

Phy 223 Final Exam Formulas

Simple Harmonic Motion: $f = \frac{1}{T}$, $\omega = 2\pi f$, $\omega = \sqrt{\frac{k}{m}}$, $F = -kx$

$$x(t) = A \cos(\omega t + \phi), \quad E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2 = \frac{1}{2}kA^2$$

waves:

$$v = f\lambda \quad y(x, t) = A \cos(kx - \omega t)$$

$$k = \frac{2\pi}{\lambda} \quad v = \sqrt{\frac{T}{\mu}}, \quad \mu = \frac{m}{L}$$

$$f_L = \left(\frac{v \pm v_L}{v \mp v_s} \right) v_s \quad \text{speed of sound} = 343 \text{ m/s}$$

Interference

$$\Delta x = m\lambda, \quad m = 0, 1, 2, 3, \dots \quad \text{constructive}$$

$$\Delta x = (m + \frac{1}{2})\lambda, \quad m = 0, 1, 2, 3, \dots \quad \text{destructive.}$$

light:

$$n = \frac{c}{v}, \quad n_a \sin \theta_a = n_b \sin \theta_b, \quad \sin \theta_{\text{crit}} = \frac{n_b}{n_a}$$

$$I = I_0 \cos^2 \phi$$

mirrors
+ lenses:

$$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}, \quad f = \frac{R}{2} \quad \text{for mirrors.}$$

$$m = \frac{-s'}{s} = \frac{h_i}{h_o}$$

double slit:

$$\Delta x = d \sin \theta = m\lambda, \quad m = 0, \pm 1, \pm 2, \pm 3 \quad \text{constructive}$$

$$\Delta x = d \sin \theta = (m + \frac{1}{2})\lambda, \quad m = 0, \pm 1, \pm 2, \pm 3, \quad \text{destructive}$$

Atomic
Physics

$$K_{\text{max}} = hf - \phi, \quad E = hf, \quad h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$E_n = -\frac{13.6 \text{ eV}}{n^2}$$

$$\lambda = \frac{h}{mv}$$

$$m = 9.11 \times 10^{-31} \text{ kg}$$

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$