PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

WAVE OPTICS

Physics

1. The first diffraction minima due to a single slit diffraction is at $q = 30^\circ$ for a light of wavelength 5000 Å. The width of the slit is-

A. 5×10^{-5} cm

B. 1.0×10^{-4} cm

C. 2.5×10^{-5} cm

D. 1.25×10^{-5} cm

Answer:

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2. Two spectral lines of sodium D_1 and D_2 have wavelengths $\lambda_1 = 5890\text{Å}$, lambda_(2) = 5896 Å incident on a slit of width

$2micrometer$. A screen is located $2m$ from the slit. Find the spacing between the first maxima of two sodium lines as measured on the screen.

A. 10^{-4} m

B. 9×10^{-4} m

C. 9×10^{4} m

D. None

Answer:

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3. Width of slit is 0.3mm. Fraunhoffer diffraction is observed in focus plane of lense of a lense of focal length 1 m. If third minima is at 5 mm distance from central maxima, then wavelength of light is

A. 7000 Å

B. 6500 Å

C. 6000 Å

D. 5000 Å

Answer:

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4. When wave of wavelength $0.2cm$is made incident normally ona slit of width $0.004m$ then the semui-angular width of central maximum of diffraction patten will be-

A. 60°

B. 30°

C. 90°

D. 0°

Answer:

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5. A parallel beam of monochromatic light is incident on a narrow rectangular slit of width $1mm$.When the diffraction pattern is seen on a screen on a screen placed at a distance of$2m$ .the width of principal maxima is found to be $2.5mm$.the wave length of light is

A. 6250 nm

B. 6200 nm

C. 5890 nm

D. 6000 nm

Answer:

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6. Light of wavelength 6328Å is incident normally on slit having a width of $0.2mm$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°

B. 0.18°

C. 0.72°

D. 0.09°

Answer:

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7. A screen is placed $2m$ away from the single narrow slit. Calculate the slit width if the first minimum lies $5mm$ on either side of the central maximum. Incident plane waves have a wavelength of 5000Å.

A. 2×10^{-4} m

B. 2×10^{-3} cm

C. 2×10^{-4} cm

D. None

Answer:

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8. Red light of wavelength 6500Å from a distant source falls on a slit $0.50mm$ wide. Calculate the distance between first two dark bands on each side of central bright band in the diffraction pattern observed on a screen placed $1.8m$ from the slit.

A. 4.68×10^{-3} cm

B. 4.68×10^{-3} mm

C. 4.68×10^{-3} nm

D. 4.68×10^{-3} m

Answer:

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9. Fraunhoffer diffraction pattern is observed at a distance of 2m on screen, when a plane-wavefront of 6000Å is incident perpendicularly on 0.2 mm wide slit.Width of central maxima is:

A. 10 mm

B. 6 mm

C. 12 mm

D. None of these

Answer:

10. A diffraction pattern is produced by a single slit of width 0.5mm with the help of a convex lens of focal length 40cm. If the wavelength of light used is 5896Å. then the

distance of first dark fringe from the axis will be-

A. 0.047 cm

B. 0.047 m

C. 0.047 mm

D. 47 cm

Answer:

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11. What should be the size of the aperture of the objective of telescope which can just resolve the two stars of angular width of 10^3 degree by light of wavelength 5000 Å ?

A. 3.5 cm

B. 3.5 mm

C. 3.5 m

D. 3.5 km

Answer:

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12. Image of sun formed due to reflection at air water interface is found to be very highly polarised. Refractive index of water being $\mu = 4/3$, find the angle of sun above the horizon

A. 36.9°

B. 26.9°

C. 16.9°

D. 46.9°

Answer:

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13. When light of a certain wavelength is incident on a plane surface of a material at a glancing angle 30°, the reflected light is found to be compleley plane polarized determine.

a) refractive index of given material and

b) angle of refraction.

A. $\sqrt{3}$

B. $\sqrt{2}$

C. $1/\sqrt{2}$

D. 2

Answer:

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14. Two polaroids are oriented with their planes perpendicular to incident light and transmission axis making an angle of 30° with

each other. What fraction of incident unpolarised light transmitted?

A. $57.5\ \%$

B. $17.5\ \%$

C. $27.5\ \%$

D. $37.5\ \%$

Answer:

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15. Unpolarized light of intensity 32 Wm^{-3} passes through three polarizers such that the transmission axis of the last polarizer is crossed with the first. If the intensity of the emerging light is $3Wm^{-2}$, what is the angle between the transmission axces of the first two polarizers ? At what angle will the transmitted intensity be maximum ?

