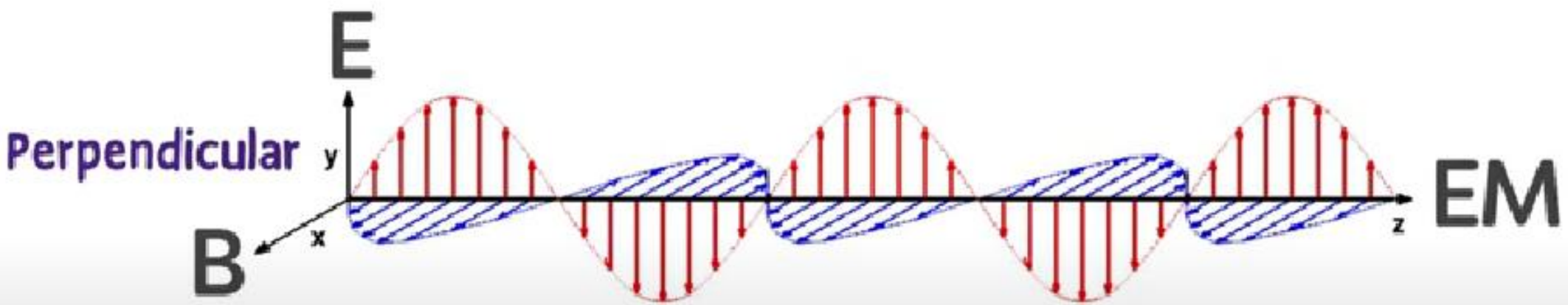
COURSE NAME – EM FIELD

SUBJECT COORDINATOR- DR. GAURAV KUMAR BHARTI

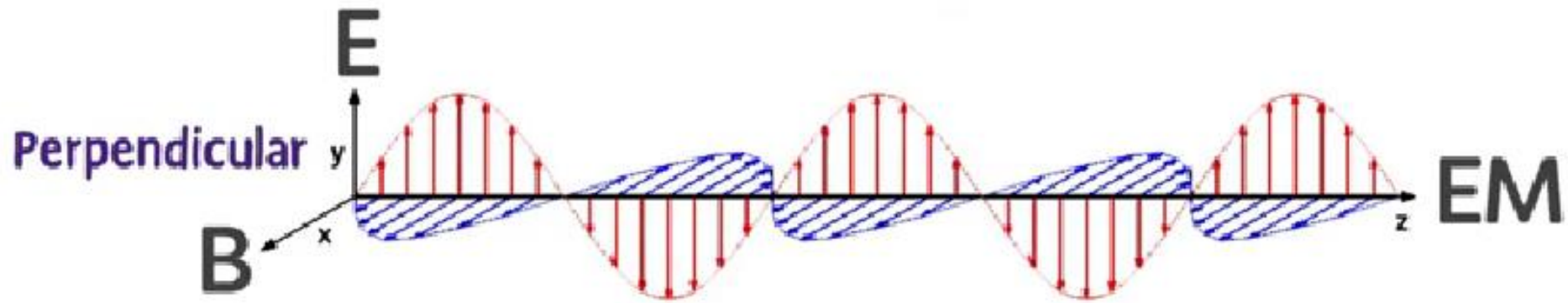
ELECTROMAGNETIC WAVES ?

Oscillating Charges Produce → Oscillating Electric Magnetic → EM WAVES



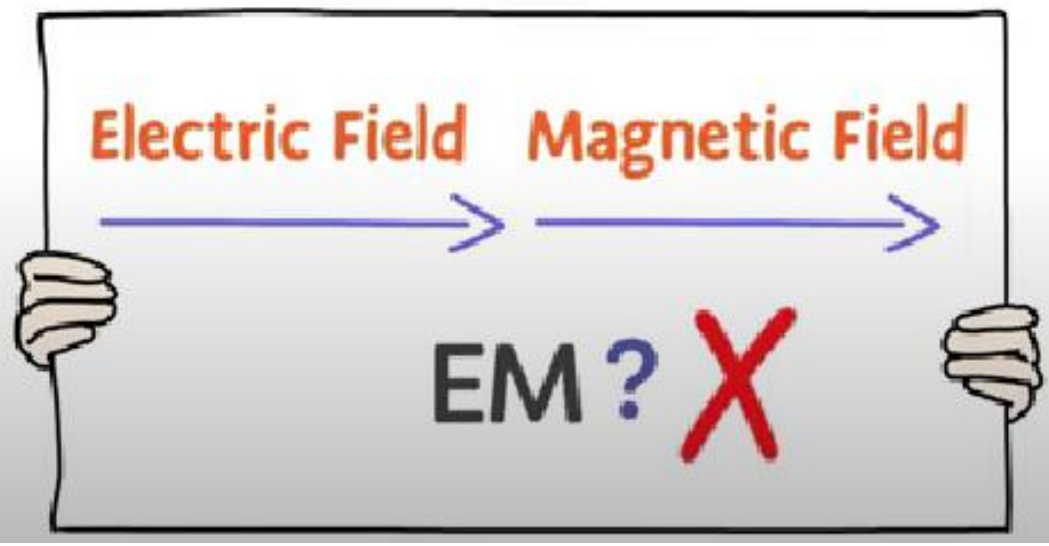
Waves produced by the oscillation of Electric and Magnetic field at

