PHYSICS

BOOKS - DISHA PUBLICATION PHYSICS (HINGLISH)

WAVE OPTICS

Jee Main 5 Years At A Glance

1. Lights of wavelength 550 nm falls normally on a slit of width $k22.0 \times 10^{-5} cm$. The angular position of the central maximum will be (in radian) :

A. $\frac{\pi}{8}$

B. $\frac{\pi}{12}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{6}$

Answer: A

Watch Video Solution

2. The angular width of the central maximum in a single slit diffraction pattern is 60°. The width of the slit is $1\mu m$. The slit is illuminated by monochromatic plane waves. If another slit of same width is made near it, Young's fringes can be observed on a screen placed at a distance 50 cm from the slits. If the observed fringe width is 1 cm, what is slit separation distance?

(i.e. distance between the centres of each slit.)

A. $25\mu m$

B. $50\mu m$

C. $75\mu m$

D. $100\mu m$

Answer: A

Watch Video Solution

3. Unpolarised light of intensity I passes through an ideal polariser A. Another identical polariser B is placed behind A. The intensity of light beyond B is found to be $\frac{I}{2}$. Now another identical polariser C is placed between A and B. The intensity beyond B is now found to be $\frac{I}{8}$. the angle between polariser A and C is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: C

Watch Video Solution

4. A single slit of width b is illuminated by a coherent monochromatic light of wavelength λ. If the second and fourth minima in the diffraction pattern at a distance 1 m from the slit are at 3 cm and 6 cm respectively from the central maximum, what is the width of the central maximum ? (i.e., distance between first minimum on either side of the central maximum)

A. 1.5 cm

B. 3.0 cm

C. 4.5 cm

D. 6.0 cm

Answer: B

Watch Video Solution

5. A single slit of width 0.1 mm is illuminated by a parallel beam of light of wavelength 6000Å and diffraction bands are observed on a screen 0.5 m from the slit. The distance of the third dark band from the central bright band is ______ mm.

A. 3 mm

B. 9 mm

C. 4.5 mm

D. 1.5 mm

Answer: B

Watch Video Solution

6. In a Young's double slit experiment, slits are separated by $0.5mm$ and the screen is placed $150cm$ away. A beam of light consisting of two wavelengths, $650nm$ and $520nm$, is used to obtain interference fringes on the screen. The least distance from the commom central maximum to the point where the bright fringes fue to both the wavelengths coincide is

A. 9.75 mm

B. 15.6 mm

C. 1.56 mm

D. 7.8 mm

Answer: D

Watch Video Solution

7. Two stars are 10 light years away from the earth. They are seen through a telescope of objective diameter 30 cm. The wavelength of light is 600nm. To see the stars just resolved by the telescope, the minimum distance between them should be (1 light year $= 9.46 \times 10^{15} m$) of the order of :

A. 10^{8} km

B. 10^{10} km

C. 10^{11} km

D. 10^{6} km

Answer: A

Watch Video Solution

8. The box of a pin hole camera, of length L, has a hole of radius a . It is assumed that when the hole is illuminated by a parallel beam of light of wavelength λ the spread of the spot (obtained on the opposite wall of the camera) is the sum of its geometrical spread and the spread due to diffraction. The spot would then have its minimum size (say b_(min)) when:

A. $a = \sqrt{\lambda L}$ and $b_{\min} = \sqrt{4\lambda L}$

B. $a = \frac{\lambda^2}{L}$ and $b_{\min} = \sqrt{4\lambda L}$

C. $a = \frac{\lambda^2}{L}$ and $b_{\min} = \left(\frac{2\lambda^2}{L}\right)$

D. $a = \lambda L$ and $b_{\min} = \left(\frac{2\lambda^2}{L}\right)$

Answer: A

Watch Video Solution

9. In a Young's double slit experiment with light of wavelength λ the separation of slits is d and distance of screen is D such that $D > > d > > \lambda$. If the fringe width is bea, the distance from point of maximum intensity to the point where intensity falls to half of maximum intensity on either side is

A. $\frac{\beta}{6}$

B. $\frac{\beta}{3}$

C. $\frac{\beta}{4}$

D. $\frac{\beta}{2}$

Answer: C

Watch Video Solution

10. Assuming human pupil to have a radius of 0.25 cm and a comfortable viewing distance of 25 cm, the minimum separation between two objects than human eye can resolve at 500nm wavelength is :

A. $100\mu m$

B. $300\mu m$

C. $1\mu m$

D. $30\mu m$

Answer: D

Watch Video Solution

11. Two monochromatic light beams of intensity 16 and 9 units are interfering. The ratio of inetnsities of bright and dark parts of the resultant pattern is :

A. $\frac{16}{9}$

B. $\frac{4}{3}$

C. $\frac{7}{1}$

D. $\frac{49}{1}$

Answer: D

Watch Video Solution

12. Two beams A and B, of plane polarized light with mutually perpendicular planes of polarization are seen through a polaroid. From the position when the beam a has maximum intensity (and beam B has zero ntensity), a rotation of polaroid through 30° makes the two beams appear equally bright. If the initial intensities of the two beams are I_A and I_B respectively, then $\frac{I_A}{I_B}$ equals:

A. 3

B. $\frac{3}{2}$

C. 1

D. `1/3

Answer: D

Watch Video Solution

Exercise 1 Concept Builder

1. According to Huygen's construction which of the following wavefront does not exists?

A. forward wavefront

B. backward wavefront

C. cylindrical wavefront

D. cannot be predicted

Answer: B

Watch Video Solution

2. Newton postulated his corpuscular theory on the basis of

A. Newton's rings

B. rectilinear propagation of light

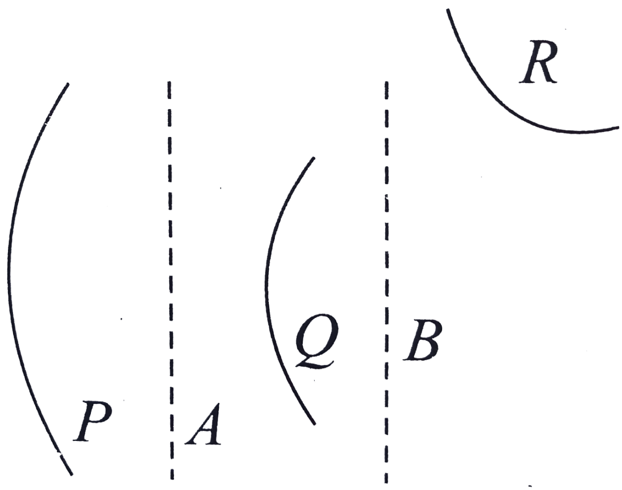
C. colour through thin films

D. dispersion of white light into colours

Answer: B

Watch Video Solution

3. Figure shows wavefront P Passing through two systems A and B, and emerging as Q and then as R. Then systems A and B could, respectively, be



A. a prism and a convergent lens

B. a convergent lens and a prism

C. a divergent lens and a prism

D. a convergent lens and a divergent lens

Answer: B

Watch Video Solution

4. Spherical wavefronts, emanating from a point source, strike a plane reflecting surface. What will happen to these wave fronts, immediately after reflection?

