Velocity of Sound (Wave motion).

(1) Speed of transverse wave motion:

(i) On a stretched string: $v = \sqrt{\frac{T}{m}}$ T = Tension in the string; m = Linear density of string (mass per unit length).

(ii) In a solid body: $v = \sqrt{\frac{\eta}{\rho}} \eta$ = Modulus of rigidity; ρ = Density of the material.

(2) Speed of longitudinal wave motion:

$$v = \sqrt{\frac{k + \frac{4}{3}\eta}{\rho}}$$

(i) In a solid medium $\int \rho k$ = Bulk modulus; η = Modulus of rigidity; ρ = Density

$$v = \sqrt{\frac{Y}{\rho}}$$

When the solid is in the form of long bar $\sqrt{\rho}$ Y = Young's modulus of material of rod

 $v = \sqrt{\frac{k}{\rho}}$ (ii) In a liquid medium

(iii) In gases
$$v = \sqrt{\frac{k}{\rho}}$$