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Class : 12th Physics
Chapter- 10 : Wave Optics

Wave Optics

- **Huygen's Principle**
  - Each point on the primary wavefront is the source of a secondary wavelets
  - **Wave front**
    - Locus of all particles vibrating in same phase
    - For spherical wavefront: $I \propto \frac{1}{r^2}$, $A \propto \frac{1}{r}$
- **Resolving Power**
  - Resolving power of telescope $= d / 1.22\lambda$
  - Resolving power of microscope $= 2n\sin\theta / \lambda$
- **Polarisation**
  - Restricting the vibration of light in a particular direction perpendicular to the direction of propagation of wave
  - **Brewster's Law**
    - $\mu = \tan\theta_p$
    - θ_p = angle of polarisation
    - Polarized used in lab to analyse plane polarised light
    - used to eliminate the head light glare in motor cars.
- **Young's Double Slit Experiment**
  - **Fringe-width**
    - $\beta = \frac{D}{d}\lambda$
    - is a distance between two consecutive bright or dark fringe
  - **Based on interference of light**
    - Distance between nth bright fringe and central fringe $x_n = \frac{n\lambda D}{d}$
    - D= distance between source and screen
    - Distance between nth dark fringe and central fringe $x_n = \frac{(2n-1)\lambda D}{2d}$
    - d = distance between slits
  - **Path difference**
    - For bright fringe $\Delta\Phi = n\lambda$
    - For dark fringe $\Delta\Phi = \left(n + \frac{1}{2}\right)\lambda$
- **Diffraction of light by single slit**
  - $b\sin\theta = n\lambda$ (dark fringe)
  - Linear width of central maxima $= \frac{2\lambda}{b}$
  - Angular width $= \frac{2D\lambda}{b}$
  - $b\sin\theta = (2n+1)\frac{\lambda}{2}$
  - (for maxima bright fringe)
- **Coherent source**
  - Two sources of light is said to be coherent if the initial phase difference between the waves emitted by the sources remains constant in time otherwise they are called Incoherent source of light
- **Interference of light**
  - Two wave superpose to form a resultant wave of greater or lower or same amplitude
  - $I = \left(\sqrt{I_1} + \sqrt{I_2}\right)^2$
  - $= \beta\left(A_1 + A_2\right)^2$
  - For constructive Interference $A = A_1 + A_2$
  - For destructive interference $A = (A_1 - A_2)$