Young’s Double Slit Experiment (YDSE)

Class 12 Physics — Exam-Ready Formula Sheet

1. Path Difference

For a point P at height *y* from the central point O:

$\Delta x = d \sin\theta \approx dy/D$

where *d* = slit separation and *D* = slit-to-screen distance (D ■ d).

2. Phase Difference

$\Delta\phi = (2\pi/\lambda)\,\Delta x = 2\pi dy/(\lambda D)$

3. Bright Fringes (Constructive Interference)

Path difference: $\Delta x = n\lambda$

Position: $y_n = n\lambda D/d$

n = 0, ±1, ±2, … ; n = 0 gives the central bright fringe.

4. Dark Fringes (Destructive Interference)

Path difference: $\Delta x = (2n - 1)\lambda/2$

Position: $y'_n = (2n - 1)\lambda D/(2d)$

n = 1, 2, 3, …

5. Fringe Width

$\beta = \lambda D/d$

β is the distance between two consecutive bright fringes or two consecutive dark fringes. All fringes have equal width.

Angular fringe width: $\theta■ = \beta/D = \lambda/d$

6. Intensity at a Point

For equal intensities from the two slits:

$I = 4I■ \cos^2(\Delta\phi/2)$

Condition	Intensity
Bright fringe	Imax = 4I■
Dark fringe	Imin = 0
Average intensity	Iavg = 2I■

7. Fringe Visibility

$V = (I_{max} - I_{min})/(I_{max} + I_{min})$

8. Thin Glass Slab

If a slab of thickness *t* and refractive index μ is placed before one slit:

Fringe shift = (μ – 1)tD/d

Also: **Fringe shift = [(μ – 1)t/λ]** β

Most Important for Numericals: $\Delta x = dy/D$, $y_{bright} = n\lambda D/d$, $y_{dark} = (2n-1)\lambda D/(2d)$, $\beta = \lambda D/d$, and slab shift = $(\mu-1)tD/d$.