90 degree



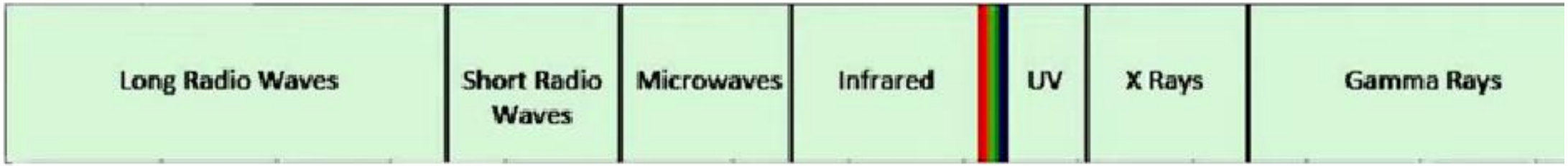
Waves produced by the oscillation of Electric and Magnetic field at

90 degree

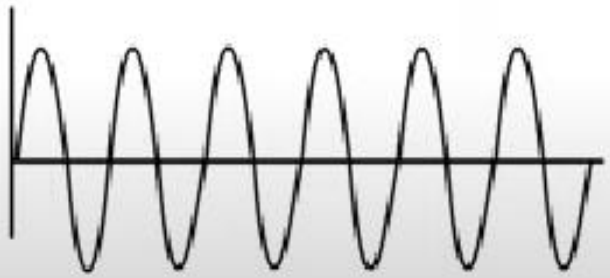


EXAMPLES OF ELECTROMAGNETIC WAVES ?

ELECTROMAGNETIC SPECTRUM



EM Waves are Transverse Waves ?



SERIES OF CREST AND TROUGH

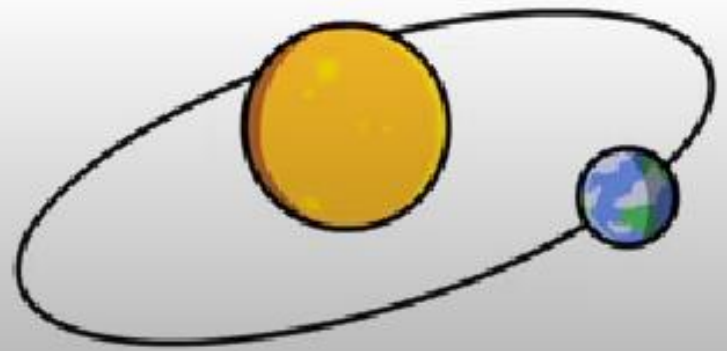
EXAMPLES OF ELECTROMAGNETIC WAVES ?

ELECTROMAGNETIC SPECTRUM

Long Radio Waves	Short Radio Waves	Microwaves	Infrared		UV	X Rays	Gamma Rays

EM Waves travel in the Medium and Vacuum.