A. 45°

B. 15°

C. 35°

D. 75°

Answer:

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16. V_0 and V_E represent the velocities, m0 and mE the refractive indices of ordinary and extraordinary rays for a doubly refracting crystal. Then

A. $V_0 \geq V_E, \mu_0 \leq \mu_E$ if the crystal is calcite

B. $V_0 \leq V_E, \mu_0 \leq \mu_E$ if the crystal is quartz

C. $V_0 \leq V_E, \mu_0 \geq \mu_E$ if the crystal is calcite

D. $V_0 \geq V_E, \mu_0 \geq \mu_E$ if the crystal is quartz

Answer:

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17. A ray of light is incident on the surface of a glass plate at an angle of incidence equal to Brewster's angle ϕ. If μ represents the refractive index of glass with respect to air, then the angle between reflected and refracted rays is

A. $90^\circ + \phi$

B. $\sin^{-1}(\mu \cos \phi)$

C. 90°

D. $90^\circ - \sin^{-1}(\cos\phi/\mu)$

Answer:

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18. A light has amplitude A and angle between analyser and polariser is 60°. Light is reflected by analyser has amplitude

A. $A\sqrt{2}$

B. $A/\sqrt{2}$

C. $\sqrt{3}A/2$

D. $A/2$

Answer:

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19. A slit of size $0.15m$ is placed at $2.1m$ from a screen. On illuminated it by a light of wavelength $5 \times 10^{-5}cm$. The width of central maxima will be

A. 70 mm

B. 0.14 mm

C. 1.4 mm

D. 0.14 cm

Answer:

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20. What will be the angle of diffracting for the first minimum due to Fraunhofer

diffraction with sources of light of wavelength $550nm$ and slit of width $0.55mm$?

A. 0.001 rad

B. 0.01 rad

C. 1 rad

D. 0.1 rad

Answer:

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21. In Fresnel diffraction, if the distance between the disc and the screen is decreased, the intensity of central bright spot will

A. increase

B. decrease

C. remains constant

D. None of these

Answer:

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

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

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

C. I_0

D. zero

Answer:

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23. Plane polarised light is passed through a polaroid. On viewing through the polaroid we find that when the polaroid is given one complete rotation about the direction of light

A. 1,2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 are correct

D. 1 and 3 are correct

Answer:

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24. Angular width of central maximum in the Fraunhoffer diffraction pattern of a slit is measured. The slit is illuminated by light of wavelength 6000Å. When the slit is illuminated by light of another wavelength, the angular width decreases by $30\,\%$. Calculate the wavelength of this light. The same decrease in the angular width of central maximum is obtained when the original apparatus is immersed in a liquid. Find the refractive index of the liquid.

A. 4200 Å

B. 3500 Å

C. 5000 Å

D. 5200 Å

Answer:

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25. Angular width of central maximum in the Fraunhoffer diffraction pattern of a slit is measured. The slit is illuminated by light of

wavelength 6000Å. When the slit is illuminated by light of another wavelength, the angular width decreases by $30\,\%$. Calculate the wavelength of this light. The same decrease in the angular width of central maximum is obtained when the original apparatus is immersed in a liquid. Find the refractive index of the liquid.

A. 1.23

B. 1.43

C. 2.2

D. 2.43

Answer:

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26. Assertion (A) : The unpolarised light and polarized light can be distinguished from each other by using Polaroid.

Reason (R) : A Polaroid is capable of producing plane polarized beams of light.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True , Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is False, Statement-2 is True

D. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-1

Answer:

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27. Assertion: Nicol prism is used to produce and analyse plane polarised light.

Reason: Nicol prism reduces the intensity of light to zero.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True , Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is False, Statement-2 is True

D. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-2

Answer:

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28. Assertion : The clouds in the sky generally appear to be whitish.

Reason : Diffraction due to clouds is efficient in equal measures its all wavelengths.

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-3

B. Statement-1 is True, Statement-2 is True , Statement-2 is NOT a correct explanation for Statement-3

C. Statement-1 is False, Statement-2 is True

D. Statement-1 is True, Statement-2 is True , Statement-2 is a correct explanation for Statement-3

Answer:

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

A. $1:9$

B. $9:1$

C. $1:4$

D. $4:1$

Answer:

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30. The equation of two light waves are $y_1 = 6\cos\omega t, y_2 = 8\cos(\omega t + \phi)$.The ratio of

maximum to minimum intensities produced by the supersposition of these waves will be-

A. $49:1$

B. $1:49$

C. $1:7$

D. $7:1$

Answer:

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31. In a Young's double slit experimetn the separation between te slits is 0.10 mm, the wavelength of light used is 600 mm and the interference patternn is observed on a screen 1.0 m away. Find the separation between the seccussive bright frings.

