

Dr. Usha Kumari
physics Dept.

Unit IV
SEM:-I
Sound

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" Superposition of Waves "

All types of waves like mechanical as well as electromagnetic are in general, subjected to the principle of Superposition.

According to Huyghens:- If two or more independent waves are propagated through a medium or space, all at the same time, the resultant physical quantity (i.e displacement etc) at any point is the vector sum of the quantities due to ~~ex~~ each individual wave.

$$\psi = \psi_1 + \psi_2 + \psi_3 + \dots$$

In case of plane waves

$$y = y_1 + y_2 + y_3 + \dots$$

Interference : -

If two identical waves with a path difference δ betⁿ them, travelling along the same,

$$y_1 = a \sin \frac{2\pi}{\lambda} (vt - x) \quad \text{2}$$

$$y_2 = a \sin \frac{2\pi}{\lambda} [vt - (x + \delta)]$$

$$y = y_1 + y_2$$

$$= 2a \cos \frac{\pi \delta}{\lambda} \sin \frac{2\pi}{\lambda} \left[vt - \left(x + \frac{\delta}{2} \right) \right]$$

There are two types of interference

(i) Constructive interference in which the resultant amplitude will be maximum ($+2a$ or $-2a$) of the two waves.

(ii) Destructive interference : -

in which the amplitude & hence the intensity of the resultant wave will be the minimum or zero of the two waves.