utfcode
utf8.sty 3.10 UTF-8 input encoding 13.06.2000
scanner for code UTF-8 installed.

OPTICS FORMULA CONCEPT CHEAT SHEET

1. Reflection & Geometrical Optics

Law of Reflection: $\theta_i = \theta_r$
Spherical Mirrors:

- Mirror Formula: $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$
- Focal Length: $f = \frac{R}{2}$
- Magnification: $m = \frac{h_i}{h_o} = -\frac{v}{u} = \frac{f}{f-u}$

2. Refraction & Snell's Law

Snell's Law: $n_1 \sin\theta_1 = n_2 \sin\theta_2$
Refractive Index: $n = \frac{c}{v} = \frac{\lambda_0}{\lambda}$
Apparent Depth:

$$d' = \frac{d}{n} \quad \text{(Observer in rarer medium)}$$

$$\text{Shift } \Delta d = d(1 - \frac{1}{n})$$

Critical Angle & TIR:

$$\sin\theta_c = \frac{n_2}{n_1} \quad (n_1 > n_2)$$

3. Prism Optics

Prism Formulae:

- Angle of Deviation: $\delta = i + e - A$
- Angle of Prism: $A = r_1 + r_2$
- Refractive Index at Min Deviation (δ_m):

$$n = \frac{\sin(\frac{A+\delta_m}{2})}{\sin(\frac{A}{2})}$$

- Small-angle Prism (δ): $\delta \approx (n-1)A$

4. Thin Lenses

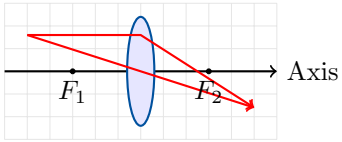
Lens Maker's Formula:

$$\frac{1}{f} = (\frac{n_l}{n_m} - 1)(\frac{1}{R_1} - \frac{1}{R_2})$$

Thin Lens Formula: $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
Magnification: $m = \frac{h_i}{h_o} = \frac{v}{u} = \frac{f}{f+u}$
Power of Lens: $P = \frac{1}{f \text{ (in m)}}$ (in Diopters, D)
Combination of Lenses in Contact:

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} \quad \Longrightarrow \quad P = P_1 + P_2$$

Convex Lens Ray Paths



5. Optical Instruments

Simple Microscope:

$$M = 1 + \frac{D}{f} \text{ (D.D.V.)}, \quad M = \frac{D}{f} \text{ (Normal)}$$

Compound Microscope:

$$M = -\frac{v_o}{u_o}(1 + \frac{D}{f_e}) \approx -\frac{L}{f_o}(\frac{D}{f_e})$$

Astronomical Telescope:

$$M = -\frac{f_o}{f_e}, \quad L = f_o + f_e \quad \text{(Normal Adj.)}$$

6. Wave Optics: Interference

Young's Double Slit Experiment (YDSE):

- Path Difference: $\Delta x = d \sin\theta \approx \frac{yd}{D}$
- Constructive (Bright): $\Delta x = n\lambda \quad (n = 0, 1, 2...)$
- Destructive (Dark): $\Delta x = (2n-1)\frac{\lambda}{2}$
- Fringe Width: $\beta = \frac{\lambda D}{d}$

Intensity Distribution:

$$I = 4I_0 \cos^2(\frac{\phi}{2}), \quad \phi = \frac{2\pi}{\lambda}\Delta x$$

7. Diffraction & Polarization

Single Slit Diffraction:

- Minima (Dark): $a \sin\theta = n\lambda$
- Secondary Maxima: $a \sin\theta = (2n+1)\frac{\lambda}{2}$
- Central Max Width: $W = \frac{2\lambda D}{a}$

Brewster's Law (Polarization):

$$\tan i_p = n \quad \Longrightarrow \quad i_p + r = 90^\circ$$

Malus's Law:

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