PHYSICS

BOOKS - CHETANA PUBLICATION

Wave Optics

Example

1. What is Ray optics or geometrical optics?

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2. According to Newton's corpuscular theory of light , light is propagated in the form of

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3. By using Hugens' wave theory of the phenomenon of

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4. Explain Maxwell's electromagnetic theory.

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5. What is Dual nature of light?

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6. Why can light waves travel in vacuum whereas sound wave cannot?

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7. What are primary sources of light?

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8. What are secondary sources light?

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9. Explain the concept of a wavefront.

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10. What is wavefront ? What is the shape of the wavefront at a point far away from the source of light?

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11. Define:- Wave surface

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12. Define wavefront of light .

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13. Define:- Wave normal.

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14. State the different types of wavefront with examples.

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15. What do you mean by two particles are in phase?

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16. Draw diagrams for :- Spherical Wavefront

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17. Draw diagrams for :- Plane Wavefront

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18. State Huygens' Principle.

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19. Explain the construction of plane spherical wavefront on the basis of Huygen's principle.

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20. State the laws of reflection.

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21. With the help of a neat diagram, explain reflection of light from a plane reflecting surface on the basis of wave theory of light

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22. On the basis of Huygens's Wave theory of light, prove that the angle of incidence is equal to the angle of reflection.

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23. What is lateral inversion?

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24. With the help of a neat diagram, explain reflection of light from a plane reflecting surface on the basis of wave theory of light

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25. What is refraction of light?

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26. Derive Snell's law by Huygen's Construction of a plane wave-front.

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27. Explain Refraction of Light at a plane boundary between two media.

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28. Why is it the refracted ray bends towards the normal, and while entering from denser to rarer it bends away from the normal.

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29. Explain Refraction of light on the basis of Wave Theory. Hence prove the Laws of Refraction.

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30. Derive Snell's law by Huygen's Construction of a plane wave-front.

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31. Show that the velocity of light in a rarer medium is greater than velocity in a denser medium.

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32. Explain dependence of wavelength on the refractive index of the medium.

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33. White light consists of wavelengths from 400 nm to 700 nm. What will be the wavelegth range seen, when white light is passed through glass of refractive index 1.55?

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34. What is unpolarised light? Explain the concept of unpolarised light.

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35. What is polarisation of light?

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36. Explain the terms:- Plane polarised light.

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37. What is an unpolarised light ?

Watch Video Solution

38. Explain the terms:- Plane of Polarization

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39. Explain the terms:- Plane of Polarization

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40. State any five methods to produce plane polarized light.

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41. Explain what is meant by polarization and derive Malus' law.

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42. A system of three polarizers P 1 ,P 2 ,P 3 is set up such that the pass axis of P 3 is crossed with respect to that of P 1 . The pass axis of P 2 is inclined at 60° to the pass axis of P 3 . When a beam of unpolarized light of intensity lo is incident on P 1 the in of light transmitted by the three polarizers I. The ratio (I0 /I) equals (nearly):

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43. The intensity of light coming from one of the slits in Young's experiment is twice the intensity of light coming from the other slit. What will be the approximate ratio of the intensities of the bright and dark fringes in the resulting interference pattern?

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44. State and prove Brewster's Law.

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45. What is Brewster's Law? Derive the formula for Brewster angle?

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46. State and prove Brewster's Law.

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47. Unpolarized light with intensity I_0 is incident on two polaroids. The axis of the first polaroid makes an angle of 50° with the vertical, and the axis of the second polaroid is horizontal. What is the intensity of the light, after it has passed through the second polaroid?

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48. Explain polarization by scattering.

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49. For what angle of incidence, will light incident on a bucket, filled with liquid having refractive index 1.5 be completely polarized after reflection.

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50. State and explain the principle of superposition of waves.

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51. Excplain the concept of interference of light.

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52. State the condition of constructive interference.

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53. State the condition of destructive interference.

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54. State the condition of constructive interference.

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55. Define:- destructive interference.

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56. Explain interference of water waves.

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57. What are coherent sources? How are they produced?

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58. Explain Young's Double Slit Experiment.

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59. Define Interference. Derive expression for fringe width in Young' double slit experiment.

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60. Show that both dark and Bright fringes have equal width.

