Wave Optics

IMPORTANT FORMULAE IN WAVE OPTICS

Here is a list of essential formulas, along with expressions, constants, and their SI units derived from the Wave Optics textbook PDF.

List of Formulas with Constants and SI Units

1. **Speed of Light**:

$$c = 3.0 \times 10^8 \, \text{m/s}$$

2. **Frequency and Wavelength Relation**:

$$v = f\lambda$$

   - v: Speed (m/s)
   - f: Frequency (Hz)
   - λ: Wavelength (m)

3. **Refractive Index (Snell's Law)**:

$$n = \frac{\sin i}{\sin r}$$

   - n: Refractive index (dimensionless)

4. **Interference Condition (Constructive Interference)**:

$$\Delta x = n\lambda$$

   - Δx: Path difference (m)
   - n: Integer (0, 1, 2, ...)

5. **Interference Condition (Destructive Interference)**:

$$\Delta x = \left(n + \frac{1}{2}\right)\lambda$$

6. **Young's Double-Slit Interference Fringe Width**:

$$\beta = \frac{\lambda D}{d}$$

   - β: Fringe width (m)
   - D: Distance between slits and screen (m)
   - d: Slit separation (m)

7. **Angular Fringe Width**:

$$\theta = \frac{\lambda}{d}$$

   - θ: Angular width (radians)

8. **Energy of Photon**:

$$E = h\nu$$

   - h: Planck's constant, $6.63 \times 10^{-34}\,\mathrm{J\,s}$
   - ν: Frequency (Hz)

9. **Critical Angle for Total Internal Reflection**:

$$\sin\theta_c = \frac{n_2}{n_1}$$

   - θ_c: Critical angle (radians)
   - n_1, n_2: Refractive indices of respective media

10. **Diffraction Angle in Single-Slit Diffraction**:

$$a\sin\theta = n\lambda$$

   - a: Slit width (m)
   - n: Order of diffraction (integer)

11. **Brewster's Angle**:

$$\tan\theta_b = n$$

   - θ_b: Brewster's angle (radians)
   - n: Refractive index (dimensionless)

12. **Maxwell's Equation (Wave Speed in Medium)**:

$$v = \frac{1}{\sqrt{\mu\epsilon}}$$

   - μ: Permeability (H/m)
   - ϵ: Permittivity (F/m)

Let me know if you need further details on any specific formula or concept!