PHYSICS

BOOKS - PRADEEP PHYSICS (HINGLISH)

OPTICS

Solved Examples

1. A point object is held between two plane mirror held at $(i)\ 24^{\circ}\ \ (ii)\ 30^{\circ}$. What is the number of images formed in the two cases ?

A. $(i) = 15, (ii) = 11$

B. $(i) = 12, (ii) = 11$

C. $(i) = 11, (ii) = 12$

D. $(i) = 11, (ii) = 15$

Answer: A

Watch Video Solution

2. (a) What is focal length of a convex mirror of radius of curvature $20cm$?

(b) What is radius of curvature of a mirror of focal length $-50cm$?

Watch Video Solution

3. An object is placed $18cm$ in front of a mirror. If the image is formed at $4cm$ to the right of the mirror, calculate its focal length. Is the mirror convex or concave ? What is the nature of the image ? What is the radius of curvature of the mirror ?

Watch Video Solution

4. An object is placed at a distance of $16cm$ from a convex mirror of focal length $20cm$. Locate the position and nature of the image.

Watch Video Solution

5. An erect image $3 \times$ the size of the object is obtained with a concave mirror of radius of curvature $36cm$. What is the position of the object ?

Watch Video Solution

6. What are the two main applications of parabolic mirrors ?

Watch Video Solution

7. Light of wavelength 5000Å falls on a plane reflecting surface. What are the wavelength and frequency of reflected light ? For what angle of incidence is the reflected ray normal to the incident ray ?

Watch Video Solution

8. Light incident normally on a plane mirror attached to a galvanometer coil retraces backwards a shown in Fig. 6(a). 14. A current in the coil produces a deflection of 3.5° in the mirror. What is the displacement of the reflected spot of light on a screen placed $1.5m$ away ?

Watch Video Solution

9. A boy $1.5m$ tall with his eye level at $1.38m$ stands before a mirror fixed on a wall. Indicate by means of a ray diagram how the mirror should be positioned so that he can view himself fully. What should be the minimum length of the mirror ? Does the answer depend on the eye level ?

Watch Video Solution

10. A square wire of side $3.0cm$ is placed $25cm$ away from a concave mirror of focal length $10cm$. What is the area enclosed by the image of the wire ? The centre of the wire is on the axis of the mirror, with its two sides normal to the axis.

Watch Video Solution

11. When an object is placed at a distance of $60cm$ from a convex spherical mirror, the magnification produced is $1/2$. Where should the object be placed to get a magnification of $1/3$?

Watch Video Solution

12. An object is placed (i)$10cm$ (ii) $5cm$ in front of a convex mirror of radius of curvature $15cm$. Find the position, nature and magnification of the image in each case.

Watch Video Solution

13. Suppose while sitting in a parked car, you notice a jogger approaching towards you in the rear view mirror of $R = 2m$. If the jogger is running at a speed of $5ms^{-1}$, how fast is the image of the jogger moving, when the jogger is

(a) 39 m

(b) 29 m

19 m and

(d) 9 m. away ?

Watch Video Solution

14. A $5cm$ long needle is placed $10cm$ from a convex mirror of focul length $40cm$. Find the position, nature and size of image of the needle. What happens to the size of image when needle is moved farhter away from the mirror ?

Watch Video Solution

15. A convex mirror of focal length $20cm$ is placed $50cm$ from a wall. How far the wall should an object be placed to form a real image on the wall ?

Watch Video Solution

16. As object is placed exactly midway between a concave mirror of $R = 40cm$ and a convex mirror of $R = 30cm$. The mirrors face eachother and are $50cm$ apart. Determine the nature and position of image formed by successive

reflections first at concave mirror and then at convex mirror.

Watch Video Solution

17. An object is placed at a dustance $36cm$ from a convex mirror. A plane mirror is placed inbetween so that the two virtual images so formed coincide. If the plane mirror is at a distance of $24cm$ from the object, find the radius of curvature of convex mirror.

Watch Video Solution

18. The sun (diameter d) subtends an angle θ radian at the pole of a concave mirror of focal length f. What is the diameter of the image of the sun formed by the mirror ?

Watch Video Solution

19. An object of height h is held before a spherical mirror of focal length $|f| = 40cm$. The image of the object produced by the mirror has same orientation as the object and has $height = 0.2h$. Is the image real or virtual ? Is the image on the convex or concave? What is focal length of mirror with proper sign?

Watch Video Solution

20. a concave mirror of focal length $20cm$ and a convex mirror of focal length $15cm$ are placed $50cm$ apart, such that the two mirrors face eaachother. An object is placed exactly midway between them. Fing the nature and position of image formed by reflection first at concave mirror and then at convex mirror.

Watch Video Solution

21. Prove that spherical mirror formula is applicable equally to a plane mirror.

Watch Video Solution

22. The wall of a room is covered with a perfect plane mirror and two movie films are made, one recording the movement of a man and the other of his mirror image.

While viewing the film later, can an outside tell which is which ?