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61. Write out relation between path difference and phase difference ($\triangle \phi$).

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62. State the conditions to get constructive and destructive interference of light.

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63. Explain Intensity distribution in interference with equations.

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64. a double - slit arrangement, the slits are separated by a distance equals to 100 times the wavelength of light passing through the slits:- What is the angular separation in radians between the central maximum and an adjacent maximum?

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65. a double - slit arrangement, the slits are separated by a distance equals to 101 times the wavelength of light passing through the slits:- What is the distance between these maxima on a screen 50.0 cm from the slits?

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66. In a biprism experiment, the fringes are observed in the focal plane of the eye piece at

a distance of 1.2m from the slits. The distance between the central bright band and 20th bright band is 0.4 cm. When a convex lens is placed between biprism and the eyepiece, the distance between the two vertical magnified images is found to be 0.9 cm. Determine the wavelength of light used.

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67. The distance between two consecutive bright fringes in a biprism experiement using

light of wavelength $6000\overset{\circ}{A}$ is 0.32 mm, by how much will the distance change, if light of wavelength $4800\overset{\circ}{A}$ is used.

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68. State the conditions for steady state interference.

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69. Explain interference due to thin films.

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70. Why are multiple colours observed over a thin film of oil floating on water? Explain with the help of a diagram.

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71. Plane wavefront of light of wavelenght $5500\overset{\circ}{A}$ is incident on two slits in a screen perpendicular to the direction of light rays. If

the total separation of 10 bright fringes on a screen 2 m away is 2 cm, find the distance between the sits .

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72. In a young's double slit experiment, the difference in optical path length between the rays starting from the slits S_1 and S_2 and reaching a point A, on the screen in 0.0075mm and reaching another point B on the screen, on the other side of the central fringes is

0.0015 mm. How many bright and dark fringes are observed between A and B if the wavelength of light used is $6000A^{\circ}$

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73. What are the two methods for obtaining coherent sources. Explain them.

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74. An isoceles prism of refracting angle 179° and refractive index 1.5 is used as a biprism by keeping it 10 cm. away from the slit, The edge of the biprism being parallel to the slit. The slit is illuminated by light of wavelength 500 nm and the screen is 90 cms. away from the biprism. Calculate the location of the centre of 20th dark band and the path difference at this location.

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75. Explain what is Optical Path.

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76. What must be the thickness of a thin film which, when kept near one of the slits shifts the central fringe by 5 mm for incident light of wavelength $5400A^{\circ}$ in Young's double slit intereference experiment? The refractive index of the material of the film is 1.1 and the distance between the slits is 0.5 mm.

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77. The optical path of a ray of light of a given wavelength travelling a distance of 3 cm in flint glass having refractive index 1.6 is same as that on travelling a distance x cm through a medium having refractive index 1.25. Determine the value of x.

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78. Explain the phenomenon of diffraction of light.

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79. Explain in brief Fraunhofer's Diffraction.

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80. Explain in brief Fraunhofer's Diffraction.

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81. Explain with a proper diagram, the experimental set up for Fraunhofer's Diffraction.

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82. Describe with a neat diagram, the Fraunhofer's diffracting pattern due to a single slit.

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83. In Fraunhaffer diffraction by a narrow slit, a screen is placed, at a distance of 2 m, from the lens to obtain a diffraction pattern. If the slit width is 0.2 mm and the first minimum is 5 mm, on either side of the central maximum. Find the wavelength of light.

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84. A parallel beam of green light of wavelength 546 nm passes through a slit of width 0.4 mm. The intensity pattern of the

transmitted light is seen on a screen which is 40 cm away. What is the distance between the two first order of minima?

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85. What must be the ratio of slit width on the wavelength for a single slit to have the firust diffraction minimum at 45°.

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86. Monochromatic electromagnetic radiation from a distant source passes through a slit.The diffraction pattern is observed on the screen 2.5 m from the slit. If the width of the central maximum is 6.00 mm, what is the slit width if the wavelength is:- 500 nm (visible light)

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87. Monochromatic electromagnetic radiation from a distant source passes through a slit.The diffraction pattern is observed on the screen 2.5 m from the slit. If the width of the central maximum is 6.01 mm, what is the slit width if the wavelength is:- $50\mu m$ (infrared radiation)

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88. Monochromatic electromagnetic radiation from a distant source passes through a slit.The diffraction pattern is observed on the screen 2.5 m from the slit. If the width of the central maximum is 6.02 mm, what is the slit width if the wavelength is:- 0.500 nm (X rays)

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89. Compare Young's Double slit interfemce pattern and single slit Diffraction pattern.