A. 6.6 mm

B. 6.0 mm

C. 6 m

D. 6 cm.

Answer:

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32. 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:

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33. The intensities of two sources are I and $9I$ respectively, If the phase difference between

the waves emitted by is π then the resultant intensity at the point of observation will be-

A. 3I

B. 4I

C. 10I

D. 82I

Answer:

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34. In Fresnel's biprism experiment the width of 10 fringes is $2cm$ which are formed at a distance of two$2meter$ from the silt .If the wavelength of light is 5100Å then the distance between two coherent sources will be

A. $5.1 \times 10 - 4m$

B. $5.1 \times 104cm$

C. $5.1 \times 10 - 4mm$

D. $10.1 \times 10 - 4cm$

Answer:

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35. Two coherent sources of intensity ratio $1:4$ produce an interference pattern. The fringe visibility will be

A. 1

B. 0.8

C. 0.4

D. 0.6

Answer:

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36. When a mica sheet of thickness 7 microns and $\mu = 1.6$ is placed in the path of one of interfering beams in the biprism expriment then the central fringe gets at the position of seventh bright fringe. What is the wavelength of light used?

A. 4000Å

B. 5000Å

C. 6000Å

D. 7000Å

Answer:

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37. In double slit experiment ,the distance between two slits is made three times then the fringe width will become-

A. 9 times

B. 1/9 times

C. 3 times

D. 1/3 times

Answer:

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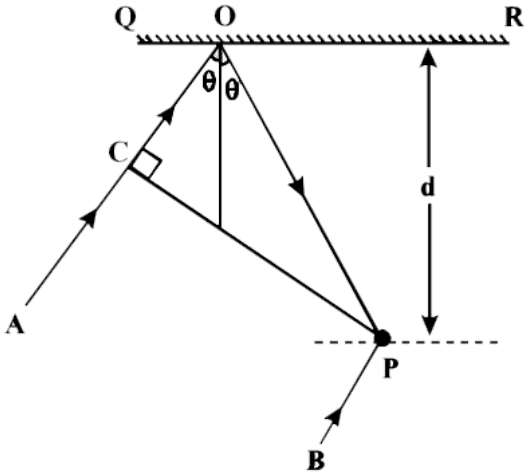
38. In the adjacent diagram, CP represents a wavefront and AO & BP, the corresponding two rays. Find the condition on θ for constructive interference at P between the ray

BP and reflected ray OP.



A. $\cos q = 3l / 2d$

B. $\cos q = l / 4d$

C. $\sec q - \cos q = l / d$

D. $\sec q - \cos l = 4l / d$

Answer:

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39. In young's slit experiment 10th order maximum is obtained at the point of observation in the interference pattern for $\lambda = 7000\text{Å}$.If the source is replaced by another one of wavelength 5000Å then the order of maximum at the same point will be-

A. 12 th

B. 14 th

C. 16 th

D. 18 th

Answer:

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40. White light is used to illuminate the two slits in a Young's double slit experiment. The separation between the slits is b and the screen is at a distance $d(>>b)$ from the slits. At a point on the screen directly in front of

one of the slits, certain wavelengths are missing. Some of these missing wavelength are

A. $\lambda = \frac{b^2}{6d}$

B. $\lambda = \frac{2b^2}{d}$

C. $\lambda = \frac{b^2}{3d}$

D. $\lambda = \frac{2b^2}{3d}$

Answer:

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41. Consider interference between waves from two sourceof intensities $I \text{ and } 4I$. Find intensities at points where phase difference is (i) $\pi/2$ (ii) π.

A. I

B. 5I

C. 4I

D. 3I

Answer:

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42. The width of one of the two slits in a Young's double slit experiment is double of the other slit. Assuming that the amplitude of the light coming from a slit is proportional to the slit width, find the ratio of the maximum to the minimum intensity in the interference pattern.

A. $34:1$

B. $9:1$

C. $4:1$

D. $16:1$

Answer:

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43. The intensity of the light coming from one of the slits in a Young's double slit experiment is double the intensity from the other slit. Find the ratio of the maximum intensity to the minimum intensity in the interference fringe pattern observed.

