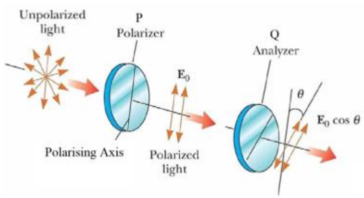
Transverse Waves

In which particles oscillates perpendicularly to the direction of wave propagation



Only transverse waves can be polarized. Intensity of transmitted polarized light depends on the angle between the incident polarized light and the polarizing axis of the polarizer.

$$Malus'Law: I = I_0 cos^2\theta$$

EM Spectrum

Gamma Rays	10^{-15} - 10^{-10} m
X Rays	10^{-12} - 10^{-9} m
UV Rays	10^{-10} - 10^{-7} m
Visible Light (Violet - Red)	4 - 7 x 10^{-7} m
Infrared Rays	10^{-7} - 10^{-3} m
Micro-waves	10^{-3} - 10^{-1} m
Radio-waves	10^{-2} - 10^{3} m

Progressive Waves: Disturbance (vibration) which propagate carrying energy without physically transferring the wave particles.

Wave Intensity:

is the rate at which energy is transported by the wave, per unit area, across a surface perpendicular to the direction of propagation i.e. it is the power per unit area.

$$Intensity = \frac{Power}{Suraface\ Area} = \frac{Power}{4\pi r^2}$$

$$\rightarrow Intensity \propto \frac{1}{r^2}$$

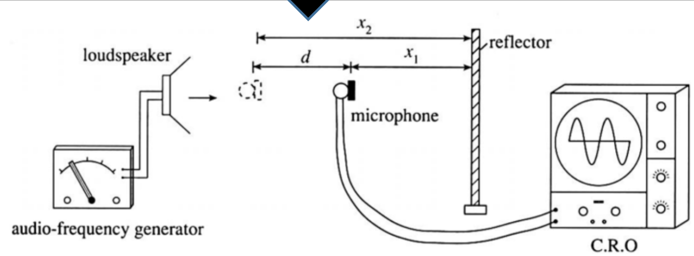
$$Energy\ \propto Amplitude^2\ ,\ P = \frac{Energy}{Time}$$

$$\rightarrow Intensity\ \propto Amplitude^2$$

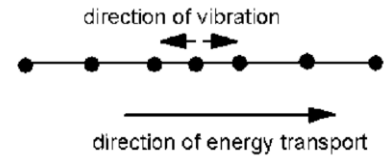
Experiment to determine frequency of sound using **Stationary Waves:**

Reflector microphone moved along x axis to detect max. & min. signals on CRO:

Distance between 2 max. or min. signals is ½ wavelength.



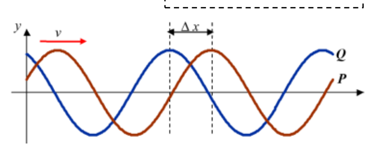
Longitudinal Waves



In which particles oscillates parallel to the direction of wave propagation

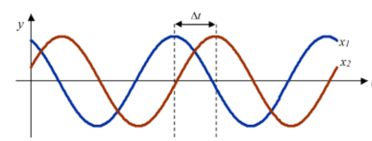
Displacement- DISTANCE graph of a wave travelling to the right.

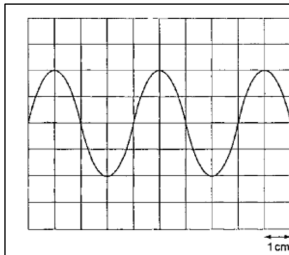
$$\Delta\emptyset = \frac{\Delta x}{\lambda} \times 2\pi$$



Displacement-TIME graph of a particle travelling to the right.

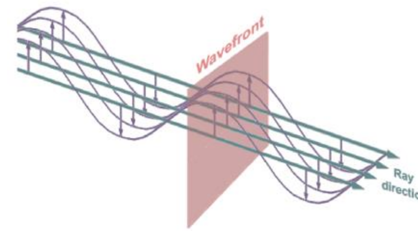
$$\Delta\emptyset = \frac{\Delta t}{T} \times 2\pi$$





Wavefront:

is an imaginary line or curve which joins points on the wave which are oscillating in phase.



Speed of Wave: $v = f\lambda = \frac{\lambda}{T}$

is the distance that the wave profile appears to be moving per unit time.

Experiment to determine frequency of sound using **Progressive waves:**

The diagram the trace produced by a sound wave on a cathode-ray oscilloscope. The time base is calibrated at 2.00 ms cm^{-1}. What is the frequency of the sound wave?

$$T = 4cm\ \times 2.00\ ms\ cm^{-1}$$

$$= 8\ \times 10^{-3} s$$

$$f = \frac{1}{T} = \frac{1}{(8\ \times 10^{-3} s)} = 125\ Hz$$