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90. Explain what is resolving power?

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91. What is meant by limit of angular resolution and the resolving power of telescope ?

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92. According to Rayleigh scattering law ,

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93. Define:- Limit of resolution

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94. Define:- Resolving Power.

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95. Discuss the resolving power of a microscope:-With luminous point objects.

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96. Derive an expression for Resolving Power of a Microscope.

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97. Derive an expression for resolving Power of a Telescope.

Watch Video Solution

98. Resolving power of telescope can be increased by

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99. To collect the maximum amount of light coming from an object, the objective lens should be made as.....as possible.

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100. Write a short note on Radio Telescope.

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101. A telescope has an objective of diameter 2.5 m. What is the angular resolution, When it observes at $5500\overset{\circ}{A}$.

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102. What is the minimum distance between two objects which can be resolved by a microscope having the visual angle of 30° when light of wavelength 500 nm is used ?

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103. A double-slit arrangement produces interference fringes for sodium light ($\lambda = 589nm$) that are 0.20° apart. What is the

angular fringe separation, if the entire arrangement is immersed in water. (n = 1.33)

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104. A star is emitting light at the wavelength of $5000\overset{\circ}{A}$, Determine the limit of resolution of a telescope, having an objective of diameter of 200 inch.

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105. Give one basic difference between interference and diffraction.

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106. What is plane polarised light ?

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107. What is diffraction of light? How does it differ from interference? What are fraunhoffer

and Fresnel diffractions?

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108. Distinguish between the phenomenon of Interference and Diffraction

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Exercise

1. If the refractive indices of glass and water with respect to air is $\frac{3}{2}$ and $\frac{4}{3}$ respectively. Calculate the velocity of light in glass and water.From these results calculate the refractive index of glass with respect to water. Given velocity of light in air is $3 \times 10^8 m/s$.

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2. Light is incident on a glass slab making an angle of 30° with the surface. Calculate the

angle of refraction in glass and velocity of light in glass. Given $\mu = 1.5$, Va =$3 \times 10^8 m/s$.

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3. The refractive index for water for red and violet colours are 1.325 and 1.334 respectively. Find the difference between the velocities of these two colours in water.

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4. Red light of wavelength $6400\overset{\circ}{A}$ in air, has a wavelength of $4000\overset{\circ}{A}$ in glass. If the wavelength of violet light in air is $4400\overset{\circ}{A}$, what is the wavelength in glass. (Assume R.I. for violet and red colour are same)

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5. An parallel beam of monochromatic light is incident on a glass slab at an angle of incidence 60°. Find the ratio of the width of

the beam in glass to that in air, if the refractive index of glass is 1.5.

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6. Light is incident on a glass slab making an angle of 30° with the surface. Calculate the angle of refraction in glass and velocity of light in glass. Given $\mu = 1.5$, Va =$3 \times 10^8 m/s$.

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7. If the critical angle of the medium is $\sin^{-1}\left(\frac{3}{5}\right)$ Find the refractive index of the medium and polarising angle.

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8. If the difference in velocities of light in glass and water is $0.25 \times 10^8 m/s$. Find the velocity of light in air. (Given ${}_a\mu_g = 1.5, {}_a\mu_\omega = \frac{4}{3}$)

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9. The path difference between two identical waves arriving at a point is 85.5λ.. If the path difference is 42.5 micrometer, the wavelength is

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10. In a biprism experiment the distance between the slit and the screen is 1 m and the separation of the two virtual images of the slit is 0.4 mm. An interference pattern is obtained with light of wavelength $5.5 \times 10^{-7} m$. Find

the distance between the 3rd and the 8th bright band.

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11. In a biprism experiment, the eye piece is kept at a distance of 1.5 m from the slit and the distance of the 2nd dark band from the central point was found to be 1.2 cm. The sizes of the magnified and diminished images of slits produced by the convex lens are found to

be 2.4 cm and 60 cm respectively. Calculate the wavelength of light used.