Transfer Energy



3×10^8 m/s

Solid Liquid & Gas

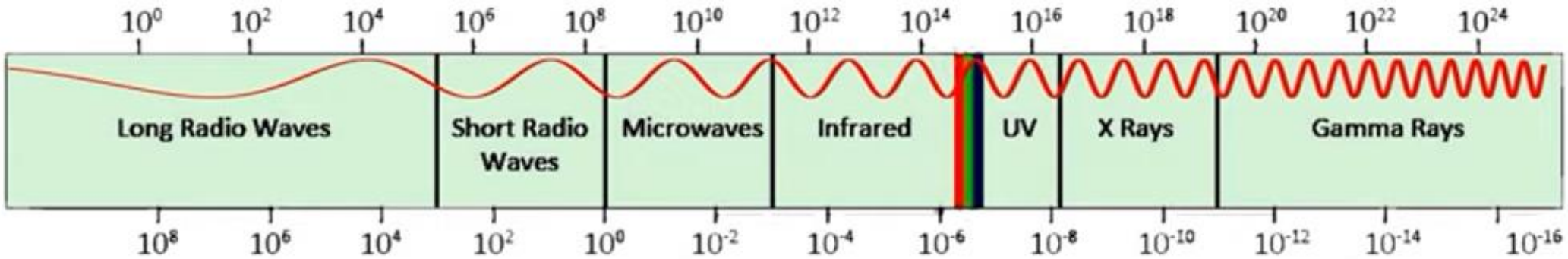
Diffraction of Waves

Why are they different?

