EngineeringRise

Wave motion and superposition

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Wave speed	v = f lambda = lambda/T = omega/k Valid when: any progressive periodic wave	m/s
Wave number, angular frequency	k = 2 pi/lambda; omega = 2 pi f Valid when: sinusoidal wave; lambda in m, f in Hz	rad/m (rad/s)
Progressive wave	y = A sin(omega t - k x + phi), moving along +x Valid when: sinusoidal wave moving in the +x direction	m
Wave moving along -x	y = A sin(omega t + k x + phi) Valid when: sinusoidal wave moving in the -x direction	m
Particle velocity	dy/dt = A omega cos(omega t - k x); maximum A omega Valid when: progressive wave of the form A sin(omega t - k x)	m/s
Speed on a string	v = sqrt(T/mu) Valid when: transverse wave on a stretched string; T tension, mu mass per length	m/s (T in N, mu in kg/m)
Phase and path difference	delta = 2 pi dx/lambda = omega dt Valid when: two points of the same wave, same medium	rad
Resultant of two waves	R^2 = A1^2 + A2^2 + 2 A1 A2 cos(delta) Valid when: two coherent waves of one frequency with phase difference delta	m
Interference conditions	constructive: dx = n lambda; destructive: dx = (n + 1/2) lambda Valid when: two coherent waves; n is an integer	m
Reflection	fixed end: phase change pi; free end: none Valid when: pulse on a string reflecting at the stated boundary	rad

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/physics/oscillations-and-waves/wave-motion-and-superposition

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