

Q1. JEE Main 2026 (21 January Shift 2)

Given below are two statements :

Statement I : In a Young's double slit experiment, the angular separation of fringes will increase as the screen is moved away from the plane of the slits

Statement II : In a Young's double slit experiment, the angular separation of fringes will increase when monochromatic source is replaced by another monochromatic source of higher wavelength.

In the light of the above statements, choose the correct answer from the options given below :

- (1) Both Statement I and Statement II are false
- (2) Statement I is false but Statement II is true
- (3) Both Statement I and Statement II are true
- (4) Statement I is true but Statement II is false

Q2. JEE Main 2026 (21 January Shift 2)

In a Young's double slit experiment set up, the two slits are kept 0.4 mm apart and screen is placed at 1 m from slits.

If a thin transparent sheet of thickness $20\mu\text{ m}$ is introduced in front of one of the slits then center bright fringe shifts by 20 mm on the screen. The refractive index of transparent sheet is given by $\frac{\alpha}{10}$, where α is ____.

Q3. JEE Main 2026 (23 January Shift 1)

In two separate Young's double-slit experimental set-ups and two monochromatic light sources of different wavelengths are used to get fringes of equal width. The ratios of the slits separations and that of the wavelengths of light used are 2 : 1 and 1 : 2 respectively. The corresponding ratio of the distances between the slits and the respective screens (D_1/D_2) is ____.

Q4. JEE Main 2026 (28 January Shift 2)

A beam of light consisting of wavelengths 650 nm and 550 nm illuminates the Young's double slits with separation of 2 mm such that the interference fringes are formed on a screen, placed at a distance of 1.2 m from the slits. The least distance of a point from the central maximum, where the bright fringes due to both the wavelengths coincide, is $\text{____} \times 10^{-5}$ m.

Q5. JEE Main 2026 (24 January Shift 2)

In the Young's double slit experiment the intensity produced by each one of the individual slits is I_0 . The distance between two slits is 2 mm. The distance of screen from slits is 10 m. The wavelength of light is $6000 \text{ \AA}$. The intensity of light on the screen in front of one of the slits is ____.

- (1) $\frac{I_0}{2}$
- (2) $2I_0$
- (3) $4I_0$
- (4) I_0

Q6. JEE Main 2026 (22 January Shift 2)

Which of the following are true for a single slit diffraction?

- A. Width of central maxima increases with increase in wavelength keeping slit width constant.
- B. Width of central maxima increases with decrease in wavelength keeping slit width constant.
- C. Width of central maxima increases with decrease in slit width at constant wavelength.
- D. Width of central maxima increases with increase in slit width at constant wavelength.
- E. Brightness of central maxima increases for decrease in wavelength at constant slit width.

(1) A, C, E only

(2) A, D only

(3) B, D only

(4) B, C only

Q7. JEE Main 2026 (23 January Shift 2)

When an unpolarized light falls at a particular angle on a glass plate (placed in air), it is observed that the reflected beam is linearly polarized. The angle of refracted beam with respect to the normal is ____.

($\tan^{-1}(1.52) = 57.7^\circ$, refractive indices of air and glass are 1.00 and 1.52, respectively.)

(1) 39.6°

(2) 32.3°

(3) 36.3°

(4) 42.6°

Q8. JEE Main 2026 (21 January Shift 1)

In a double slit experiment the distance between the slits is 0.1 cm and the screen is placed at 50 cm from the slits plane. When one slit is covered with a transparent sheet having thickness t and refractive index $n(= 1.5)$, the central fringe shifts by 0.2 cm. The value of t is ____ cm.

(1) 5.0×10^{-3}

(2) 6.0×10^{-3}

(3) 8×10^{-4}

(4) 5.6×10^{-4}

Q9. JEE Main 2026 (28 January Shift 1)

Given below are two statements:

Statement I: A plane wave after passing through prism remains as plane wave but passing through small pin hole may become spherical wave.