Because of Wavelength and Frequency

Low frequency

High frequency

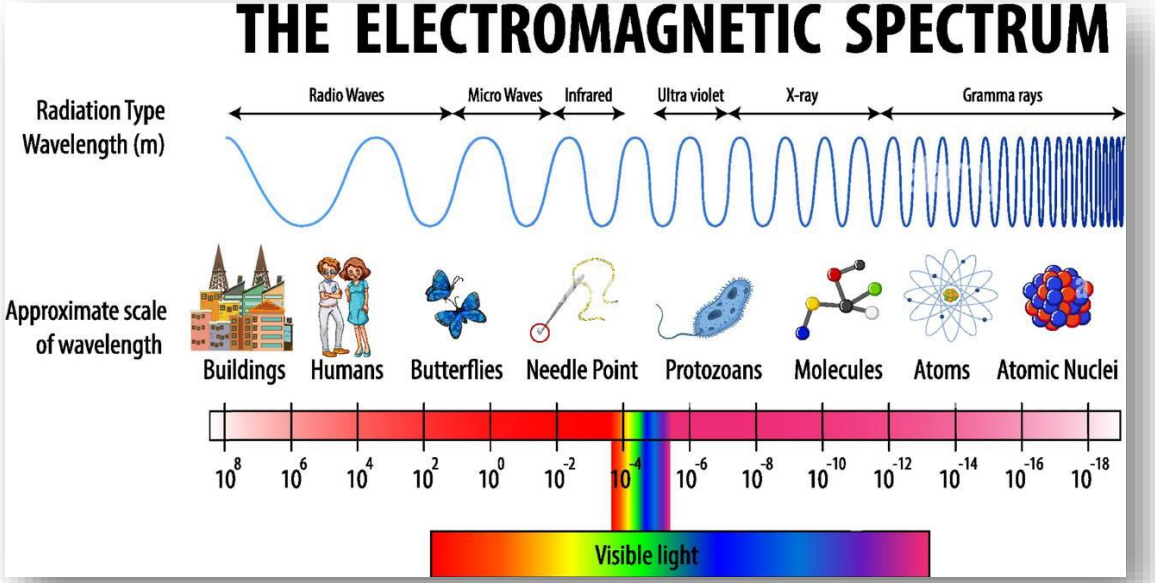


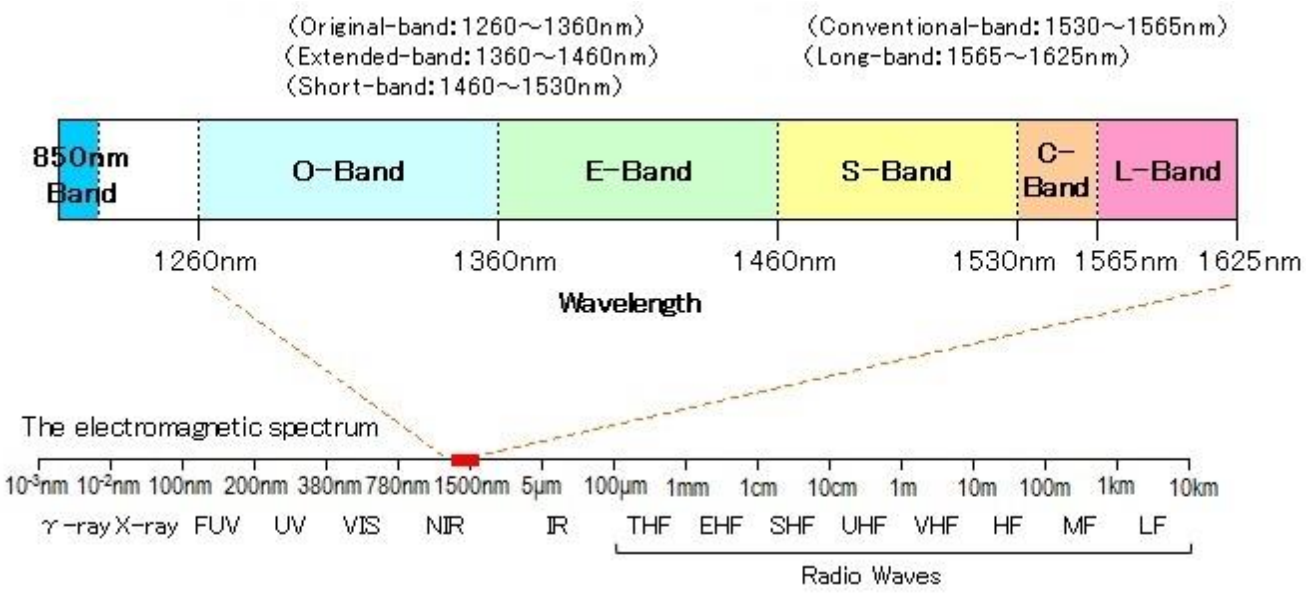
High wavelength

Low wavelength

Inverse Relationship

$\lambda \downarrow \quad f \uparrow$



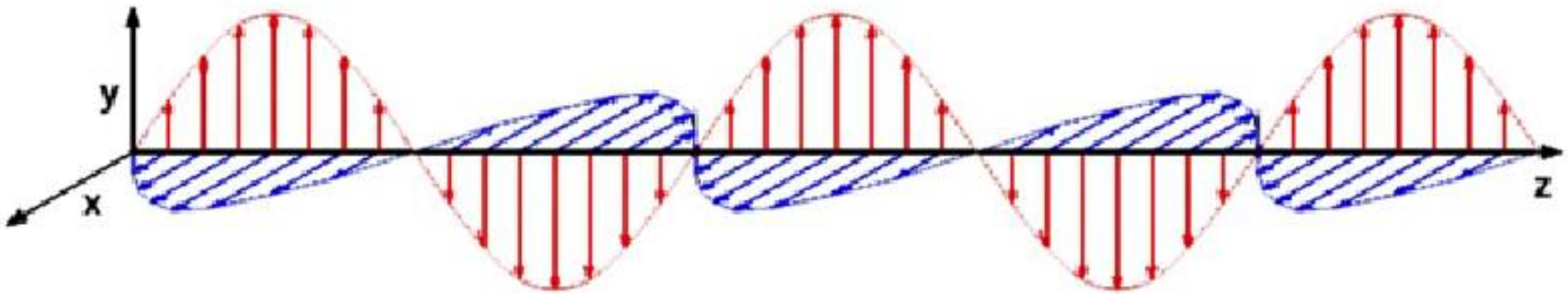


Light rays	Range
γ rays	Less than 0.01 nm
X rays	0.01 – 10 nm
UV rays	10 – 400 nm
Visible	400 – 700 nm
IR	700 – 1000 um (1mm) f=470 THz-300 GHz.; red edge is in visible spectrum nearly 700nm.
Mircowave	1mm -1m
Radiowave	1m- 100000 km

IR waves	Range
Near IR	0.75-1.4 μm
Short IR	1.4-3 μm
Mid IR	3-8 μm
Long IR	8-15 μm
Far IR	15-1000 μm

EM Waves Travel in the Vacuum ?

Perpendicular Oscillations of Electric & Magnetic Fields.

