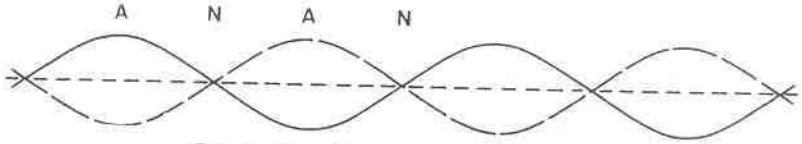
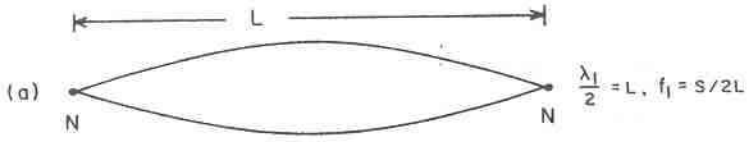
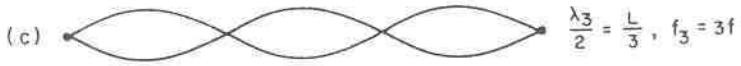


FIG. 2. Standing wave on a long string.

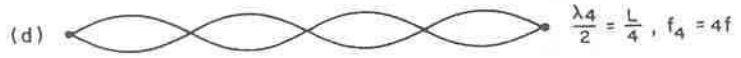


n = 1
fundamental
(first harmonic)

n = 2
2nd harmonic
(1st overtone)



n = 3
3rd harmonic
(2nd overtone)



n = 4
4th harmonic
(3rd overtone)

FIG. 3. First four vibration modes of a string fastened at both ends.

Longitudinal wave speed, v

$v = f_n \bullet \lambda_n = f_1\lambda_1 = f_3\lambda_3 = \ldots f_n\lambda_n$

n = integer = 1, 2, 3, 4, ….

$f_n = nf_1$

$\lambda_n = \lambda_n = \lambda_1/n$

$v = \sqrt{\frac{T}{\mu}}$

T = string tension (*Newtons*)
μ = mass per unit length of string = M/L (kg/m)