Unless otherwise stated, take the speed of sound in air to be $v = 343\text{m/s}$ and $I_0 = 1.0 \times 10^{-12}\text{W/m}^2$.

1 Simple Harmonic Motion

$F = -kx$

$x(t) = A\cos(\omega t)$

$f = \frac{1}{T}$ and $\omega = 2\pi f$

$v_{\max} = \omega A$ and $a_{\max} = \omega^2 A$

$\omega = \sqrt{\frac{k}{m}}$ (mass on spring)

$E_{\text{tot}} = KE + PE = \frac{1}{2}mv^2 + \frac{1}{2}kx^2 = \frac{1}{2}kA^2$

@ $x = A$: $KE = 0$, $PE_{\max} = \frac{1}{2}kA^2$

@ $x = 0$: $PE = 0$, $KE_{\max} = \frac{1}{2}kA^2$

$\omega = \sqrt{\frac{g}{\ell}}$ (pendulum)

2 Waves and Sound

$v = \lambda f$

$v = \sqrt{\frac{T}{\mu}}$ (string)

$y(x,t) = A\sin(2\pi ft \pm \frac{2\pi}{\lambda}x) = A\sin(\omega t \pm kx)$

$k = \frac{2\pi}{\lambda}$ and $\omega = 2\pi f$

$T = P/A$

$\beta = (10\text{dB})\log(I/I_0)$

$f_o = f_s\frac{1 \pm v_o/v}{1 \mp v_s/v}$

3 Superposition and Interference

$\sin\theta = \frac{\lambda}{D}$ (single slit)

$\sin\theta = 1.22\frac{\lambda}{D}$ (circular aperture)

$f_{\text{beat}} = |\Delta f|$

$\lambda = \frac{2L}{n}$ or $f = n\left(\frac{v}{2L}\right)$ where $n = 1, 2, 3, \ldots$ (string)

$\lambda = \frac{2L}{n}$ or $f = n\left(\frac{v}{2L}\right)$ where $n = 1, 2, 3, \ldots$ (tube open/open or closed/closed)

$\lambda = \frac{4L}{n}$ or $f = n\left(\frac{v}{4L}\right)$ where $n = 1, 3, 5, \ldots$ (tube open/closed)