

Doppler Effect:

$$f' = f \frac{v \pm v_o}{v \pm v_s}, \text{ + observer moving towards, - observer moving away, - source moving towards, + source moving away.}$$

Sound:

$$v = 331 \text{ m/s} \sqrt{1 + \frac{T}{273}} \quad I = \frac{P}{4\pi r^2} \quad \beta = 10 \log \left(\frac{I}{I_0} \right) \quad I_0 = 1 \times 10^{-12} \text{ W/m}^2$$

Simple Harmonic Motion:

$$F = -kx \quad a = -\frac{k}{m} x \quad v = \lambda f \quad T = 1/f$$

$$\text{Period of a Spring: } T = 2\pi \sqrt{\frac{m}{k}} \quad \text{Period of a pendulum: } T = 2\pi \sqrt{\frac{L}{g}} \quad g = 9.8 \text{ m/s}^2$$

$$PE_s = \frac{1}{2} kx^2 \quad PE_g = mgh \quad KE = \frac{1}{2} mv^2 \quad v = \pm \sqrt{\frac{k}{m} (A^2 - x^2)}$$

$$\text{Equations of motion general: } x = A \cos(2\pi f t) \quad v = -2\pi f A \sin(2\pi f t) \quad a = -(2\pi f)^2 A \cos(2\pi f t)$$

$$\text{Equations of motion springs: } x = A \cos\left(\sqrt{\frac{k}{m}} t\right) \quad v = -\sqrt{\frac{k}{m}} A \sin\left(\sqrt{\frac{k}{m}} t\right) \quad a = -\frac{k}{m} A \cos\left(\sqrt{\frac{k}{m}} t\right)$$

Light:

$$v = \lambda f \quad c = 2.998 \times 10^8 \text{ m/s}$$

$$\text{Law of Reflection: } \theta_i = \theta_r \quad \text{Snell's Law: } n_1 \sin \theta_1 = n_2 \sin \theta_2 \quad \sin \theta_c = n_2 / n_1$$

Circuits:

$$I = \Delta Q / \Delta t \quad I = nqAv_d \quad R = \rho l/A \quad \Delta R = R_o \alpha \Delta T$$

$$\Delta V = IR \quad I = \Delta Q / \Delta t \quad P = I\Delta V = (\Delta V)^2 / R = I^2 R$$

$$C = Q / \Delta V \quad R_{eq} = R_1 + R_2 + R_3 + \dots \quad 1/R_{eq} = 1/R_1 + 1/R_2 + 1/R_3 + \dots$$

RC circuits:

$$q = Q (1 - e^{-t/RC}) \quad q = Q e^{-t/RC} \quad \tau = RC$$

Magnetic Fields:

$$F = qvB \sin \theta \quad F = IlB \sin \theta \quad B = \mu_o I / 2\pi r$$

$$\mu_o = 1.26 \times 10^{-6} \text{ Tm/A}$$

Photoelectric Effect and Spectra:

$$KE_{max} = hf - E_o \quad E = hf \quad E = -13.6 \text{ eV} / n^2$$

$$\lambda = h/mv \quad c = \lambda f \quad c = 3.00 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ Js} = 4.14 \times 10^{-15} \text{ eVs} \quad 1.6 \times 10^{-19} \text{ J} = 1 \text{ eV}$$