

$$n_2 \sin \theta_2 = n_1 \sin \theta_1$$

$$\frac{1}{d_1} + \frac{1}{d_2} = \frac{1}{f} \quad \frac{1}{f} = (n - 1) \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$$

$$m = \frac{-d_2}{d_1} \quad |m| = \frac{-h'}{h} \quad m = \frac{f_0}{f_e}$$

$$\vec{E}_{rad} = \frac{1}{4\pi\epsilon_0} \frac{-q\vec{a}_\perp}{c^2 r} \quad \vec{S} = \frac{1}{\mu_0} \vec{E} \times \vec{B} \quad \langle S \rangle = F \quad E = cB$$

$$L = 4\pi r^2 F$$

$$E = E_0 \sin(kx - \omega t + \epsilon) \quad k = \frac{2\pi}{\lambda} \quad \omega = 2\pi f$$

$$I = I_0 \cos^2 \theta \quad \tan \theta_P = \frac{n_2}{n_1}$$

$$m\lambda = d \sin \theta$$

### Conversions and Constants

$$1 \mu\text{m} = 10^{-6} \text{m}$$

$$1 \text{nm} = 1 \times 10^{-9} \text{m}$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$q = 1.6 \times 10^{-19} \text{C}$$

$$\mu_0 = 4\pi \times 10^{-7} \frac{\text{T} \cdot \text{m}}{\text{A}}$$

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$$