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12. In a biprism experiment, red light of wavelength $6500\overset{\circ}{A}$ was used. It was then replaced by green light of wavelength $5200\overset{\circ}{A}$. Find the value of n for which $(n+1)^t h$ green bright band would coincide with the nth bright band, for the same setting.

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13. In an experiment with Fresnel biprism sodium light is used and bands 0.0196 cm in width are observed at the distance of 100 cm from the slit. A convex lens is placed between the biprism and the slit. If the distance between the slit and screen is one meter, the magnified distance apart of the images is found to be 0.7 cms, the lens being 30 cm from the slit, calculate the wavelength of light.

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14. In a biprism experiment, a source of light has a wavelength of $5500\mathring{A}$. Calculate the change in fringe width, if the screen is at a distance of 1 m from the points which are 1mm apart.

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15. In a single slit diffraction pattern, the distance between the 1st minima on the right and the 1st minima on the left is 5.2 mm. The screen on which the pattern is displayed is 80

cm from the slit. If $\lambda = 5460\overset{\circ}{A}$. Calculate the slit width.

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16. Diffraction pattern of a single width 0.5 cm is formed by a lens of a focal length 40 cm. Calculate the distance between the first dark and next bright fringe from the axis. $\lambda = 4890\overset{\circ}{A}$ (given)

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17. The semivertical angle of a cone of the rays incident on the objective of the microscope is 20°. If $\lambda = 6600\overset{\circ}{A}$, calculate the smallest distance between two points which can be just resolved.

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18. Whatis theminimumangularseparation between two stars if a telescope is used to observe them, with an objective of aperture 20 cms. ($\lambda = 5900\overset{\circ}{A}$)

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19. Two slits in Young Experiment have width in the ratio $81:1$. What is the ratio of the amplitudes of the waves coming from them.

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20. Two coherent sources, whose intensity ratio are $81:1$, produce interference fringes.

Calculate the ratio of intensities of maxima and minima in the fringe system.

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21. Choose the correct answers:-Michelson and Morley performed several experiments to detect ..... but obtained negative results.

A. Ether

B. Particles

C. Corpuscles

D. Waves

Answer:

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22. In dual nature of light, particles of light are called

A. electrons

B. photons

C. neutrons

D. corpuscles

Answer:

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23. Visible light comprises of waves in the ..... range.

A. 300 - 600 nm

B. 400 - 700 nm

C. 500- 800 nm

D. 600 - 700 nm

Answer:

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24. The refractive index of a medium is 1.7 the velocity of light in this medium is

A. $1.565 \times 10^8 m/s$

B. $1.665 \times 10^8 m/s$

C. $1.765 \times 10^8 m/s$

D. $1.865 \times 10^8 m/s$

Answer:

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25. If the frequency of the light beam is $14 \times 10^{14} Hz$. The wave number of the beam of light in air is

A. $1.66 \times 10^6 m^{-1}$

B. $2.66 \times 10^6 m^{-1}$

C. $3.66 \times 10^6 m^{-1}$

D. $4.66 \times 10^6 m^{-1}$

Answer:

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26. The wavelength of a certain light in air and in a medium are $4560\overset{\circ}{A}$ and $3648\overset{\circ}{A}$ respectively. The speed of light in air to the speed of light in the medium is

A. 1.15

B. 1.25

C. 1.35

D. 1.45

Answer:

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27. The velocity of light in diamond is $1.25 \times 10^8 m/s$. The refractive index of diamond with respect to water ($_a\mu_\omega = 1.33$) is

A. 1.5

B. 1.6

C. 1.7

D. 1.8

Answer:

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28. Lateral inversion of light does not occur during ..... at a plane surface.

A. reflection

B. refraction

C. rectilinear propogation

D. diffraction

Answer:

Watch Video Solution

29. If light is constrained or restricted or made to vibrate in one plane it is called

A. plane polarized light

B. Unpolarized light

C. reflection of light

D. refraction of light

Answer:

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30. $I_2 = I_1 \cos^2 \theta$ ..... Law gives the intensity of a linearly polarized wave, after it passes through a polarizer.