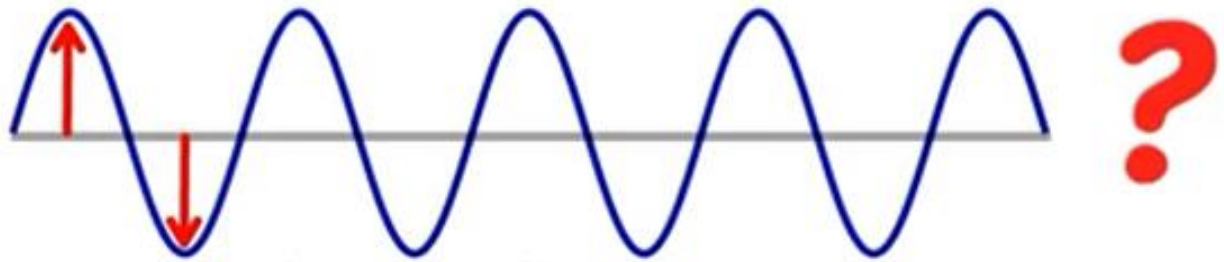


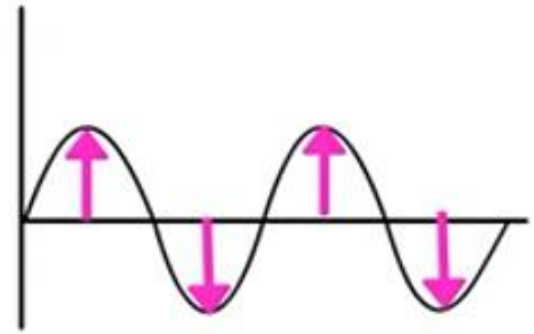
When Electromagnetic Waves travel in the Space or Vacuum

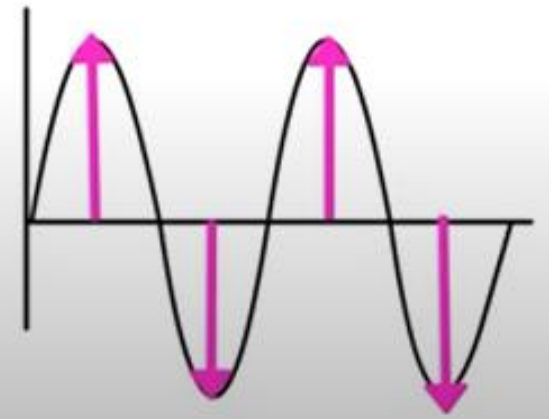
Energy transfer from Electric to the nearby Magnetic Field & Vice Versa.

AMPLITUDE ?

Maximum height above or below mean position.





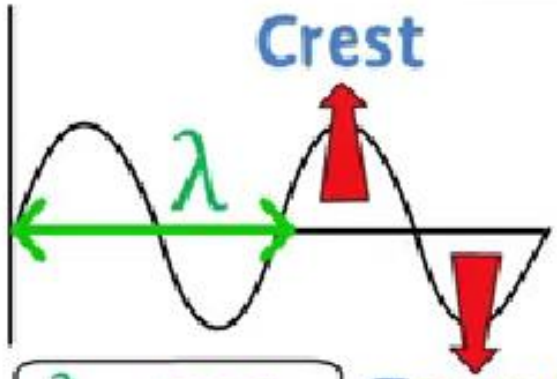


Particles Oscillate about Mean Position

Denoted by x_o

S.I unit is m

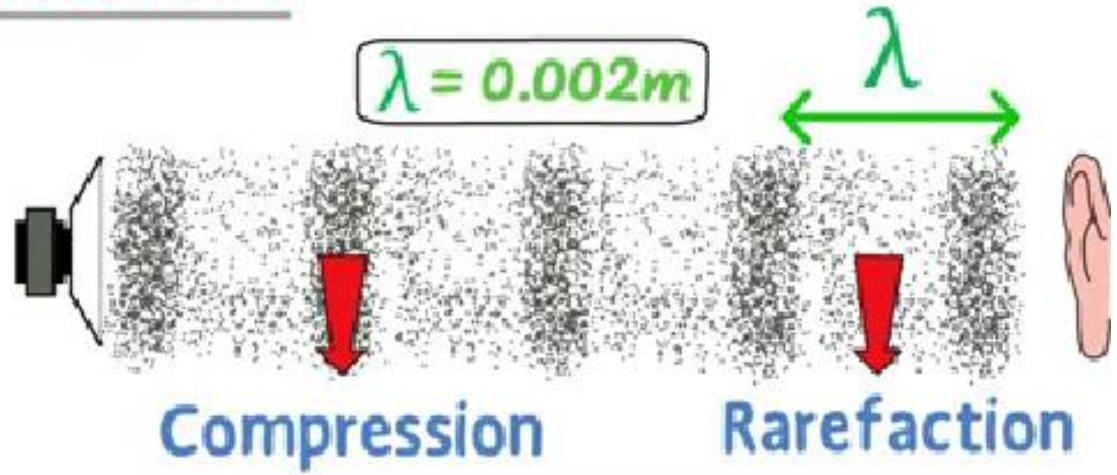
WAVELENGTH ?