A. $9:1$

B. $34:1$

C. $4:1$

D. $16:1$

Answer:

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44. Ratio waves originating from sources S_1 and S_2 having zero phase difference and common wavelength λ will show completely

destructive interference at a point P is $S_1P - S_2P$ is

A. 5λ

B. $3\lambda/4$

C. 2λ

D. $11\lambda/2$

Answer:

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45. If an interfernce pattern,at a point we observe the 16^{th} order maximum for $\lambda_1 = 6000\text{Å}$. what order will be visible here if the soruce is replaced by light of wavelength $\lambda_2 = 4800\text{Å}$

A. 40

B. 20

C. 10

D. 80

Answer:

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46. In Young's experiment the wavelength of red light is 7.5×10^{-5}cm.and that of blue light 5.0×10^{-5}.The value of n for which $(n+1)^{th}$the blue bright band coincides with n^{th}red band is -

A. 8

B. 4

C. 2

D. 1

Answer:

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47. The Young's double slit experiment is carried out with light of wavelength 5000Å. The distance between the slits is $0.2mm$ and the screen is at $200cm$ from the slits. The central maximum is at $y = 0$. The third maximum will be at y equal to

A. $1.67cm$

B. $1.5cm$

C. $0.5cm$

D. $5.0cm$

Answer:

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48. In the Young's double-slit experiment, the interference pattern is found to have intensity ratio between gright and dark fringes as 9.

This implies that

(i) the intensities at the screen due to the two slits are 5 units and 4 units respectively

(ii) the intensities st the screen due to the slits are 4 units and 1 unit respectively

(iii) the amplitude ratio is 3

(iv) the amplitude ratio is 2

A. 1,2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 are correct

D. 1 and 3 are correct

Answer:

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49. In an experiment similar to young's experiment,interference is observed using waves associated with electrons.The electrons are being produced in an electron gun.In order to increase the fringe width .

A. 1,2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 are correct

D. 1 and 3 are correct

Answer:

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50. Interference fringes were produced in Young's double-slit experiment using light of wavelength 5000Å. When a film of thickness $2.5 \times 10^{-3} cm$ was placed in front of one of the slits, the fringe pattern shifted by a

distance equal to 20 fringe-widths. The refractive index of the material of the film is

A. 1,2 and 3 are correct

B. 1 and 2 are correct

C. 2 and 4 are correct

D. 1 and 3 are correct

Answer:

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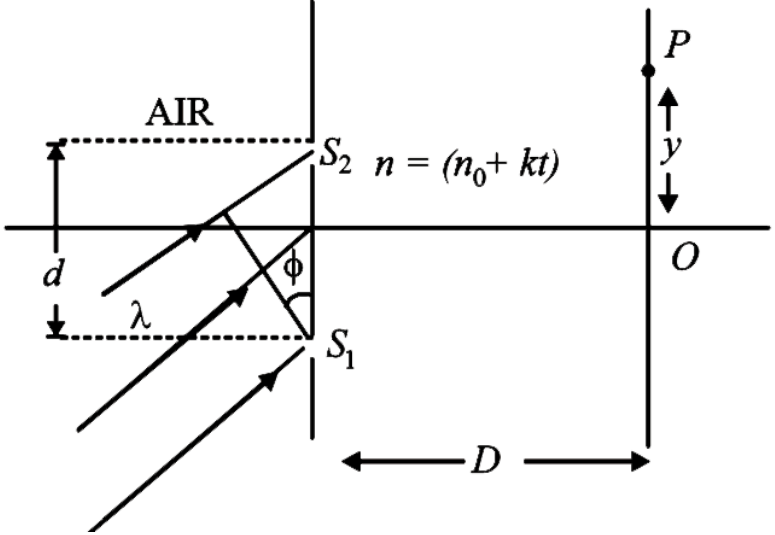
51. In a Young's double slit experiment a monochromatic light whose wavelength is l strikes on the slits, separated by distance d, as shown in the figure. Refractive index of the medium between slits and screen varies with time t as n = n0 + kt. Here n0 and k are positive constants. Position of any point P on screen is measure by its y-coordinate as shown.