A. Brewster's

B. Nicole's

C. Bragg's

D. Malus'

Answer:

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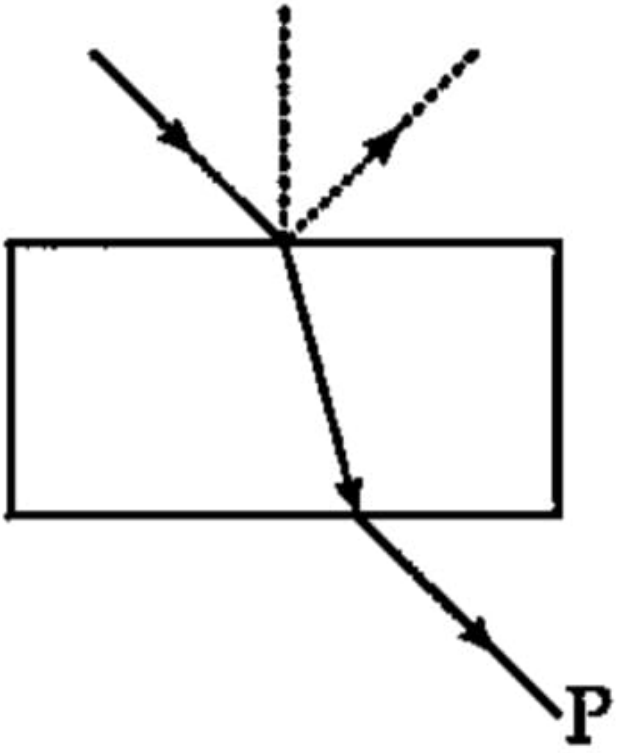
31. Consider a light beam incident from air to a glass slab at Brewster's angle as shown in figure . A polaroid is placed in the path of the

emergent ray at point P and rotated about an axis passing through the centre and perpendicular to the plane of the polaroid .



A. 30°

B. 45°

C. 60°

D. 90°

Answer:

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32. Which of the following phenomenon proves that light is a transverse wave.

A. Reflection

B. Interference

C. Diffraction

D. Polarization

Answer:

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33. Which property of light does not change when it travels from one medium to another.

A. velocity

B. Wavelength

C. Amplitude

D. Frequency

Answer:

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34. When its unpolarized light is passed through a polarizer, its intensity

A. increases

B. decreases

C. remains unchanged

D. depends on the orientation of the polarizer

Answer:

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35. In Young's double slit experiment , the two coherent sources have different intensities . If the ratio of maximum intensity to the minimum intensity in the interference pattern

produced is 25 : 1 . What was the ratio of intensities of the two sources ?

A. $5:1$

B. $25:1$

C. $3:2$

D. $9:4$

Answer:

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36. In Young's double slit experiment , a thin uniform sheet of glass is kept in front of two slits , parallel to the screen having slits . The resulting interference pattern will satisfy

A. The interference pattern will remain unchanged

B. The fringe width will decrease

C. The fringe width will increase

D. The fringes will shift.

Answer:

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37. A ray of light passes from vaccuum to a medium refractive index μ. The angle of incidence is found to be twice the angle of refraction. The angle of refraction is

A. $\cos^{-1}\left(\frac{\mu}{2}\right)$

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

C. $2\cos^{-1}\left(\frac{\mu}{2}\right)$

D. $2\sin^{-1}\left(\frac{\mu}{2}\right)$

Answer:

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38. The absolute refractive index of air is

A. zero

B. 0.95

C. 1

D. infinity

Answer:

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39. The ratio of velocity of light in glass to that in diamond, if the refractive index of glass and diamond with respective to air are $\frac{3}{2}$ and $\frac{12}{5}$ respectivbely will be

A. $\frac{5}{8}$

B. $\frac{8}{5}$

C. $\frac{18}{5}$

D. $\frac{5}{18}$

Answer:

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40. Polarization of light cannot be produced by

A. Reflection

B. Double refraction

C. Dichroism

D. Diffraction

Answer:

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41. The angle of incidence is 45° and the angle of refraction is 30°. The polarising angle for the same medium is

A. $54^\circ 43'$

B. 30°

C. 45°

D. 60°

Answer:

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42. The refractive index of the material is equal to the tangent of the polarizing angle. This is known as

