Ray Optics and Optical Instruments Class 12 Formula Sheet

CBSE Class 12 Physics · NCERT · for boards, NEET and JEE revision

ChapterNotes

Spherical Mirrors

$$1/v + 1/u = 1/f\ ,\ f = R/2$$

Sign convention: distances from pole

- Concave: real f (converging)
- Convex: virtual f (diverging)
- Follow the sign convention

Lens Maker's & Lens Formula

$$1/f = (n-1)(1/R_1 - 1/R_2)\ \cdot\ 1/v - 1/u = 1/f$$

Power P = 1/f (dioptre, D)

- Convex lens: +f
- Concave lens: –f
- P in D when f in metres

Magnification (Mirror)

$$m = -\,v\,/\,u = h'\,/\,h$$

m < 0 → real, inverted

- |m| > 1 enlarged
- |m| < 1 diminished
- m > 0 → virtual, erect

Total Internal Reflection

$$\sin\theta_c = 1\,/\,n\ (\theta > \theta_c)$$

Dense → rare, beyond critical angle

- Optical fibres
- Mirage & sparkle of diamond
- Only dense → rarer medium

Refraction & Snell's Law

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

n = c / v (refractive index)

- Denser medium: light bends toward normal
- n has no unit
- Frequency stays the same

Prism

$$A + \delta = i + e\ \cdot\ n = \sin((A+\delta_m)/2)\,/\,\sin(A/2)$$

δ_m = minimum deviation

- δ minimum when i = e
- Splits white light (dispersion)
- A = angle of prism

Refraction at a Spherical Surface

$$n_2/v - n_1/u = (n_2 - n_1)/R$$

Builds the lens maker's formula

- R positive if centre is on outgoing side
- Used twice for a lens
- Sign convention applies

Microscope & Telescope

$$\text{Microscope } M = (L/f_0)(D/f_e)\ \cdot\ \text{Telescope } M = f_0/f_e$$

Objective f_0 , eyepiece f_e

- Microscope: both f small
- Telescope: f_0 large, f_e small
- D = 25 cm (near point)

Quick revision

- Single surface: $n_1/u + n_2/v = (n_2 - n_1)/R$
- Lens maker: $1/f = (n-1)(1/R_1 - 1/R_2)$; Thin lens: $1/v - 1/u = 1/f$
- TIR: sin ic = n_rarer/n_denser; needs denser→rarer and i > ic
- Prism: n = sin[(A+δm)/2]/sin(A/2)
- Telescope: m = fo/fe; length = fo + fe (normal adjustment)
- Microscope: m ≈ (L/fo)(D/fe) for large magnification

Full chapter notes with solved examples and practice questions: https://chapternotes.in/cbse/class-12-physics/ray-optics-and-optical-instruments-class-12-notes/