A. They will remain spherical with the same curvature, both in magnitude and sign.

B. They will become plane wave fronts.

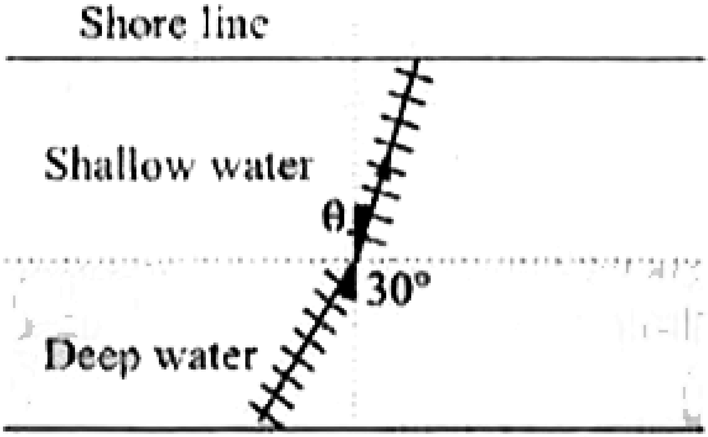
C. They will remain spherical, with the same curvature, but sign of curvature reversed.

D. They will remain spherical, but with different curvature, both in magnitude and sign.

Answer: C

Watch Video Solution

5. Ocean waves moving at a speed of 4.0 m/s are approaching a beach at an angle of 30° to the normal, as shown in figure. Suppose the water depth changes abruptly at a certain distance from the beach and the wave speed there drops to 3.0 m/s. Close to the angle θ is :



A. $\sin^{-1}(3/4)$

B. $\sin^{-1}(1/4)$

C. $\sin^{-1}(3/8)$

D. none of these

Answer: C

View Text Solution

6. According to Huygen's construction , tangential envelope which touches all the secondary spheres is the position of

A. original wavefront

B. secondary wavefront

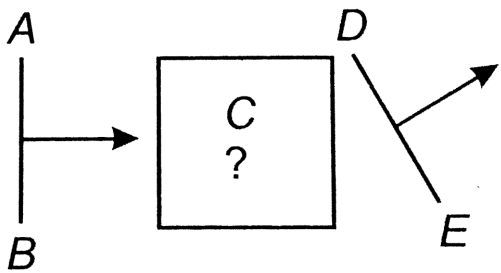
C. geometrical wavefront

D. extended wavefront

Answer: B

Watch Video Solution

7. A wave front AB passing through a system C emerges as DE. The system C could be



A. a slit

B. a biprism

C. a prism

D. a glass slab

Answer: C

Watch Video Solution

8. The wavefronts of a light wave travellilng in vacuum are given by $x+y+z=c$. The angle made by the direction of propagation of light with the X-axis is

A. 0°

B. 45°

C. 90°

D. $\cos^{-1}(1/\sqrt{3})$

Answer: D

Watch Video Solution

9. Find the minimum thcknessof a film which will strongly reflect the light of wavelength 589 nm. The refractive index of the material of the film is 1.25.

A. 118 nm

B. 120 nm

C. 218 m

D. 225 mm

Answer: A

Watch Video Solution

10. A parallel beam of white light is reflected from a thin wedge shaped film. The colour of the fringe at the edge of the wedge will be

A. white

B. red

C. black

D. violet

Answer: C

View Text Solution

11. The path difference between two wavefronts emitted by coherent sources of wavelength 5460 Å is 2.1 micron . The phase difference between the wavefronts at that point is –

A. 7.692

B. 7.692π

C. $\frac{7.692}{\pi}$

D. $\frac{7.692}{3\pi}$

Answer: B

Watch Video Solution

12. To deminstrate the phenimenon of interference, we require two sources which emit radiation

A. nearly the same frequency

B. the same frequency

C. different wavelengths

D. the same frequency and having a definite phase relationship

Answer: D

Watch Video Solution

13. When a thin transparent plate of thickness t and refractive index μ is placed in the path of one the two interfering waves of light, then the path difference changes by

A. $(\mu + 1)t$

B. $(\mu - 1)t$

C. $\frac{(\mu + 1)}{t}$

D. $\frac{(\mu - 1)}{t}$

Answer: B

Watch Video Solution

14. The intensity ratio of two waves is $9:1$. If they produce interference, the ratio of maximum to minimum intensity will be

A. $10:8$

B. $9:1$

C. $4:1$

D. $2:1$

Answer: C

Watch Video Solution

15. Interference was observed in interference chamber when air was present, now the chamber is evacuated and if the same light is used, a careful observer will see

A. no interference

B. interference with brighter bands

C. interference with dark bands

D. interference fringe with larger width

Answer: D

Watch Video Solution

16. White light falls normally on a film of soap water whose thickness is $5 \times 10^{-5} cm$ and refractive index is 1.40. The wavelengths in the visible region that are reflected the most strongly are :

A. 5000 Å and 4000 Å

B. 5400 Å and 4000 Å

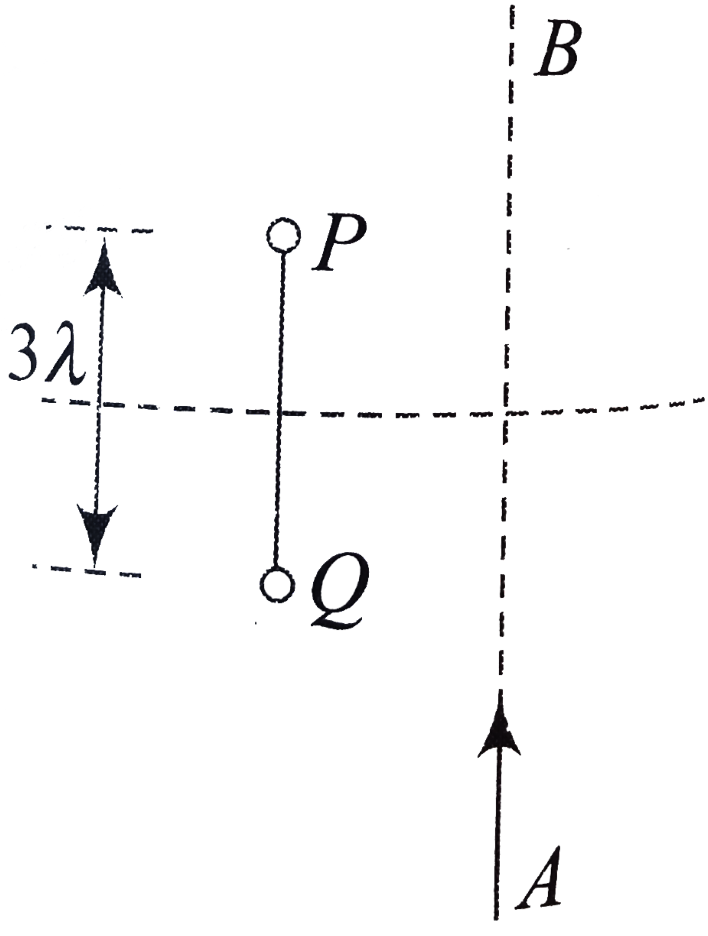
C. 6000 Å and 5000 Å

D. 4500 Å only

Answer: A

Watch Video Solution

17. Two coherent light sources, each of wavelength λ, are separated by a distance 3λ, The maximum number of minima formed on line AB, which funs from $-\infty$ to $+\infty$, is