A. Huygens' principle

B. Brewster's law

C. Newton's Law

D. Electromagnetic radiation

Answer:

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43. The relation between path length $(\triangle l)$ and phase difference$(\triangle \phi)$ is given by

A. $\triangle \phi = \left(\frac{2\pi}{\lambda}\right) \triangle l$

B. $\triangle \phi = \left(\frac{\lambda}{2\pi}\right) \triangle l$

C. $\triangle \phi = (2\pi\lambda) \triangle l$

D. $\triangle \phi = \left(\frac{1}{2\pi\lambda}\right) \triangle l$

Answer:

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44. The phase difference between the two waves reaching an arbitary point P from S_1 and S_2 is given by

A. $\triangle \phi = \frac{yd}{D}\left(\frac{\lambda}{2\pi}\right)$

B. $\triangle \phi = \frac{yd}{D}\left(\frac{2\pi}{\lambda}\right)$

C. $\triangle \phi = \frac{D}{yd}\left(\frac{\lambda}{2\pi}\right)$

D. $\triangle \phi = \frac{D}{yd}\left(\frac{2\pi}{\lambda}\right)$

Answer:

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45. The condition for constructive interference in terms of phase difference is given by ..... where n = 0, ± 2.....

A. $\triangle \phi_n = (n2\pi)$

B. $\triangle \phi_n = (n\pi)$

C. $\triangle \phi_n = \left(\frac{1}{n2\pi}\right)$

D. $\triangle \phi_n = \left(\frac{1}{n\pi}\right)$

Answer:

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46. The condition for destructive interference in terms of phase difference is given by ..... where n = 0, ± 2.....

A. $\triangle \phi_n = \left(n - \frac{1}{2}\right)2\pi$

B. $\triangle \phi_n = \left(n - \frac{1}{2}\right)4\pi$

C. $\triangle \phi_n = \left(n - \frac{1}{2}\right)6\pi$

D. $\triangle \phi_n = \left(n - \frac{1}{2}\right)3\pi$

Answer:

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47. The brilliant colours of soap bubbles and thin oil films on the surface of water are due to

A. Reflection

B. Refraction

C. Interference

D. Diffraction

Answer:

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48. In Fraunhofers' diffraction, the source of light and screen are kept at _____ distance from the obstacle.

A. Finite

B. Infinite

C. 1 meter

D. half a meter

Answer:

49. Spherical or cylindrical wavefronts are considered for

A. Fresnel diffraction

B. Braggs diffraction

C. Brewsters diffraction

D. Fraunhoffers' diffraction

Answer:

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50. If the separation between the central maxima of the two objects is greater than the distance between the central maxima and first

minima of any two objects then they are said to be

A. Just resolved

B. Well resolved

C. Unresolved

D. Resolved

Answer:

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51. The path difference between two identical waves arriving at a point is 85.5λ.. If the path difference is 42.5 micrometer, the wavelength is

A. $4771\overset{\circ}{A}$

B. $4871\overset{\circ}{A}$

C. $4971\overset{\circ}{A}$

D. $4671\overset{\circ}{A}$

Answer:

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52. In a biprism experiment, the distance between the slit and screen is 1 m and distance between the images of the slit is 0.274 mm. If the fringewidth is 0.2 cm, the wavelength of light is

A. $5380\overset{\circ}{A}$

B. $5480\overset{\circ}{A}$

C. $5580\overset{\circ}{A}$

D. $5680\overset{\circ}{A}$

Answer:

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53. In a biprism experiment, the fringe width is 0.4 mm, when the eyepiece is at a distance of 1meter away from the slit. The change in fringe width, if the eyepiece is moved through a distance of 25 cm towards the byprism without changing any other arrangement is

A. 0.1mm

B. 0.2 mm

C. 0.3mm

D. 0.4mm

Answer:

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54. The fringe separation in a biprism is 3.2×10^{-4} m when red light of wavelength 6.4×10^{-7} m is used, by how much will this

change, if blue light of wavelength 4×10^{-7} m is used with the same setting.