Statement II: The curvature of a spherical wave emerging from a slit will increase for increasing slit width.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are false

(4) Statement I is true but Statement II is false

Q10. JEE Main 2026 (24 January Shift 1)

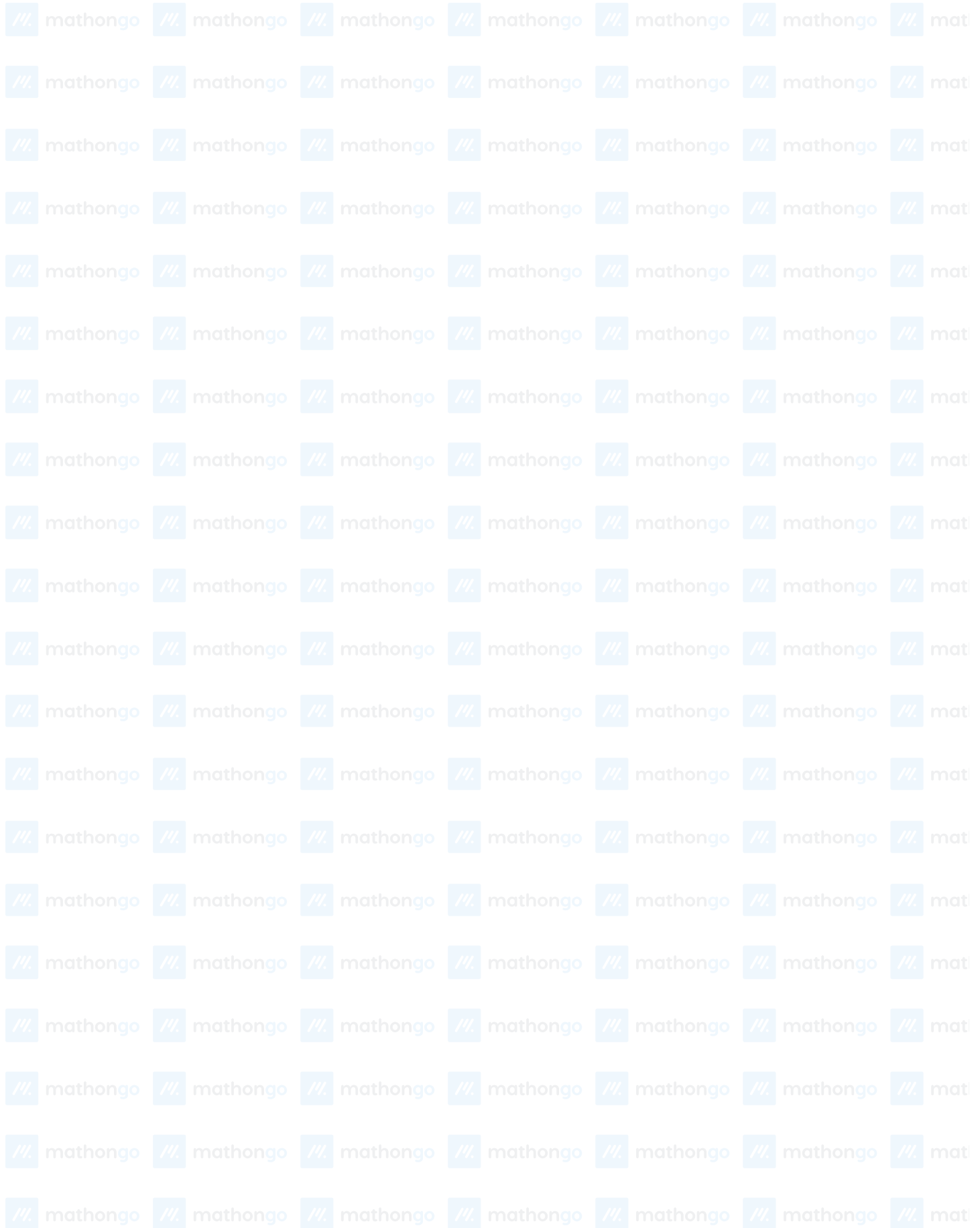
An unpolarised light is incident at an interface of two dielectric media having refractive indices of 2 (incident medium) and $2\sqrt{3}$ (medium) respectively. To satisfy the condition that reflected and refracted rays are perpendicular to each other, the angle of incidence is ____.

