

Optics Formula Sheet

Comprehensive Summary of Geometric and Wave Optics

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1. Geometric Optics

Law of Reflection:

$$\theta_i = \theta_r$$

Snell's Law (Refraction):

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

where $n = \frac{c}{v}$ is the index of refraction.

Mirror and Lens Equation:

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

where f is focal length, d_o is object distance, d_i is image distance.

Magnification:

$$m = -\frac{d_i}{d_o} = \frac{h_i}{h_o}$$

Lensmaker's Equation:

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

2. Wave Optics

Wavelength Relation:

$$\lambda = \frac{\lambda_0}{n}$$

Young's Double Slit Interference: * Maxima (Constructive):

$$d \sin \theta = m\lambda, \quad m = 0, \pm 1, \pm 2, \dots$$

* Minima (Destructive):

$$d \sin \theta = \left(m + \frac{1}{2} \right) \lambda$$

* Fringe Width (β):

$$\beta = \frac{\lambda D}{d}$$

3. Diffraction

Single Slit Diffraction Minima:

$$a \sin \theta = m\lambda, \quad m = \pm 1, \pm 2, \dots$$

Rayleigh Criterion (Resolution):

$$\theta_R \approx 1.22 \frac{\lambda}{D}$$

4. Polarization

Malus's Law:

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

Brewster's Law:

$$\tan \theta_B = \frac{n_2}{n_1}$$