A. 1.2×10^{-4}

B. 2.2×10^{-4}

C. 3.2×10^{-4}

D. 4.2×10^{-4}

Answer:

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55. The path difference of two identical waves arriving at a point is 100.5λ. The phase difference is 44 micrometer. The wavelength of light is used is

A. $4358\overset{\circ}{A}$

B. $4368\overset{\circ}{A}$

C. $4378\overset{\circ}{A}$

D. $4388\overset{\circ}{A}$

Answer:

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56. If the magnified and diminished images are 4.5 mm and 0.02 mm apart, then d in the biprism experiment is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer:

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57. Calculate the distance of the 30th bright band in a biprism experiment , if the distance of the 15th bright band, from the centre of the interference pattern is 6 mm.

A. 3 mm

B. 6 mm

C. 9 mm

D. 12 mm

Answer:

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58. In Young's experiment, the distance between two slits is 0.8mm and the distance of the screen from the slit is1.2 m. If the fringe width is 0.79 mm, the wavelength of light used is

A. $5167\overset{\circ}{A}$

B. $5267\overset{\circ}{A}$

C. $5367\overset{\circ}{A}$

D. $5467\overset{\circ}{A}$

Answer:

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59. In a biprism experiement, the slit is illuminated by light of wavelength $4800\overset{\circ}{A}$. The distance from the slit to the screen is 1 metre. If the distance between the two virtual sources is 0.3 cm, determine the distance

between the 5th bright band on one side and 5th dark band on the other side.

A. $12.2 \times 10^{-4} m$

B. $13.2 \times 10^{-4} m$

C. $14.2 \times 10^{-4} m$

D. $15.2 \times 10^{-4} m$

Answer:

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60. The limit of resolution of a microscope with self luminous point objects is

A. $0.61\frac{\lambda}{N.A}$

B. $\frac{NA}{0.61}\lambda$

C. $0.61\lambda(NA)$

D. $\frac{1}{0.61}\lambda(NA)$

Answer:

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61. The resolving power of a microscope, with a pair of non-luminous objects is

A. $\frac{2(NA)}{\lambda}$

B. $\frac{\lambda}{2(NA)}$

C. $2(NA)\lambda$

D. $\frac{1}{2(NA)\lambda}$

Answer:

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62. For constructive interference, the phase difference between two waves should be

A. $0, \frac{\pi}{2}, \pi, \ldots.$

B. $0, 2\pi, 4\pi, \ldots$

C. $\pi, 3\pi, 5\pi, \ldots.$

D. $\frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \ldots.$

Answer:

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63. For constructive interference, the phase difference between two waves should be

A. $0, \frac{\pi}{2}, \pi, \ldots.$

B. $0, 2\pi, 4\pi, \ldots$

C. $\pi, 3\pi, 5\pi, \ldots.$

D. $\frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \ldots.$

Answer:

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64. In the diffraction pattern due to a single slit of width 'd' with incident light of wavelength $'\lambda'$, at an angle of diffraction $'\theta'$, the condition for first minimum is

A. $\lambda \sin\theta = d$

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

C. $d \sin\theta = \lambda$

D. $\lambda \sin\theta = d$

Answer:

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65. The resolving power of a telescope of aperture 100 cm for light of wavelength $5.5 \times 10^{-7} m$ is

A. 0.149×10^{-7}

B. 1.49×10^{-7}

C. 14.9×10^{-7}

D. 149×10^{-7}

Answer:

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66. A diffraction pattern is obtained using a beam of red light. What happens if the red light is replaced by blue light?

A. No change

B. Diffraction pattern becomes narrower

C. Band becomes broader

D. Bonds disappear altogether

Answer:

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67. Width of the central maxima is

A. $\frac{\lambda D}{a}$

B. $\frac{2\lambda D}{a}$

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

D. $\frac{4\lambda D}{a}$

Answer:

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68. A parallel beam of light ($\lambda = 6000\overset{\circ}{A}$) is incident normally on a narrow slit of width 0.3 mm. The angular separation between, the first two minima is

A. $2 \times 10^{-3} rad$

B. $2 \times 10^{-3} degree$

C. $3 \times 10^{-3} rad$

D. $0.3 \times 10^{-3} rad$

Answer:

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69. A plane wave of wavelength $5500\mathring{A}$ is incident normally on a slit of width $2 \times 10^{-2} cm$. The width of the central maximum on a screen 50 cms away is

