12 Physics Optics Formula

Refractive index
$$\mu = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}} = \frac{c}{v}$$

Snell's Law
$$\frac{\sin \mathrm{i}}{\sin \mathrm{r}} = \frac{\mu_2}{\mu_1}$$

Apparent depth
$$\mu = \frac{\text{real depth}}{\text{apparent depth}} = \frac{d}{d'}$$

Critical angle
$$\mu = \frac{1}{\sin i_c}$$

Refraction at spherical surface (Rarer to Denser refraction)
$$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}, \quad m = \frac{\mu_1 v}{\mu_2 u}$$

Refraction at spherical surface (Denser to rarer refraction)
$$\frac{\mu_1}{v} - \frac{\mu_2}{u} = \frac{\mu_1 - \mu_2}{R}$$

Lens maker's formula
$$\frac{1}{f} = (\mu - 1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$

Lens formula (Thin lens)
$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}, \quad m = \frac{v}{u}$$

Two thin lenses separated by distance d
$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 f_2}$$

Cauchy's equation
$$\mu = \mu_0 + \frac{A}{\lambda^2}, \quad A > 0$$

Mean deviation
$$\delta_y = \left(\mu_y - 1\right)A$$

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Angular dispersion $\theta = (\mu_v - \mu_r)A$

Dispersion power $\omega = \frac{\mu_v - \mu_r}{\mu_y - 1} \approx \frac{\theta}{\delta_y}$ (if A and i small)

Dispersion without deviation $(\mu_y - 1)A + (\mu'_y - 1)A' = 0$

Deviation without dispersion $(\mu_v - \mu_r)A = (\mu'_v - \mu'_r)A'$

Simple Microscope

Magnifying power

Case 1: When image if formed at the near point.

$$M = 1 + \frac{D}{f}$$

In case of when eye is placed behind the lens at a distance a,

$$M = 1 + \frac{D - a}{f}$$

Case 2: When the image if formed at infinity.

$$M = \frac{D}{f}$$

Compound Microscope

Magnifying power, $M = m_e \times m_o$

$M = \frac{v_o}{u_o}\left(1 + \frac{D}{f_e}\right)$, when image is at near point

$M = \frac{v_o}{u_o} \times \frac{D}{f_e}$, when final image is at infinity

Reflecting Astronomical

Cassegrain refracting telescope :

12 Physics Optics Formula

Telescope

$$\text{Magnification, } M = \frac{f_o}{f_e}\left(1 + \frac{f_e}{D}\right)$$

Resolving Power of microscope

$$\frac{1}{d} = \frac{2\mu sin\emptyset}{\lambda}$$