A. 2

B. 4

C. 6

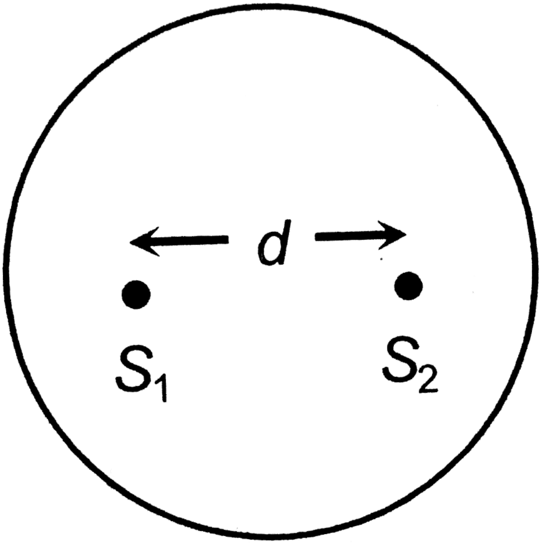
D. 8

Answer: C

Watch Video Solution

18. Two coherent sources separated by distance d are radiating in phase having wavelength λ. A detector moves in a big circle around the two sources in the plane of the two sources. The angular position of $n = 4$

interference maxima is given as



A. $\sin^{-1}\frac{n\lambda}{d}$

B. $\cos^{-1}\frac{4\lambda}{d}$

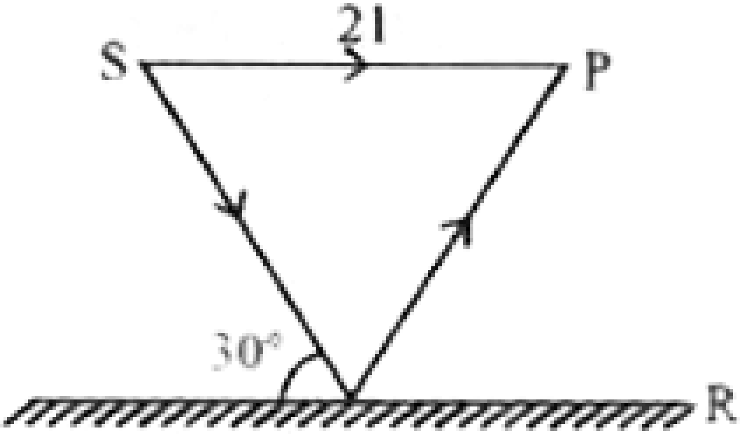
C. $\tan^{-1}\frac{d}{4\lambda}$

D. $\cos^{-1}\frac{\lambda}{4d}$

Answer: B

Watch Video Solution

19. Interference pattern is observed at 'P' due to superimposition of two rays coming out from a source 'S' as shown in the figure. The value of '1' for which maxima is obtained at 'P' is : (R is perfect reflecting surface)



A. $1 = \dfrac{2n\lambda}{\sqrt{3}-1}$

B. $1 = \dfrac{(2n -)\lambda}{2\left(\sqrt{3}-1\right)}$

C. $1 = \dfrac{(2n -)\lambda\sqrt{3}}{4\left(2-\sqrt{3}\right)}$

D. $1 = \dfrac{(2n -)\lambda}{\sqrt{3}-1}$

Answer: C

View Text Solution

20. Two coherent monochromatic light beams of intensities I and $4I$ are superposed. The maximum and minimum possible intensities in the resulting beam are

A. 5I and I

B. 5I and 3I

C. 9I and I

D. 9I and 3I

Answer: C

Watch Video Solution

21. The path difference between two interfering waves at a point on screen is 171.5 times the wavelength if the path difference is 0.01029 cm find the wavelength.

A. $6000 \times 10^{-10} cm$

B. 6000 Å

C. $6000 \times 10^{-8} mm$

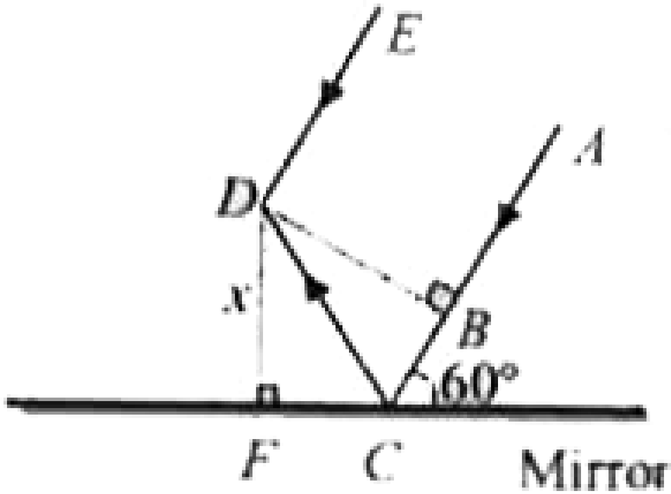
D. None of these

Answer: B

Watch Video Solution

22. For the two parallel rays AB and DE shown here, BD is the wavefront. For what value of wavelength of rays destructive interference takes place between ray DE and reflected ray

CD?



A. $\sqrt{3}x$

B. $\sqrt{2}x$

C. x

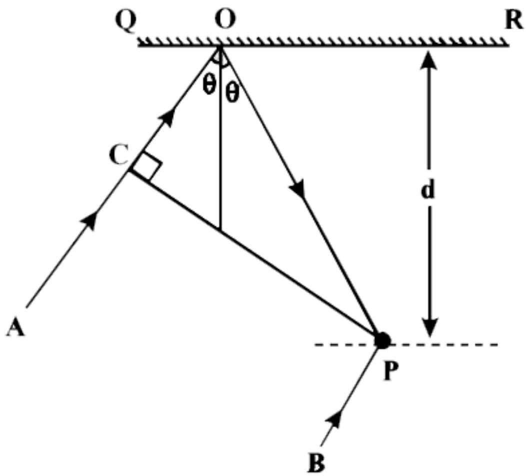
D. 2x

Answer: A

View Text Solution

23. In the adjacent diagram, CP represents a wavefront and AO & BP, the corresponding two rays. Find the condition on θ for constructive interference at P between the ray

BP and reflected ray OP.



A. $\cos\theta = 3\lambda / 2d$

B. $\cos\theta = \lambda / 4d$

C. $\sec\theta - \cos\theta = \lambda / d$

D. $\sec\theta - \cos\theta = 4\lambda / d$

Answer: B

Watch Video Solution

24. Two beam of light having intensities I and 4I interfere to produce a fringe pattern on a screen. The phase difference between the beams is $\frac{\pi}{2}$ at point A and π at point B. Then the difference between resultant intensities at A and B is : $(2001, 2M)$

A. 2 I

B. 4 I

C. 5 I

D. 7 I

Answer: B

Watch Video Solution

25. Light from two coherent sources of the same amplitude A and wavelength λ illuminates the screen. The intensity of the central maximum is I_0. If the sources were incoherent, the intensity at the same point will be

A. $4I_0$

B. $2I_0$

C. I_0

D. $I_0 / 2$

Answer: D

Watch Video Solution

26. A point p is situated $90.50cm$ and 90.58 cm away from two coherent sources. The nature of illumination of the point p of the wavelength of light is 400Å is,

A. bright

B. dark

C. neither bright nor dark

D. none of these

Answer: A

Watch Video Solution

27. For observing interference in thin films with a light of wave length λ the thickness of the film:

A. may be of any magnitude

B. should be much smaller than λ

C. should be of the order of λ

D. should be a few thousand times of λ

Answer: B

View Text Solution

28. Sodium light $(\lambda = 6 \times 10^{-7} m)$ is used to produce interference pattern. The observed fringe width is 0.12 mm. The angle between two interfering wave trains, is