(1) 45°

(2) 60°

(3) 10°

(4) 30°



ANSWERS AND SOLUTIONS

1. (2) 2. 14 3. 4 4. 429 5. (4) 6. (1) 7. (2) 8. (3)
9. (4) 10. (2)

1. (2) In Young's double slit experiment, angular separation of fringes is $\beta = \frac{\lambda}{d}$ where λ is wavelength and d is slit separation.

Statement I is false because angular separation is independent of screen distance; it depends only on the slit separation and wavelength.

Statement II is true because increasing the wavelength directly increases the angular separation β .

Therefore, Statement I is false but Statement II is true.

2. (14) In Young's Double Slit Experiment, when a thin transparent sheet of thickness t and refractive index μ is introduced in front of one slit, the central bright fringe shifts by a distance Δy .

The formula for the shift is given by $\Delta y = \frac{D}{d}(\mu - 1)t$.

Given values:

Distance between slits $d = 0.4 \text{ mm} = 0.4 \times 10^{-3} \text{ m}$

Distance to screen $D = 1 \text{ m}$

Thickness of sheet $t = 20 \mu\text{m} = 20 \times 10^{-6} \text{ m}$

Shift $\Delta y = 20 \text{ mm} = 20 \times 10^{-3} \text{ m}$

Substituting the values into the formula:

$$20 \times 10^{-3} = \frac{1}{0.4 \times 10^{-3}} \times (\mu - 1) \times 20 \times 10^{-6}$$

$$20 \times 10^{-3} = \frac{20 \times 10^{-6}}{0.4 \times 10^{-3}} \times (\mu - 1)$$

$$20 \times 10^{-3} = 50 \times 10^{-3} \times (\mu - 1)$$

$$\mu - 1 = \frac{20}{50} = 0.4$$

$$\mu = 1.4$$

The refractive index is given as $\frac{\alpha}{10}$.

$$\text{So, } 1.4 = \frac{\alpha}{10}$$

$$\alpha = 14$$

3. (4) Fringe width in double slit: $\beta = \frac{\lambda D}{d}$

Given: $\frac{d_1}{d_2} = 2 : 1$ and $\frac{\lambda_1}{\lambda_2} = 1 : 2$, with equal fringe widths

For equal fringe widths: $\frac{\lambda_1 D_1}{d_1} = \frac{\lambda_2 D_2}{d_2}$

$$\frac{\lambda_1}{\lambda_2} \times \frac{D_1}{D_2} = \frac{d_1}{d_2}$$

$$\frac{1}{2} \times \frac{D_1}{D_2} = 2$$

$$\frac{D_1}{D_2} = 4$$

4. (429) Given wavelengths are $\lambda_1 = 650 \text{ nm}$ and $\lambda_2 = 550 \text{ nm}$.

Slit separation $d = 2 \text{ mm} = 2 \times 10^{-3} \text{ m}$.

Distance to screen $D = 1.2 \text{ m}$.

For the bright fringes of both wavelengths to coincide at a distance y from the central maximum, we have:

$$y = n_1 \frac{\lambda_1 D}{d} = n_2 \frac{\lambda_2 D}{d}$$

where n_1 and n_2 are integers representing the order of the fringes.

This simplifies to $n_1 \lambda_1 = n_2 \lambda_2$.

$$\frac{n_1}{n_2} = \frac{\lambda_2}{\lambda_1} = \frac{550}{650} = \frac{11}{13}$$

The least values for coincidence are $n_1 = 11$ and $n_2 = 13$.

