

Chapter 9: Ray Optics and Optical Instruments

Short • Exam-ready • CBSE 2026–27 syllabus focused

Mirrors

- Mirror formula: $1/f = 1/v + 1/u$.
- Magnification: $m = h_i/h_o = -v/u$.
- Concave mirror: $f < 0$; convex mirror: $f > 0$ under Cartesian sign convention.

Refraction & lenses

- Snell's law: $n_1 \sin i = n_2 \sin r$.
- Critical angle for denser-to-rarer transition: $\sin C = n_r/n_d$.
- Thin lens formula: $1/f = 1/v - 1/u$.
- Lens magnification: $m = v/u$.
- Lens maker: $1/f = (\mu - 1)(1/R_1 - 1/R_2)$ for lens in air.
- Power: $P = 1/f(m)$, unit dioptre. Lenses in contact: $P_{eq} = P_1 + P_2$.

Prism & optical instruments

- At minimum deviation: $\mu = \sin[(A + D_m)/2] / \sin(A/2)$.
- Simple microscope: magnifying power approximately $1 + D/f$ for final image at near point; D/f for normal adjustment.
- Astronomical telescope (normal adjustment): magnifying power magnitude = f_o/f_e .

TIR & fibre

- Total internal reflection requires light travelling from denser to rarer medium and $i > C$.
- Optical fibre works mainly on repeated total internal reflection.

Exam focus

- Sign convention; mirror/lens numericals; TIR; prism; lens combinations; microscope/telescope magnifying power.

Revision tip: learn the formula, understand the symbols, then practise 2–3 application questions from NCERT/CBSE-style problems.