A. 1×10^{-3} rad

B. 1×10^{-2} rad

C. 5×10^{-3} rad

D. 5×10^{-2} rad

Answer: C

Watch Video Solution

29. In which of the following is the interference due to the division of wave front

A. Young's double slit experiment

B. Fresnel's biprism experiment

C. Lloyd's mirror experiment

D. Demonstration colours of thin film.

Answer: B

Watch Video Solution

30. In Young's double slit experiment, one slit is covered with red filter and another slit is covered by green filter, then interference pattern will be

A. red

B. green

C. yellow

D. invisible

Answer: D

Watch Video Solution

31. In Young's double slit experiment, a minimum is obtained when the phase difference of super imposing waves is

A. zero

B. $(2n-1)\pi$

C. $n\pi$

D. $(n+1)\pi$

Answer: B

Watch Video Solution

32. Instead of using two slits as in Young's experiment, if we use two separate but identical sodium lamps, which of the following will occur?

a) uniform illuminations is observed

b) widely separate interference

c) very bright maximum

d) very minimum

A. General illumination

B. Widely separate interference

C. Very bright maxima

D. Very dark minima

Answer: A

Watch Video Solution

33. The maximum intensity of fringes in Young's experiment is I. If one of the slit is closed, then the intensity at that place becomes I_o. Which of the following relation is true?

A. $I = I_o$

B. $I = 2I_o$

C. $I = 4I_o$

D. there is no relation between I and I_o

Answer: C

Watch Video Solution

34. When we close one slit in the Young's double slit experiment then

A. the bandwidth is increased

B. the bandwidth is decreased

C. the bandwidth remains unchanged

D. the diffraction pattern is observed

Answer: D

Watch Video Solution

35. S is the size of the slit, d is the separation between the slits and D is the distance of slits from a plane where Young's double slit interference pattern is being observed . If λ be the wavelength of light, then for sharp fringes, the essential conditional is

A. $\frac{S}{D} < \frac{\lambda}{d}$

B. $\frac{S}{D} > \frac{\lambda}{d}$

C. $S\lambda < dD$

D. $SD > \lambda d$

Answer: D

Watch Video Solution

36. Distance between screen and source is decreased by 25%. Then the percentage change in fringe width is

A. 0.2

B. 0.31

C. 0.75

D. 0.25

Answer: D

Watch Video Solution

37. In a Young's double slit experiment, the separation of the two slits is doubled. To keep the same spacing of fringes, the distance D of the screen from the slits should be made

A. $\frac{D}{2}$

B. $\frac{D}{\sqrt{2}}$

C. 2D

D. 4D

Answer: C

Watch Video Solution

38. In YDSE, how many maximas can be obtained on a screen including central maxima in both sides of the central fringe if $\lambda = 3000\text{Å}, d = 5000\text{Å}$

A. 2

B. 5

C. 3

D. 1

Answer: C

Watch Video Solution

39. The Young's double slit experiment is performed with blue and with green light of wavelengths $4360A$ and $5460A$ respectively. If

X is the distance of $4th$ maximum from the central one, then :

A. x (blue) = x (green)

B. x (blue) $>$ x (green)

C. x (blue) $<$ x (green)

D. $\frac{x(\text{blue})}{x(\text{green})} = \frac{5460}{4360}$

Answer: C

Watch Video Solution

40. In Young's double slit experiment, the slits are 3 mm apart. The wavelength of light used is 5000 Å and the distance between the slits and the screen is 90 cm. The fringe width in mm is

A. 1.5

B. 0.015

C. 2.0

D. 0.15

Answer: D

Watch Video Solution

41. In Young's experiment intensity at a point on the scrren is 75% of the maximum value. Minimum phase difference between the waves arriving at this point from the two slits will be

A. 30°

B. 45°

C. 60°

D. 135°

Answer: C

Watch Video Solution

42. In Young's double slit experiment, $\lambda = 500nm$, d = 1mm, D = 1m. Minimum distance from the central maximum for which intensity is half of the maximum intensity is

A. $2.5 \times 10^{-4}m$

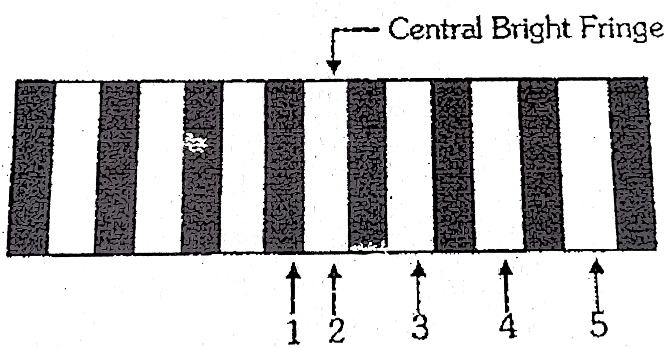
B. $1.25 \times 10^{-4}m$

C. $0.625 \times 10^{-4}m$

D. $0.3125 \times 10^{-4} m$

Answer: B

View Text Solution

43. 

The figure shows the interfernece pattern obtained in double slit experiment using light of wavelength 600 nm.

Q. The third order bright fringe is

A. 2

B. 3

C. 4

D. 5

Answer: D

Watch Video Solution

44. In YSDE, both slits are covered by transparent slab. Upper slit is covered by slab of R.I. 1.5 and thickness t and lower is covered by R.I. $\frac{4}{3}$ and thickness 2t, then central maxima

` (##DPP_PHY_CP24_E01_008_Q01.png"

width="80%">

A. shifts in +ve y-axis direction

B. shifts in -ve y-axis direction

C. remains at same position

D. may shift in upward or downward depending upon wavelength of light

Answer: B

Watch Video Solution

45. In a Young's experiment, two coherent sources are placed $0.90 mm$ apart and the fringes are observed one metre away. If is produces the second dark fringe at a distance of $1 mm$ from the central fringe, the wavelength of monochromatic light used would be

A. 60×10^{-4} cm

B. 10×10^{-4} cm

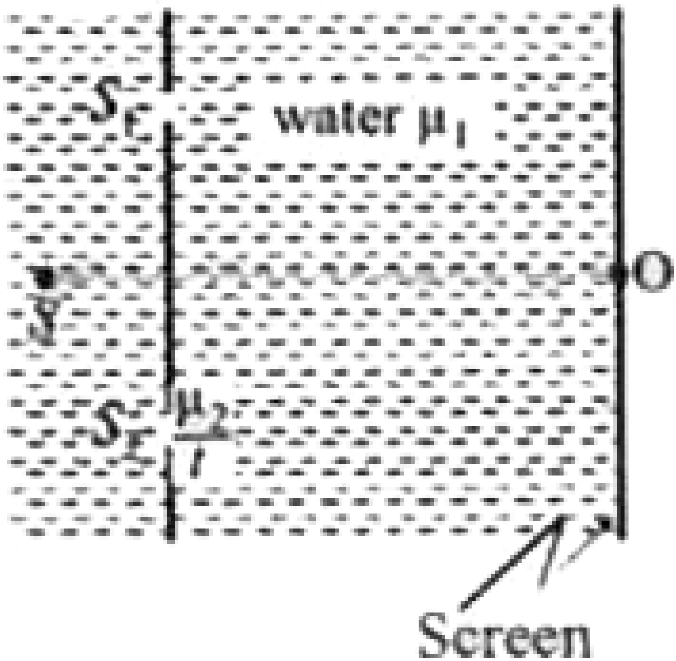
C. 10×10^{-5} cm

D. 6×10^{-5} cm

Answer: D

Watch Video Solution

46. A YDSE is conducted in water (μ_1) as shown in figure. A glass plate of thickness t and refractive index μ_2 is placed in the path of S_2. The optical path difference at O is