The least distance y is given by:

$$y = n_1 \frac{\lambda_1 D}{d} = 11 \times \frac{650 \times 10^{-9} \times 1.2}{2 \times 10^{-3}}$$

$$y = 11 \times 650 \times 0.6 \times 10^{-6} \text{ m}$$

$$y = 11 \times 390 \times 10^{-6} \text{ m}$$

$$y = 4290 \times 10^{-6} \text{ m}$$

$$y = 429 \times 10^{-5} \text{ m}.$$

5. (4) In Young's double slit experiment:

$d = 2 \text{ mm}$, $D = 10 \text{ m}$, $\lambda = 6000 \text{ \AA}$

The point in front of one slit is at $y = \frac{d}{2}$ from the central axis.

$$I = 4I_0 \cos^2\left(\frac{\pi dy}{\lambda D}\right)$$

$$= 4I_0 \cos^2\left(\frac{\pi \times 2 \times 10^{-3} \times 1 \times 10^{-3}}{6000 \times 10^{-10} \times 10}\right)$$

$$= 4I_0 \cos^2\left(\frac{\pi}{3}\right) = 4I_0 \times \frac{1}{4} = I_0$$

6. (1) For single slit diffraction, linear width of central maximum is $W = \frac{2\lambda D}{a}$.

A: Width increases with wavelength (keeping a constant) - TRUE since $W \propto \lambda$.

B: Width increases with decreasing wavelength - FALSE, opposite of A.

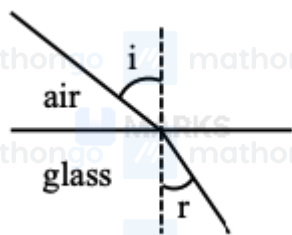
C: Width increases with decreasing slit width (keeping λ constant) - TRUE since $W \propto \frac{1}{a}$.

D: Width increases with increasing slit width - FALSE, opposite of C.

E: Brightness increases with decreasing wavelength at constant slit width - TRUE since less wavelength means less diffraction spreading and more concentrated intensity.

Statements A, C, and E are true.

7.



(2)

$$\tan i = \frac{\mu_2}{\mu_1} = \frac{\mu_g}{\mu_a}$$

$$\tan i = 1.52$$

$$i = 57.7^\circ$$

$$r = 90^\circ - i$$

$$r = 32.3^\circ$$

8. (3) Given: $d = 0.1$ cm, $D = 50$ cm, $n = 1.5$, Shift = 0.2 cmOptical path difference by sheet: $\Delta = (n - 1)t$

$$\text{Shift of central fringe: Shift} = \frac{(n-1)t \times D}{d}$$

$$0.2 = \frac{(1.5-1) \times t \times 50}{0.1} = \frac{0.5 \times 50 \times t}{0.1} = 250t$$

$$t = \frac{0.2}{250} = 8 \times 10^{-4} \text{ cm}$$

9. (4) Statement I: A plane wave passing through a prism remains a plane wave due to refraction at parallel surfaces.

However, when passing through a small pin hole comparable to the wavelength, Huygens' principle applies where each point on the wavefront acts as a source of secondary wavelets, creating a spherical wavefront. Statement I is TRUE.

Statement II: When a spherical wave emerges from a slit, the diffraction effect depends on slit width. A narrower slit causes stronger diffraction and greater curvature of the emerging wavefront. As slit width increases, diffraction effects decrease and the wavefront becomes flatter with reduced curvature. Therefore, the curvature decreases with increasing slit width. Statement II is FALSE.

The correct answer identifies that Statement I is true but Statement II is false.

10. (2) For reflected and refracted rays to be perpendicular, if i is the angle of incidence and r is the angle of refraction, then $i + r = 90^\circ$, giving $r = 90^\circ - i$.Applying Snell's law: $n_1 \sin i = n_2 \sin r$

$$2 \sin i = 2\sqrt{3} \sin(90^\circ - i)$$

$$2 \sin i = 2\sqrt{3} \cos i$$

$$\tan i = \sqrt{3}$$

$$i = 60^\circ$$