Waves and Sound

Waves:

Transverse Wave: the disturbance occurs perpendicular to the direction of travel of the wave

Longitudinal Wave: the disturbance occurs parallel to the direction of travel of the wave

\[ f = \frac{1}{T} \quad T = \frac{1}{f} \]

\[ v = \frac{\lambda}{T} \quad v = \lambda f \]

⇒ if the frequency is increased, the wavelength is decreased but wave speed doesn’t change

Speed of waves on a string: \( v = \sqrt{\frac{F}{(m/L)}} \)

Sound:

Intensity: \( I = \frac{E}{tA} = \frac{P}{A} \) \( I = \frac{P}{4\pi r^2} \) for spherically uniform radiation

\[ \beta = (10 \text{ dB})\log\left(\frac{I}{I_0}\right) \text{ where } I_0 = 1.0 \times 10^{-12} \text{ W/m}^2 \]

Doppler Effect: \( f_0 = f_s \left(\frac{1 \pm \frac{v_0}{v}}{1 \mp \frac{v_s}{v}}\right) \)

Numerator: + observer moving toward source
- observer moving away from source

Denominator: - source moving toward observer
+ source moving away from observer