A. $(\mu_2 - 1)t$

B. $(\mu_1 - 1)t$

C. $\left(\frac{\mu_2}{\mu_1} - 1\right)t$

D. $(\mu_2 - \mu_1)t$

Answer: D

Watch Video Solution

47. In YDSE, bichromatic light of wavelengths 400 nm and 560 nm are used. The distance between the slits is 0.1 mm and the distance between the plane of the slits and the screen is 1m. The minimum distance between two successive regions of complete darkness is

A. 4mm

B. 5.6mm

C. 14mm

D. 28mm

Answer: D

Watch Video Solution

48. In Young's double slit experiment intensity at a point is $\left(\frac{1}{4}\right)$ of the maximum intersity. Angular position of this point is

A. $\sin^{-1}(\lambda / d)$

B. $\sin^{-1}(\lambda / 2d)$

C. $\sin^{-1}(\lambda / 3d)$

D. $\sin^{-1}(\lambda / 4d)$

Answer: C

Watch Video Solution

49. In a Young's double-slit experiment the fringe width is $0.2mm.$ If the wavelength of light used is increased by 10% and the separation between the slits if also increased by 10%, the fringe width will be

A. 0.20 mm

B. 0.401 mm

C. 0.242 mm

D. 0.165 mm

Answer: A

Watch Video Solution

50. In Young's double slit experiment, distance between two sources is 0.1mm. The distance of screen from the sources is 20cm. Wavelength of light used is 5460Å. Then, angular position of first dark fringe is approximately

A. 0.08°

B. 0.16°

C. 0.20°

D. 0.32°

Answer: B

Watch Video Solution

51. A single slit diffraction pattern is obtained using a beam of red light. If the red light is replaced by the blue light, then the diffraction pattern

A. remains unchanged

B. becomes narrower

C. becomes broader

D. will disappear

Answer: B

Watch Video Solution

52. From Brewster's law of polarisation, it follows that the angle of polarisation depends upon

A. the wavelength of light

B. plane of polarisation's orientation

C. plane of vibration's orientation

D. None of these

Answer: A

Watch Video Solution

53. The first diffraction minima due to a single slit diffraction is at $\theta = 30^{\circ}$ for a light of wavelength 5000Å The width of the slit is

A. $5 \times 10^{-5} cm$

B. $10 \times 10^{-5} cm$

C. $2.5 \times 10^{-5} cm$

D. $1.25 \times 10^{5} cm$

Answer: B

Watch Video Solution

54. When an unpolarized light of intensity I_0 is incident on a polarizing sheet, the intensity of the light which does not get transmitted is

A. $\frac{1}{4}I_0$

B. $\frac{1}{2}I_0$

C. I_0

D. zero

Answer: B

Watch Video Solution

55. Unpolarised light is incident on a dielectric of refractive indexspt$\sqrt{3}$. What is the angle of incidence if the reflected beam is completely polarised?

A. 30°

B. 45°

C. 60°

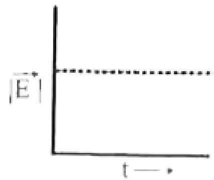
D. 75°

Answer: C

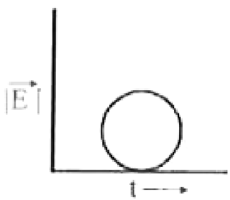
Watch Video Solution

56. Which of the following diagrams represent the veriation of electric field vector with time for a circularly polarised light

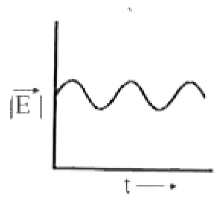
A.



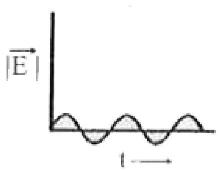
B.



C.



D.



Answer: A

Watch Video Solution

57. A beam of light is incident on a glass slab $(\mu = 1.54)$ in a direction as shown in the figure. The reflected light is analysed by a polaroid prism. On rotating the polaroid, $(\tan 57^\circ = 1.54)$

` (##DPP_PHY_CP24_E01_002_Q01.png"

width="80%">

A. the intensity remains unchanged

B. the intensity is reduced to zero and remains at zero

C. the intensity gradually reduces to zero and then again increase

D. the intensity increases continuously

Answer: C

Watch Video Solution

58. Unpolarized light is incident on a plane sheet on water surface. The angle of incidence for which the reflected and refracted rays are perpendicular to each other is (μ of water = $\frac{4}{3}$)

A. $\sin^{-1}\left(\frac{4}{3}\right)$

B. $\tan^{-1}\left(\frac{3}{4}\right)$

C. $\tan^{-1}\left(\frac{4}{3}\right)$

D. $\sin^{-1}\left(\frac{1}{3}\right)$

Answer: C

Watch Video Solution

59. The fraunhofer diffraction pattern of a single slit is formed at the focal plane of a lens of focal length 1m. The width of the slit is 0.3 mm. if the third minimum is formed at a distance of 5 mm from the central maximum then calculate the wavelength of light.

A. 5000 Å

B. 2500 Å

C. 7500 Å

D. 8500 Å

Answer: A

Watch Video Solution

60. Unpolarised light of intensity $32Wm^{-2}$ passes through three polarizer such that the transmission axis of the last polarizer is crossed with that of the first. The intensity of final emerging light is $3Wm^{-2}$. The intensity of light transmitted by first polarizer will be

A. $32Wm^{-2}$

B. $16Wm^{-2}$

C. $8Wm^{-2}$

D. $4Wm^{-2}$

Answer: B

Watch Video Solution

61. A parallel beam of light of wavelength l is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of the incident beam. At the second minimum of the diffraction pattern, the phase difference between the rays coming from the two edges of slit is

A. $\pi\lambda$

B. 2π

C. 3π

D. 4π

Answer: D

Watch Video Solution

62. A single slit Fraunhofer diffraction pattern is formed with white light. For what wavelength of light the third secondary maximum in the diffraction pattern coincides with the secondary maximum in the pattern for red light of wavelength 6500 Å ?

A. 4400Å

B. 4100Å

C. 4642.8Å

D. 9100Å

Answer: C

Watch Video Solution

63. Two polaroids are placed in the path of unpolarized beam of intensity I_0 such that no light is emitted from the second polarid. If a third polaroid whose polarization axis makes an angle θ with the polarization axis of first polaroid, is placed between these two polariods then the intensity of light emerging from the last polaroid will be

A. $\left(\frac{I_0}{8}\right)\sin^2 2\theta$

B. $\left(\frac{I_0}{4}\right)\sin^2 2\theta$

C. $\left(\frac{I_0}{2}\right)\cos^4 \theta$

D. $I_0 \cos^4 \theta$

Answer: A

Watch Video Solution

64. A beam of unpolarised light of intensity I_0 is passed through a polaroidA and then through another polaroid B which is oriented so that its principal plane makes an angle of 45° relative to that of A. The intensity of the emergent light is

A. I_0

B. $I_0 / 2$

C. $I_0 / 4$

D. $I_0 / 8$

Answer: C

Watch Video Solution

65. A beam of light of λ = 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between first dark fringes on either side of the central bright fringe is

A. 1.2 cm

B. 1.2 mm

C. 2.4 cm

D. 2.4 mm

Answer: D

Watch Video Solution

Exercise 2 Concept Applicator

1. Light of wavelength 6.5×10^{-7}m is made incident on two slits 1 mm apart. The distance between third dark fringe and fifth bright fringe on a screen distant 1 m from the slits will be