Length of successive Crest & Trough Wavelength

Denoted by λ

S.I unit is m

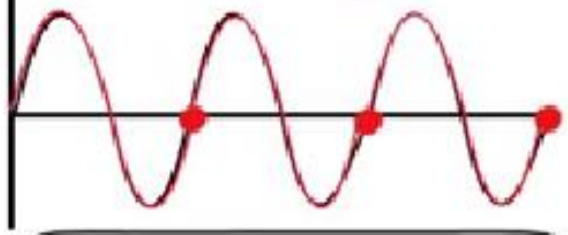


Length of successive Compression & Rarefaction Wavelength

TIME PERIOD ?

Wave Cycle

3 Wave Cycles



?

1 Wave Cycle

2 sec

T = 2 sec

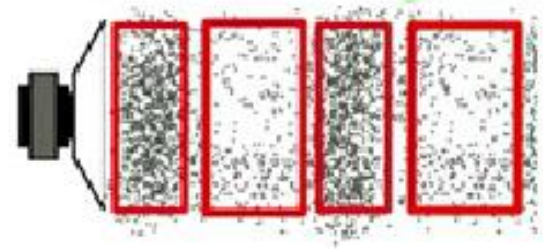
TIME PERIOD

Time taken by the Oscillating body to complete one 1 Wave Cycle

Denoted by T

S.I Unit is sec

2 Wave Cycles



?

1 Wave Cycle

1 sec

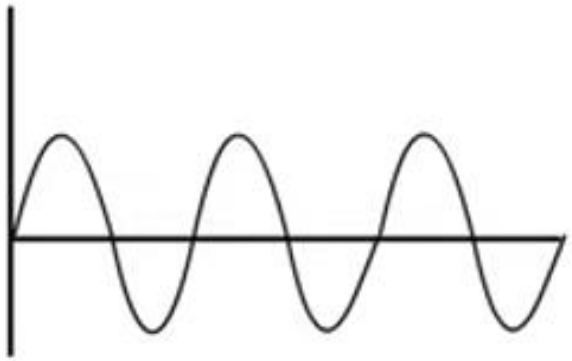
T = 1 sec

FREQUENCY ?

No of Wave Cycles or No of Oscillations completed in 1 sec.

Denoted by f

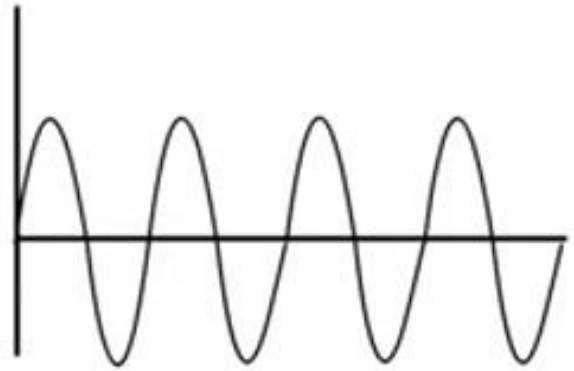
S.I unit is Hertz



1 sec

3 Wave Cycles

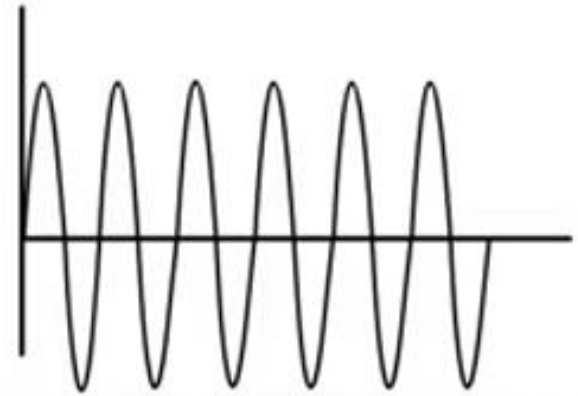
3 Hertz



1 sec

4 Wave Cycles

4 Hertz



1 sec

6 Wave Cycles

6 Hertz

Disturb the Particles of medium → Particles Oscillatory Motion → WAVES Produce

Transfer Energy

Sound Waves 

Sound Waves 

Waves 

[Pluck the String Disturb the Particles Oscillatory Motion]

[Hitting the Cup Disturb the Particles Oscillatory Motion]

[Pebble into lake Disturb the Particles Oscillatory Motion]

Waves

- Mechanical Waves
- Electromagnetic Waves

MECHANICAL WAVES ?

