

Q-1 (5)

Dr. Supriya Kumari
Deptt. of Physics
J.N.C., Madhubani

Equation of a Stationary waves.

Stationary waves or Standing waves :- When two identical progressive waves travel through a bounded medium along the same line in opposite directions with the same speed, they superimpose to produce a new type of wave which appears stationary in space. Such type of wave is called standing or stationary wave.

Bounded medium is the necessary condition for the formation of stationary waves. For example :- Stationary waves formed in stretched strings of musical instruments (like violin, guitar etc.) are transverse stationary waves.

Eqn. of Stationary waves :-

Let us suppose a plane progressive wave of amplitude a is travelling with speed v in the $+x$ -direction. The eqn. of the wave is given as

$$y = a \sin 2\pi \left(\frac{t}{T} - \frac{x}{\lambda} \right) \quad \text{--- (1)}$$

where T = Time period and λ = wavelength of the wave,

Let us suppose this wave is reflected from a free surface, hence the reflected wave propagates in -ve x -direction with no phase change. Hence the eqⁿ. of this wave is given by

$$y' = a \sin 2\pi \left(\frac{t}{T} + \frac{x}{\lambda} \right) \quad \text{--- (2)}$$

In these equations (1) and (2) y and y' is the displacement of a particle at ~~pt~~ position x at any instant t due to incident and reflected waves, respectively.