A. 0.325 mm

B. 0.65 mm

C. 1.625 mm

D. 3.25 mm

Answer: C

Watch Video Solution

2. In a two slit experiment with monochromatic light fringes are obtained on a screen placed at some distance from the sits. If the screen is moved by $5 \times 10^{-2} m$ towards the slits the change in fringe width is $3 \times 10^{-5} m$. If separation between the slits is $10^{-3} m$, the wavelength of light used

A. 4500 Å

B. 5000 Å

C. 5500 Å

D. 6000 Å

Answer: D

Watch Video Solution

3. In Young's experiment the distance between two slits is $\frac{d}{3}$ and the distance between the screen and the slits is 3D. The number of fringes in $\frac{1}{3}$ metre on the screen, formed by monochromatic light of wavelength 3λ, will be:

A. $\frac{d}{9D\lambda}$

B. $\frac{d}{27D\lambda}$

C. $\frac{d}{81D\lambda}$

D. $\frac{d}{D\lambda}$

Answer: C

Watch Video Solution

4. In a Young's double slit experiment, if the incident light consists of two wavelengths λ_1 and λ_2, the slit separation is d, and the distance between the slit and the screen is D, the maxima due to the two wavelengths will coincide at a distance from the central maxima, given by :

A. $\frac{\lambda_1 \lambda_2}{2Dd}$

B. $(\lambda_1 - \lambda_2) \cdot \frac{2d}{D}$

C. LCM of $\lambda_1 \cdot \frac{D}{d}$ and $\lambda_2 \cdot \frac{D}{d}$

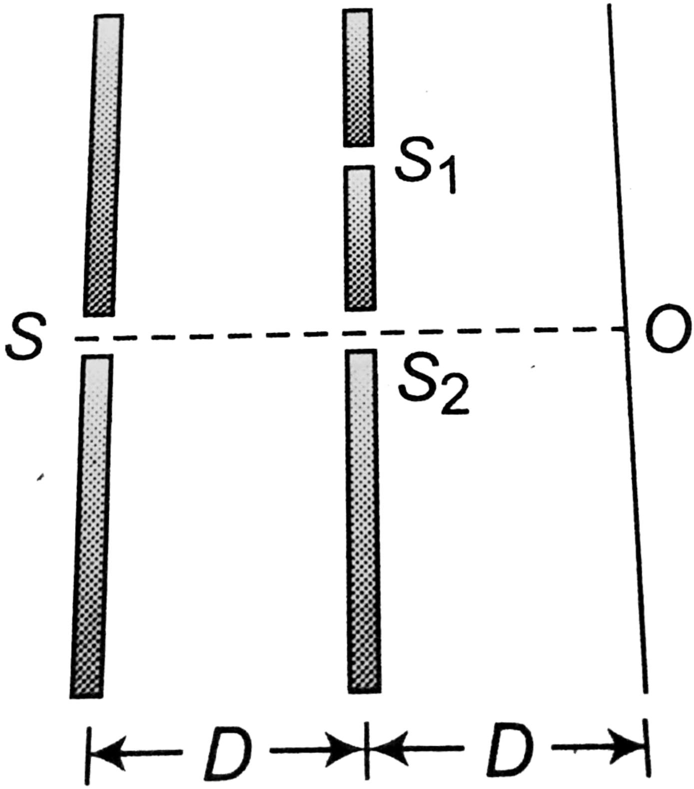
D. HCF of $\frac{\lambda_1 D}{d}$ and $\frac{\lambda_2 D}{d}$

Answer: C

Watch Video Solution

5. Two ideal slits S_1 and S_2 are at a distance d apart, and illuninated by light of wavelength λ passing through an ideal source slit S placed on the line through S_2 as shown. The distance between the planes of slits and the source slit is D. A screen is held at a distance D from the plane of the slits. The minimum value of d for which there is darkness at O is

$(d < < D)$



A. $\sqrt{\frac{3\lambda D}{2}}$

B. $\sqrt{\lambda D}$

C. $\sqrt{\frac{\lambda D}{2}}$

D. $\sqrt{3\lambda D}$

Answer: C

Watch Video Solution

6. A micture of light, consisting of wavelength 590nm and an unknown wavelength, illuminates Young's double slit and gives rise to two overlapping interference patterns on the scree. The central maximum of both lights coincide. Further, it is obseved that the third bright fringe of known light coincides with the 4th bright fringe of the unknown light. From this data, the wavelength of the unknown light is:

A. 393.4nm

B. 885.0nm

C. 442.5nm

D. 776.8nm

Answer: C

Watch Video Solution

7. The central fringe of the interference pattern produced by the light of wavelength 6000 Å is found to shift to the position of 4th dark fringe after a glass sheet of refractive index 1.5 is introduced. The thickness of glass sheet would be

A. $4.8 \mu m$

B. $8.23 \mu m$

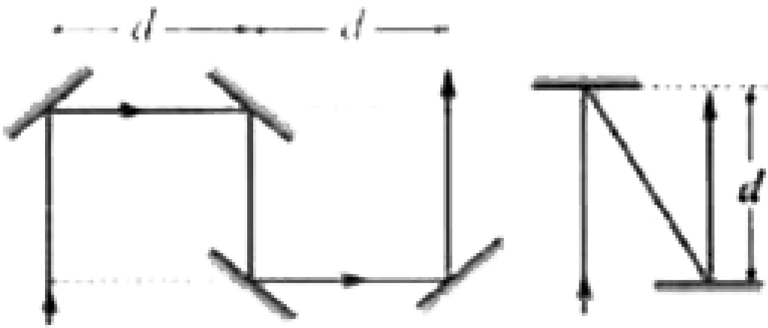
C. $14.98 \mu m$

D. $3.78 \mu m$

Answer: A

Watch Video Solution

8. Figure shows two light rays that are initially exactly in phase and that reflect from several glass surfaces. Neglect the slight slant in the path of the light in the second arrangement. The path length difference in terms of wavelength λ is :



A. 2d

B. $(d + \lambda)$

C. $(2d + \lambda)$

D. none of these

Answer: C

Watch Video Solution

9. In young's double slit experiment the slits are illumated by light of wavelength 5890° A and the distance between the fringes obtained on the screen is 0.2°. If the whole apparatus is immersed in water then the angular fringe width will be, if the refractive index of water is $4/3$

A. 0.30°

B. 0.15°

C. 15°

D. 30°

Answer: B

Watch Video Solution

10. In a double slit experiment, the two slits are 1 mm apart and the screen is placed 1 m away. A monochromatic light of wavelength 500 mm is used.what will be the width of each slit for obtaining ten maxima of double slit within the central maxima of single slit pattern?