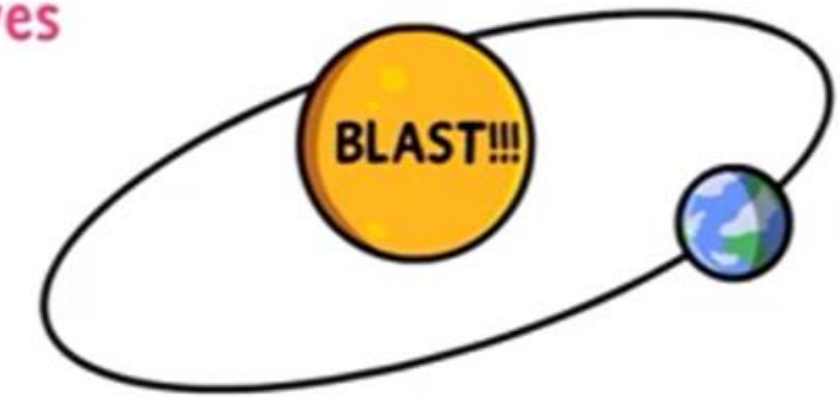
Waves produced by the oscillationt of material particles.

Mechanical Waves

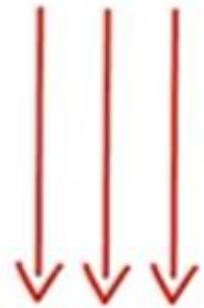
- Transverse Waves
- Longuitudinal Waves

