PhyzExamples: Waves

Physical Quantities • Symbols • Units • Brief Definitions

Wavelength • λ • meter: m • The distance through which a complete cycle of a wave is observed (e.g., from one crest to the next crest).
Amplitude • *A* or x_{max} • meter: m • The distance between the equilibrium position of a medium and the top of a crest or bottom of a trough of a wave passing through it. Indicative of the energy associated with the wave.
Frequency • *f* or ν (nu) • hertz: Hz • The rate at which a source or observer of waves oscillates. Related to the rate at which a source transmits energy to an observer.
Period • *T* • seconds: s • The time required for a source or observer of waves to oscillate through one cycle.
Speed • v_w • meters per second: m/s • The rate at which a wave passes or propagates through a medium or through space.

Equations

$f = 1/T$ • *frequency = 1 / period*
$v_w = f\lambda$ • The Wave Equation • *wave speed = frequency · wavelength*
$f_{beat} = f_2 - f_1$ • *beat frequency = higher frequency – lower frequency*

Smooth Operations Examples

1. Ripples on a pond pass a rock at a frequency of 5.0 Hz; there is a distance of 6.0 cm between the wave crests. What is the speed of the waves?

1. f = 5.0 Hz λ = 0.060 m v = ?
v = fλ
v = 5.0 Hz · 0.060 m
v = 0.30 m/s

2. Waves in a wave machine travel at 60 cm/s. If one end of the wave sticks is wiggled once every two seconds, what wavelength will be produced?

2. v = 0.60 m/s T = 2 s (f = 1/T = 0.5 Hz) λ=?
v = fλ => λ = v/f
λ = 0.60 m/s / 0.5 Hz
λ = 1.2 m