A. 0.1 mm

B. 0.5 mm

C. 0.02 mm

D. 0.2 mm

Answer: D

Watch Video Solution

11. In a Young's double slit experiment, the two slits act as coherent sources of waves of equal amplitude A and wavelength λ in another experiment with the same arrangement the two slits are made to act as incoherent sources of waves of same amplitude and wavelength. if the intensity at the middle point of the screen in te first case is I_1 and in te second case I_2 then the ratio $\frac{I_1}{I_2}$ is

A. 2

B. 1

C. 0.5

D. 4

Answer: A

Watch Video Solution

12. In Young's double slit experiment, the fringes are displaced index 1.5 is introduced in the path of one of the beams. When this plate in replaced by another plate of the same thickness, the shift of fringes is $(3/2)x$. The refractive index of the second plate is

A. 1.75

B. 1.50

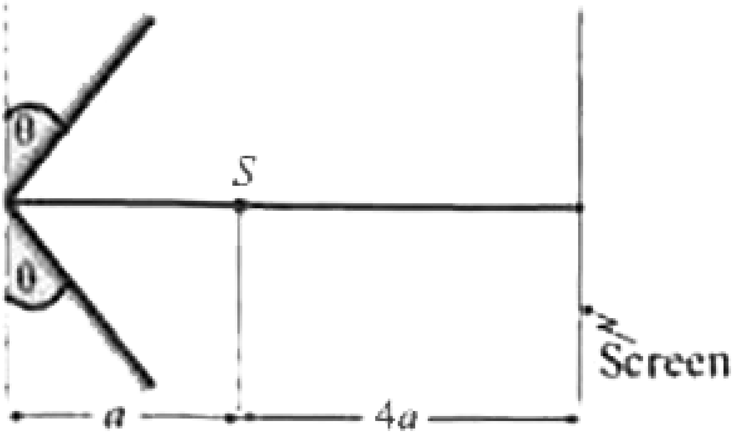
C. 1.25

D. 1.00

Answer: A

Watch Video Solution

13. There are two plane mirrors. They are mutually inclined as shown in figure. S is a source of monochromatic light of wavelength λ. The reflected beam interfere and fringe pattern is obtained on the screen. If θ is small, the fringe width will be :



A. λ / θ

B. $3\lambda / 2\theta$

C. $2\lambda / 3\theta$

D. none of these

Answer: B

View Text Solution

14. In the ideal double-slit experiment, when a glass-plate(refractive index 1.5) of thickness t is introduced in the path of one of the interfering beams (wave-length λ), the intensity at the position where the central maximum occurred previously remains unchanged. The minimum thickness of the glass-plate is

A. 2λ

B. $\frac{2\lambda}{3}$

C. $\frac{\lambda}{3}$

D. λ

Answer: A

Watch Video Solution

15. A thin glass plate of thickness is $\frac{2500}{3}\lambda$ (λ is wavelength of light used) and refractive index $\mu = 1.5$ is inserted between one of the slits and the screen in Young's double slit experiment. At a point on the screen equidistant from the slits, the ratio of the intensities before and after the introduction of the glass plate is :

A. $2 : 1$

B. $1 : 4$

C. $4:1$

D. $4:3$

Answer: C

Watch Video Solution

16. In Young's double slit experiment, wavelength $\lambda = 5000 \text{Å}$ the distance between, the slits is $0.2mm$ and the screen is at 200cm from the slits. The central maximum is at $x = 0$ The third maximum (Taking the central maximum as zeroth maximum) will be at x equal to

A. 1.67 cm

B. 1.5 cm

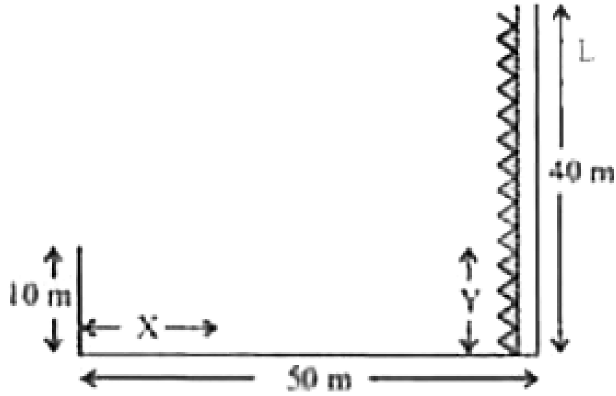
C. 0.5 cm

D. 5.0 cm

Answer: B

Watch Video Solution

17. A person lives in a high-rise building on the bank of a river 50 m wide. Across the river is a well it tower of height 40 m. When the person, who is at a height of 10 m, looks through a polarizer at an appropriate angle at light of the tower reflecting from the river surface, he notes that intensity of light coming from distance X from his building is the least and this corresponds to the light coming from light bulbs at height 'Y' on the tower. The values of X and Y are respectively close to (refractive index of water = $\frac{4}{3}$)



A. 25m, 10m

B. 13m, 27m

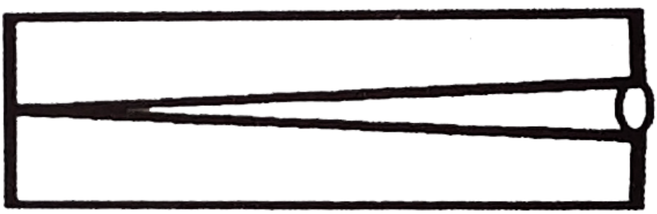
C. 22m, 13m

D. 17m, 20m

Answer: B

Watch Video Solution

18. A broad sources of light of wavelength $680nm$ illuminated normally two glass plates. $120nm$long that meet at one end and are separated by a wire$0.048mm$in diameter at the other end,Find the number of bright fringes formed over the $120nm$distance.



A. 50

B. 100

C. 200

D. 400

Answer: B

Watch Video Solution

19. A thin film of soap solution $(\mu_s = 1.4)$ lies on the top of a glass plate $(\mu_g = 1.5)$. When visible light is incident almost normal to the plate, two adjacent reflection maxima are observed at two wavelengths 420 and 630 nm.

The minimum thickness of the soap solution is

A. 420 nm

B. 450 nm

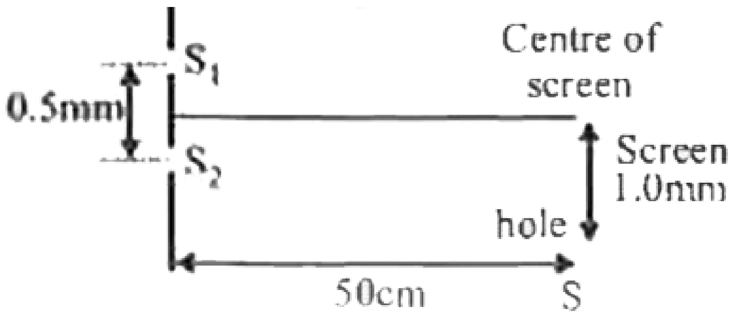
C. 630 nm

D. 1260 nm

Answer: B

Watch Video Solution

20. In Young's double slit experiment shown in figure S1 and S2 are coherent sources and S is the screen having a hole at a point 1.0 mm away from the central line. White light (400 to 700nm) is sent through the slits. Which wavelength passing through the hole has strong intensity?



A. 400 nm

B. 700 nm

C. 500 nm

D. 667 nm

Answer: C

Watch Video Solution

21. In a Young's double slit experiment, the separation between the two slits is d and the wavelength of the light is λ. The intensity of light falling on slit 1 is four times the intensity of light falling on slit 2. Choose the correct choice (s).

A. if $d = \lambda$, the screen will contain only one maximum

B. if $\lambda < d < 2\lambda$, at least one more maximum (besides the central maximum) will be observed on the screen

C. if the intensity of light falling on slit 1 is reduced so that it becomes equal to that of slit 2, the intensities of the observed dark and bright fringes will increase

D. if the intensity of light falling on slit 2 is reduced so that it becomes equal to that of slit 1, the intensities of the observed dark and bright fringes will increase.

Answer: B

Watch Video Solution

22. A beam of light consisting of two wavelength $6500Å \& 5200Å$is used to obtain interferance fringes in a young's double slit experiment .The distance between the slits is $2.0mm$ and the distance between the plane of the slits and thescreen is $120cm$,.what is the least distance from the central maximum where the bright fringes due to both the wave length coincides?

