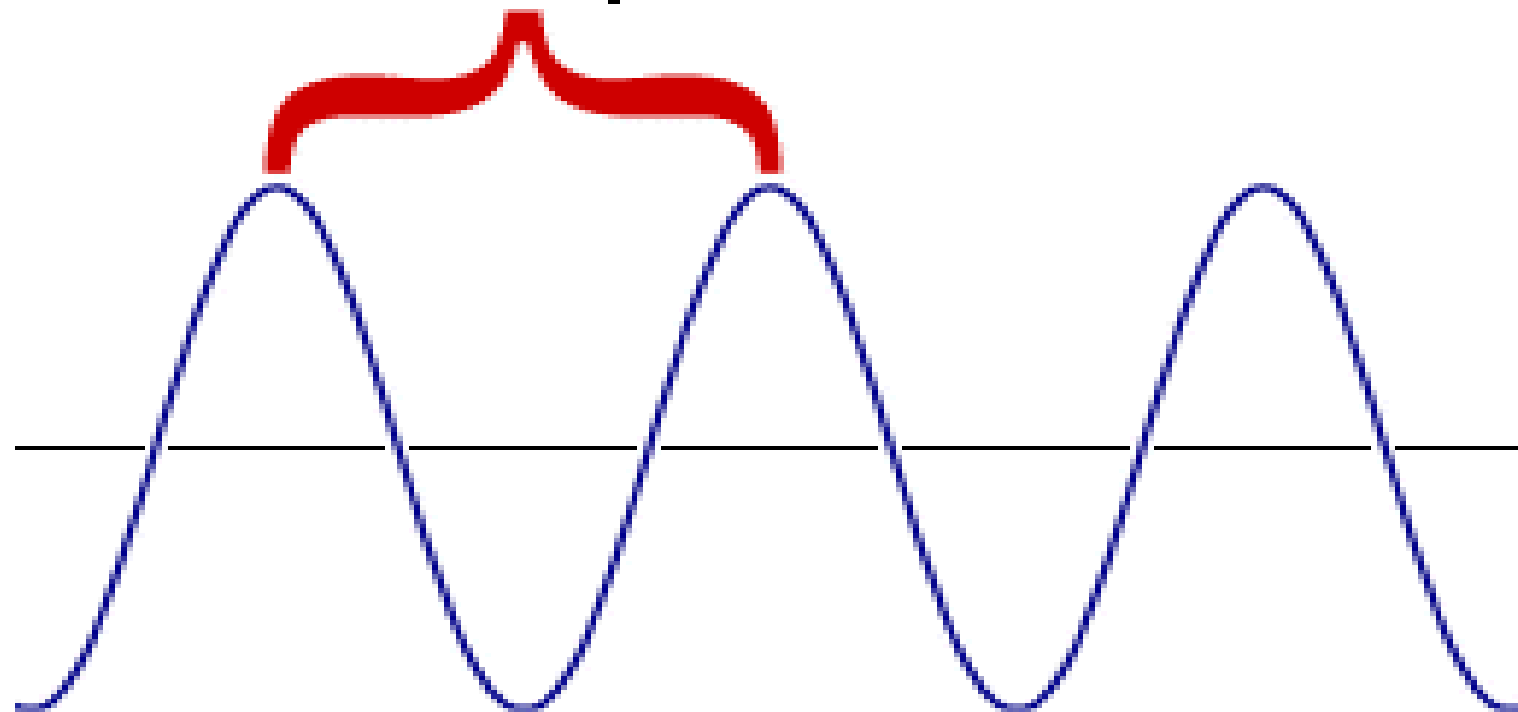


## Amplitude



wave cycle

Pressure



compression

expansion

compression

expansion

compression

Time

# IMPACT OF NOISE

25000 hair cells present in our ear which respond to different levels of frequencies.

With increasing levels of sound the cells get destroyed and decrease our ability to hear the high frequency sound.

High noise levels may interfere with the natural cycles of animals, including feeding behavior, breeding and migration.

# HEALTH EFFECTS

- ⦿ Hearing impairments
- ⦿ Sleep disturbance
- ⦿ Interference with speech communication
- ⦿ Performance
- ⦿ Annoyance
- ⦿ Physiological functions



# NOISE CONTROL

- ⦿ Noise reduction at the source
- ⦿ Noise control on the transmission path
- ⦿ Protective measure at the receiver

# NOISE CONTROL AND ABATEMENT MEASURES

## ◎ Legal aspects

- Indian penal code
- Criminal procedure code
- The factories act 1948
- Motor vehicles act 1988 and rules framed there under
- Law of torts
- The air act 1981
- The environmental protection act 1986
- Regulation on loud speakers/public address systems

## Environmental and other aspects

- ◎ Green belt development
- ◎ Protection equipments
- ◎ Surveillances of silence zones
- ◎ Source identification
- ◎ Awareness