

CLASS 12

PHYSICS

REVISION NOTES

Class 12 Physics Chapter 10 Wave Optics – Revision Notes

Quick revision notes for Class 12 Physics Chapter 10 – Wave Optics, covering Huygens' principle, wavefronts, and Young's double-slit interference — ideal for last-minute board exam revision.

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Quick revision notes for **Class 12 Physics Chapter 10 – Wave Optics**, covering Huygens' principle, wavefronts, and Young's double-slit interference — ideal for last-minute board exam revision.

Huygens' Principle

Every point on a wavefront becomes a source of secondary spherical wavelets; the envelope of these wavelets at a later instant gives the new wavefront. Used to derive the laws of reflection and refraction from the wave theory of light, and to explain why a wavefront bends towards the normal when entering a denser (slower) medium.

Wavefronts

Spherical wavefront: from a point source, radius increasing with distance. **Plane wavefront:** from a source at infinity (or a point source at the focus of a converging lens/mirror) — parallel rays, flat wavefronts perpendicular to them. **Cylindrical wavefront:** from a line source.

Refraction and Reflection (Wave Picture)

Snell's law $n_1 \sin i = n_2 \sin r$ follows from Huygens' construction, with speed $v_1 = c/n_1$ in the first medium and $v_2 = c/n_2$ in the second. Frequency is fixed by the source and never changes on reflection or refraction; wavelength and speed both change with the medium ($\lambda = v/\nu$).

Interference — Young's Double-Slit Experiment

Path difference at a point on the screen, distance y from the centre, slit separation d , screen distance D (with $D \gg d$): path difference $\approx yd/D$.

Constructive interference (bright fringe): path difference $= n\lambda$ ($n=0, \pm 1, \pm 2, \dots$) $\Rightarrow y_n = n\lambda D/d$.

Destructive interference (dark fringe): path difference $= (n + \frac{1}{2})\lambda$.

Fringe width: $\beta = \lambda D/d$ (spacing between consecutive bright, or consecutive dark, fringes — independent of n).

Intensity at any point: $I = 4I_0 \cos^2(\phi/2)$, where $\phi = (2\pi/\lambda) \times (\text{path difference})$ is the phase difference, and I_0 is the intensity from each slit alone. Maximum intensity $4I_0$ occurs at bright fringes; minimum (zero) at dark fringes.

Coherent sources (constant phase relationship) are essential for a stable, observable interference pattern — two independent ordinary sources cannot produce visible fringes since their relative phase fluctuates randomly.

One-Line Summary

Chapter 10 shifts from the ray picture of light to the wave picture — Huygens' principle explains reflection and refraction as wavefront phenomena, and interference in Young's double-slit experiment demonstrates the wave nature of light directly, with fringe position and width governed by path difference, wavelength, slit separation, and screen distance.

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