Propagation of Mechanical Waves

Medium



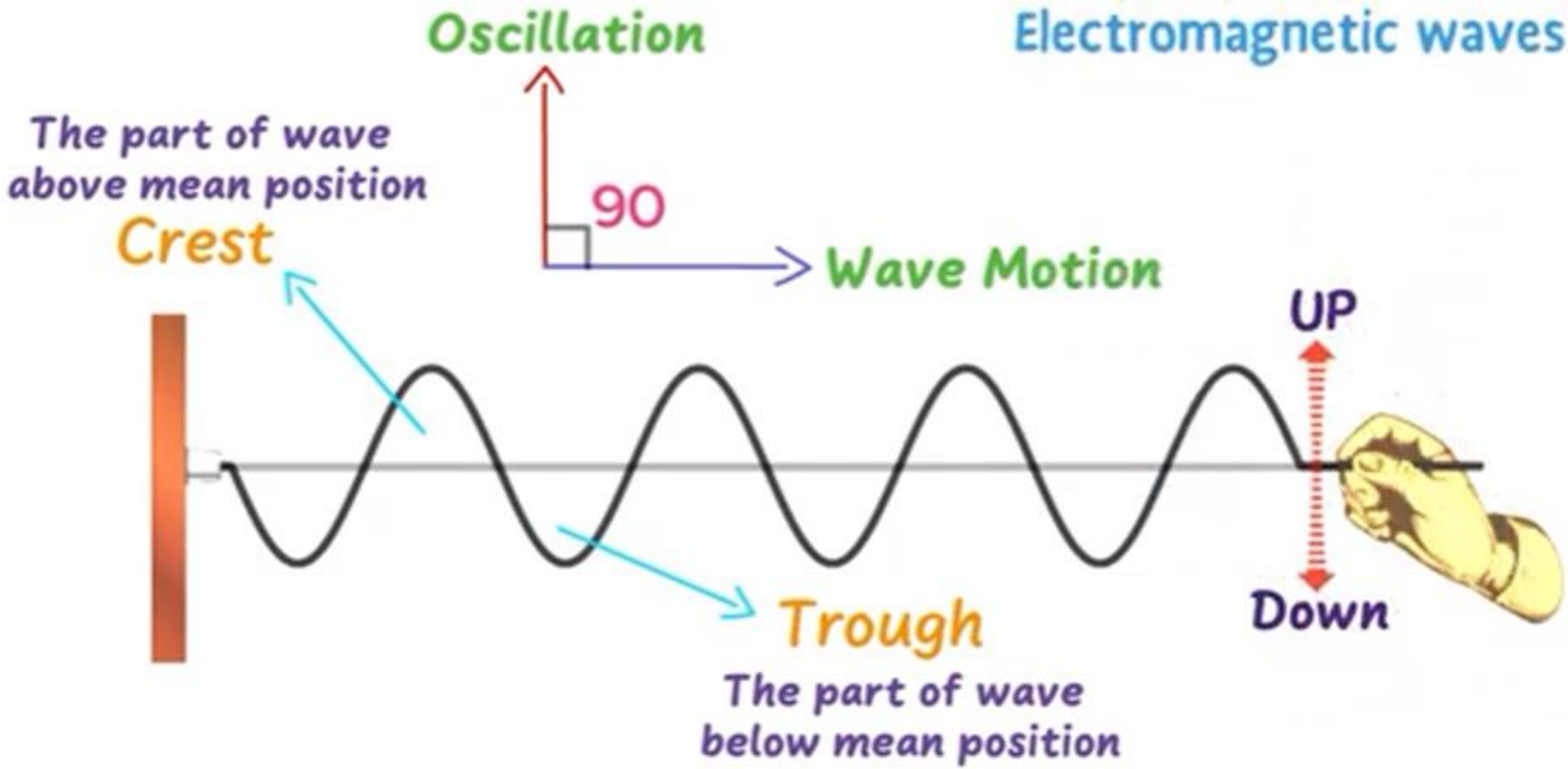
Sound Waves



Mechanical Waves

TRNASVERSE WAVES ?

Water waves
Electromagnetic waves

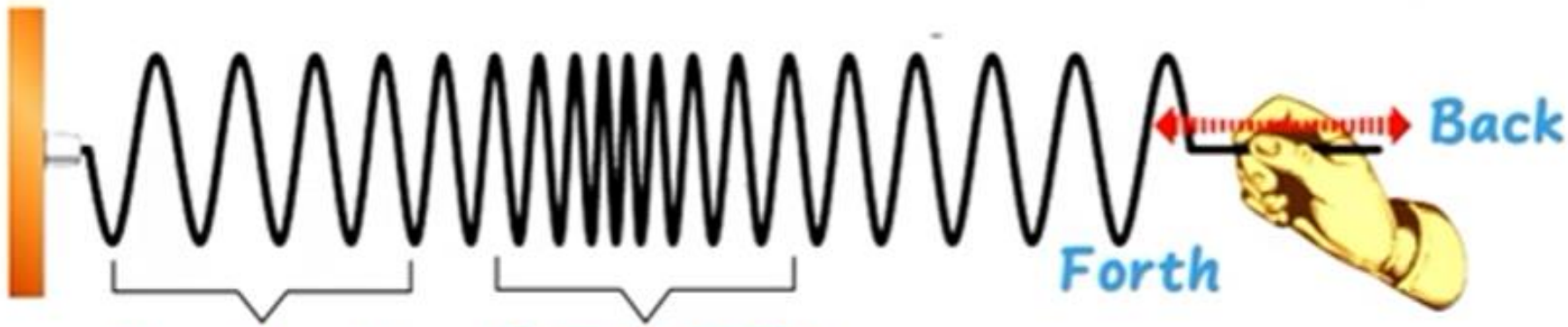


LONGITUDINAL WAVES ?

Oscillation

Wave Motion

Sound Waves



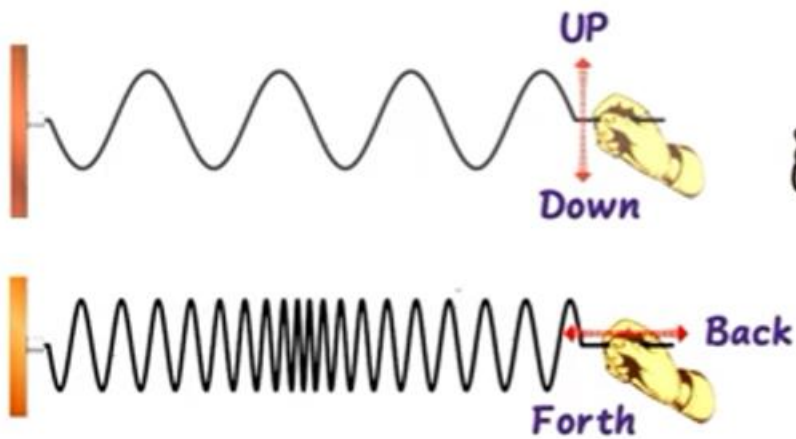
Rarefaction

Compression

Relatively low
Density & Presure

Relatively high
Density & Presure

Wave Motion is SHM ?



Oscillatory motion in which particles of the body moves back and forth or up and down

Simple Harmonic Motion