The y co-ordinate of central maxima at any time t is

A. $\frac{D \sin \phi}{n_0 + kt}$

B. $\frac{D \cos \phi}{n_0 + kt}$

C. $\frac{D \sin \phi}{(n_0 + kt)^2}$

D. $\frac{D \cos \phi}{(n_0 + kt)^2}$

Answer:

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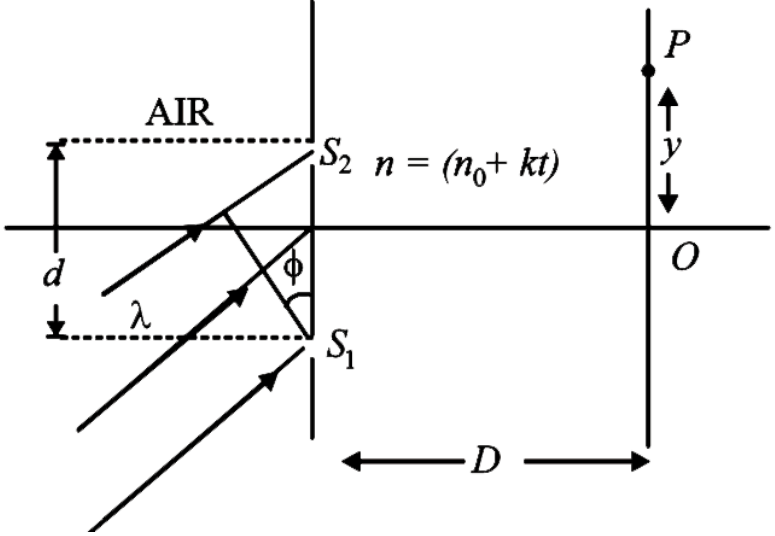
52. In a Young's double slit experiment a monochromatic light whose wavelength is l strikes on the slits, separated by distance d, as shown in the figure. Refractive index of the medium between slits and screen varies with time t as n = n0 + kt. Here n0 and k are positive constants. Position of any point P on screen is measure by its y-coordinate as shown.



The velocity of central maxima at any time t as a function of time t is

A. $\frac{-2kD\sin\phi}{(n_0+kt)^2}$

B. $\frac{-kD\sin\phi}{(n_0+kt)^2}$

C. $\frac{-2kD\sin\phi}{(n_0+kt)}$

D. $\frac{-kD\sin\phi}{(n_0+kt)}$

Answer:

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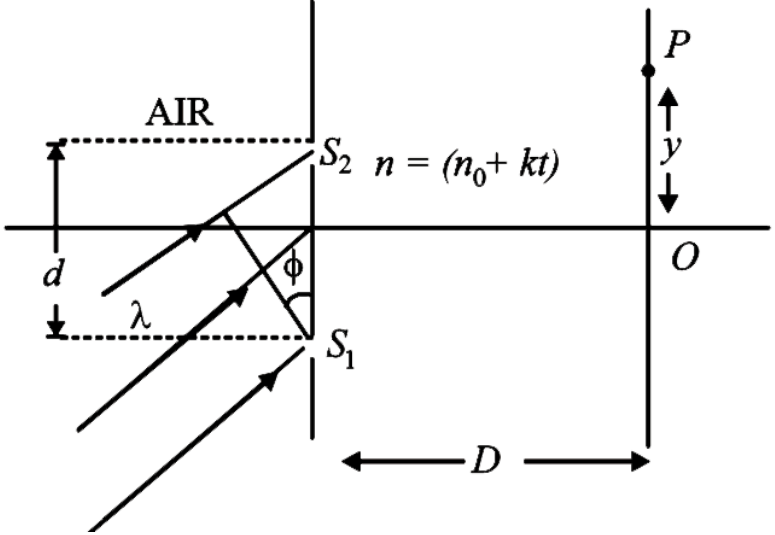
53. In a Young's double slit experiment a monochromatic light whose wavelength is l strikes on the slits, separated by distance d, as shown in the figure. Refractive index of the medium between slits and screen varies with time t as n = n0 + kt. Here n0 and k are positive constants. Position of any point P on screen is measure by its y-coordinate as shown.



If a glass plate of small thickness b is placed in front of S1. How should its refractive index vary with time so that central maxima is formed at O.

A. $n_0 + kt + \dfrac{2d \sin \phi}{b}$

B. $n_0 + kt - \dfrac{2d \sin \phi}{b}$

C. $n_0 + kt - \dfrac{d \sin \phi}{b}$

D. $n_0 + kt + \frac{d \sin \phi}{b}$

Answer:

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54. Assertion (A) : No interfrence pattern is detected when two coherent sources are very closer to each other. (i.e separation almost zero)

Reason (R) : The fringe width is inversely

proportional to the distance between the two slits

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

Answer:

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55. Statement-1 : In Young's experiment, the fringe width for dark fringes is same as that for white fringes. Statement-2 : In Young's double slit experiment performed with a

source of white light, only black and bright fringes are observed.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

Answer:

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56. Statement-1 : In Young's double slit experiment, the fringes become indistinct if one of the slits is covered with cellophane paper. Statement-2 : The cellophane paper decreases the wavelength of light.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

Answer:

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