A. 0.156 cm

B. 0.152 cm

C. 0.17

D. 0.16 cm

Answer: A

Watch Video Solution

23. Fig, here shows P and Q as two equally intense coherent sources emitting radiations of wavelength 20m. The separation PQ si 5m, and phase of P is ahead of the phase Q by 90°. A, B and C are three distant points of observation equidistant from the mid - point of PQ. The intensity of radiations of A, B, C will be in the ratio

A. $0:1:4$

B. $4:1:0$

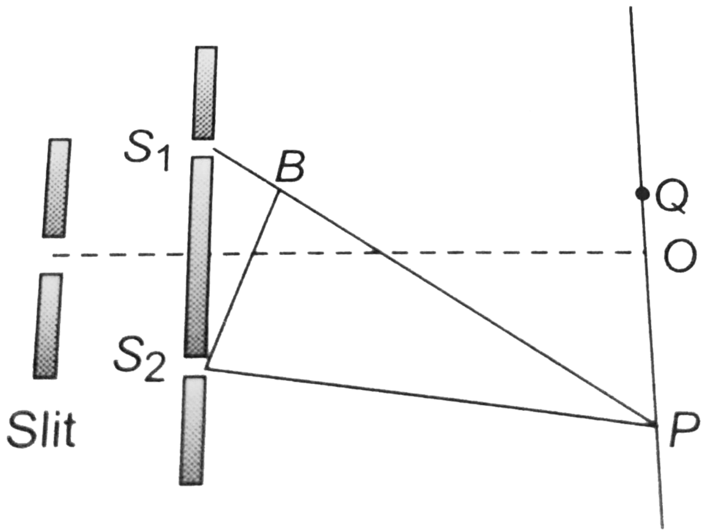
C. $0:1:2$

D. $2:1:0$

Answer: C

Watch Video Solution

24. In the figure is shown Young's double slit experiment. Q is the position of the first bright fringe on the right side of O. P is the 11^{th} bright fringe on the other side, as measured from Q. If the wavelength of the light used is $600nm$. Then S_1B will be equal to



A. $6 \times 10^{-6} m$

B. $6.6 \times 10^{-6} m$

C. $3.138 \times 10^{-7} m$

D. $3.144 \times 10^{-7} m$

Answer: A

Watch Video Solution

25. In Young's double slit experiment, we get 10 fringes in the field of view of monochromatic light of wavelength 4000Å. If we use monochromatic light of wavelength 5000Å, then the number of fringes obtained in the same field of view is

A. 8

B. 10

C. 40

D. 50

Answer: A

Watch Video Solution

26. Light of wavelength $6328 \mathring{A}$ is incident normally on slit having a width of $0.2 mm$The width of the central maximum measured form minimum to minimum of diffraction pattens on a screen $9.0 meter$away will be about-

A. 0.36 degree

B. 0.18 degree

C. 0.72 degree

D. 0.09 degree

Answer: A

Watch Video Solution

27. In Young's double slit experiment, the distnace between two sources is $0.1/\pi mm$. The distance of the screen from the source is 25 cm. Wavelength of light used is $5000Å$ Then what is the angular position of the first dark fringe.?

A. 0.10°

B. 0.15°

C. 0.30°

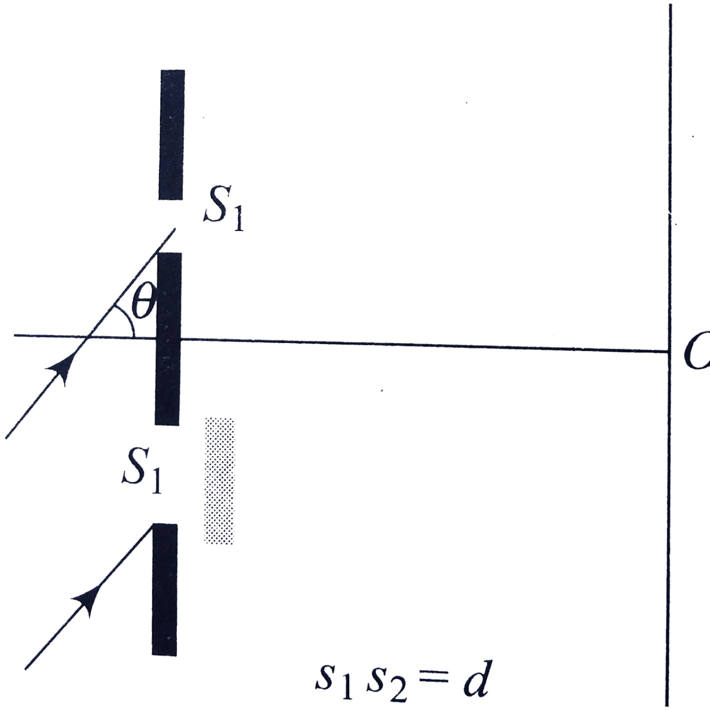
D. 0.45°

Answer: D

Watch Video Solution

28. A monochromatic beam of light fall on YDSE apparatus at some angle (say θ) as shown in figure. A thin sheet of glass is inserted in front of the lower slit s_2. The central bright fringe (path difference $= 0$)

will be obtained



A. at O

B. above O

C. blow O

D. anywhere depending on angle θ, thickness of plate t and refractive index of glass μ.

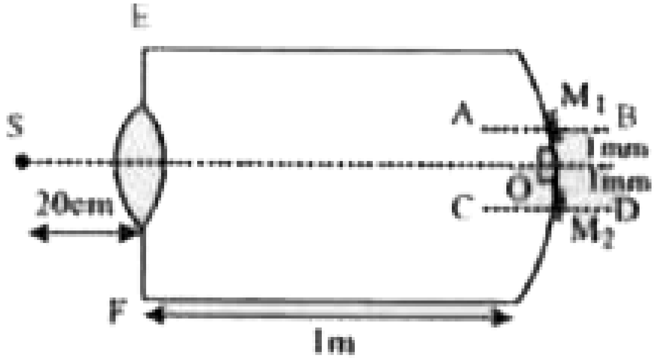
Answer: D

Watch Video Solution

29. An equiconvex lens of focal length 10 cm (in air) and R.I. 3/2 is put at a small opening on a tube of length 1 m fully filled with liquid of R.I. 4/3. A concave mirror of radius of curvature

20 cm is cut into two halves M_1 and M_2 and placed at the end of the tube. M_1 and M_2 are placed such that their principal axes AB and CD respectively are separated by 1 mm each from the principal axis of the lens. A slit S placed in air illuminates the lens with light of frequency $7.5 \times 10^{14} Hz$. The light reflected from M_1 and M_2 forms interference pattern on the left end EF of the tube. O is an opaque substance to cover the hole left by M_1 and M_2. Width of the fringes on EF is

$(x \times 10)\mu m$. Find the value of x.



A. 5 m

B. 3 m

C. 6 m

D. 4 m

Answer: C

View Text Solution

30. In YDSE, having slits of equal width, let β be the fringe width and I_0 be the maximum intensity. At a distance x from the central brigth fringe, the intensity will be

A. $I_0 \cos\left(\frac{x}{\beta}\right)$

B. $I_0 \cos^2\left(\frac{x}{\beta}\right)$

C. $I_0 \cos^2\left(\frac{\pi x}{\beta}\right)$

D. $\left(\frac{I_0}{4}\right)\cos^2\left(\frac{\pi x}{\beta}\right)$

Answer: C

Watch Video Solution