A. $2.5 \times 10^{-3} cm$

B. $2.75 \times 10^{-3} cm$

C. $27.5 \times 10^{-3} cm$

D. $5.50 \times 10^{-3} cm$

Answer:

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70. If numerical aperture of a microscope is increased then its _____

A. resolving power decreases

B. limit of resolution decreases

C. resolving power remains constant

D. limit of resolution increases.

Answer:

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71. If the frequency of the light beam is $14 \times 10^{14} Hz$. The wave number of the beam of light in air is

A. $1.66 \times 10^{6} m^{-1}$

B. $2.66 \times 10^{6} m^{-1}$

C. $3.66 \times 10^{6} m^{-1}$

D. $4.66 \times 10^{6} m^{-1}$

Answer:

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72. Which of the following phenomenon proves that light is a transverse wave.

A. Reflection

B. Interference

C. Diffraction

D. Polarization

Answer:

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73. The relation between path length $(\triangle l)$ and phase difference$(\triangle \phi)$ is given by

A. $\triangle \phi = \left(\frac{2\pi}{\lambda}\right) \triangle l$

B. $\triangle \phi = \left(\frac{\lambda}{2\pi}\right) \triangle l$

C. $\triangle \phi = (2\pi\lambda) \triangle l$

D. $\triangle \phi = \left(\frac{1}{2\pi\lambda}\right) \triangle l$

Answer:

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74. Select and write the most appropriate answer from the given alternative:- If the magnified and diminished images are 4.5mm and 2 mm apart, then d in the biprism experiment is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer:

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75. What are secondary sources light?

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76. What is polarisation of light?

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77. What are coherent sources of light ?

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78. Explain interference due to thin films.

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79. A star is emitting light at the wavelength of $5000\mathring{A}$, Determine the limit of resolution of a telescope, having an objective of diameter of 200 inch.

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80. The intensity of light coming from one of the slits in Young's experiment is twice the intensity of light coming from the other slit. What will be the approximate ratio of the

intensities of the bright and dark fringes in the resulting interference pattern?

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81. The distance between two consecutive bright fringes in a biprism experiement using light of wavelength $6000\overset{\circ}{A}$ is 0.32 mm, by how much will the distance change, if light of wavelength $4800\overset{\circ}{A}$ is used.

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82. A parallel beam of green light of wavelength 546 nm passes through a slit of width 0.4 mm. The intensity pattern of the transmitted light is seen on a screen which is 40 cm away. What is the distance between the two first order of minima?

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83. Whatis theminimumangularseparation between two stars if a telescope is used to

observe them, with an objective of aperture 20 cms. ($\lambda = 5900\overset{\circ}{A}$)

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84. In a biprism experiment, the fringes are observed in the focal plane of the eye piece at a distance of 1.2m from the slits. The distance between the central bright band and 20th bright band is 0.4 cm. When a convex lens is placed between biprism and the eyepiece, the distance between the two vertical magnified

images is found to be 0.9 cm. Determine the wavelength of light used.

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85. Monochromatic electromagnetic radiation from a distant source passes through a slit.The diffraction pattern is observed on the screen 2.5 m from the slit. If the width of the central maximum is 6.00 mm, what is the slit width if the wavelength is:- 500 nm (visible light)

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86. Monochromatic electromagnetic radiation from a distant source passes through a slit.The diffraction pattern is observed on the screen 2.5 m from the slit. If the width of the central maximum is 6.01 mm, what is the slit width if the wavelength is:- $50\mu m$ (infrared radiation)

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87. Monochromatic electromagnetic radiation from a distant source passes through a slit.The diffraction pattern is observed on the screen 2.5 m from the slit. If the width of the central maximum is 6.02 mm, what is the slit width if the wavelength is:- 0.500 nm (X rays)

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88. In a biprism experiment, red light of wavelength $6500\mathring{A}$ was used. It was then

replaced by green light of wavelength $5200\overset{\circ}{A}$. Find the value of n for which $(n+1)^t h$ green bright band would coincide with the nth bright band, for the same setting.

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89. Compare Young's Double slit interfemce pattern and single slit Diffraction pattern.

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90. Derive an expression for fringe width for Bright and Dark bands.

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