Watch Video Solution

23. An object is placed between two parallel plane mirrors. Why do the distance images get fainter and fainter ?

Watch Video Solution

24. Why are mirrors used in search lights parabolic and not concave sphrical ?

Watch Video Solution

25. A man holding a lighted candle in front of a thick glass mirror and viewing it obliquely sees a number of images of the candle. What is the origin of these multiple images ?

Watch Video Solution

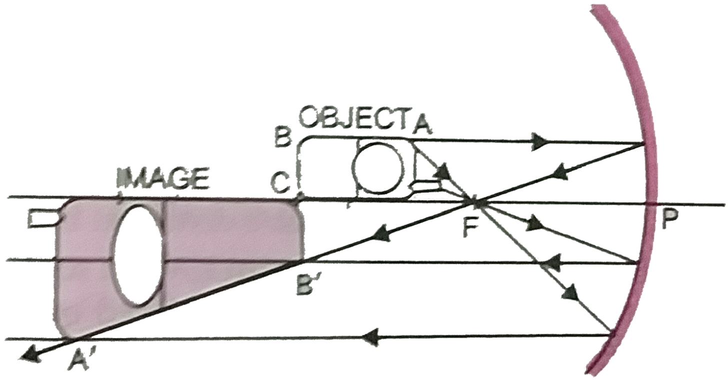
26. If you were driving a car, what type of mirror would you prefer to use for observing traffic at your back ?

Watch Video Solution

27. Suppose that the lower half of a concave mirror's reflecting surface is covered with an opaque nonreflecting material. What effect will this have on the image of an object placed in front of the mirror ?

Watch Video Solution

28. A mobile phone lies along the principal axis of a concave mirror as shown in Fig. Show by suitable diagram, the formation of its image. Explain why the magnification is not uniform, and distortion will occur depending on the location of the mobile with respect to the mirror.



Watch Video Solution

29. A section of a sphere has a radius of curvature of $0.80m$. Both, inside and ouside surfaces have a mirror like polish. What are the focal lengths of the inside and outside surfaces?

Watch Video Solution

30. Will the reflected rays converge at a point when a parallel beam of light is incident on a concave mirror of large aperture ?

Watch Video Solution

31. Why are mirrors used in search lights parabolic and not concave sphrical ?

Watch Video Solution

32. Give three basic differences between real image and virtual image.

Watch Video Solution

33. Define principal axis of a spherical mirror.

Watch Video Solution

34. A ray incident along normal to the mirror retraces its path. Why ?

Watch Video Solution

35. What si the number of images of a point object held inbetween two plane mirrors inclined at an angle θ° ?

Watch Video Solution

36. A mirror is turned through 15°. Through what angle will the reflected ray turn ?

Watch Video Solution

37. What is the number of images of an object held between two parallel plane mirrors ?

A. 0

B. infinite

C. 1

D. none of these

Answer: B

Watch Video Solution

38. Can we obtain the image formed by a convex mirror on a screen ? If not, why ?

Watch Video Solution

39. Can a convex mirror form a mgnified image ?

Watch Video Solution

40. When does a concave mirror form a virtual image ?

Watch Video Solution

41. what is the relation between f and R of a spherical mirror ?

Watch Video Solution

42. Can a virtual image be photographed by a camera ?

Watch Video Solution

43. A person moves with a velocity v towards a plane mirror. With what velocity does his image move towards him ?

A. $3v$

B. $2v$

C. $4v$

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

Answer: B

Watch Video Solution

44. What is the value of focal length of a plane mirror ?

Watch Video Solution

45. If the wavelength of incident light on a concave mirror is increased, how will the focal length of the mirror change ?

Watch Video Solution

46. To which wavelength of lights is our eye most sensitive ? In which region does this wavelength lie ?

Watch Video Solution

47. Find the minimum height of a mirror where one can see his full image.

Watch Video Solution

48. How many images of himself can a person see in a room whose ceiling and two adjacent walls are mirrors ?

Watch Video Solution

49. What are the two types of spherical mirrors ?

Watch Video Solution

50. Which spherical mirror has a real focus and which one has a virtual focus ?

Watch Video Solution

51. Which spherical mirror is converging and which one is diverging ?

Watch Video Solution

52. Which spherical mirror forms a virtual, erect and smaller image of an object ?

Watch Video Solution

53. Where should an object be held so that a concave mirror forms a real, inverted and magnified image ?

Watch Video Solution

54. How will you distinguish between a plane mirror, a convex mirror and a concave mirror without touching them?

Watch Video Solution

55. Does size of mirror affect the nature of the image ?

Watch Video Solution

56. A concave mirror of small aperture forms a shrper image. Why ?

Watch Video Solution

57. How can we see a virtual image when it cannot be obtained on a screen ?

Watch Video Solution

58. If a spherical mirror is dipped in water, does its focal length change ? 17. If a thin lens is dipped in water, does its focal length change ?

Watch Video Solution

59. What is the difference between the virtual images produced by (i) plane mirror (ii) concave mirror and (iii) convex mirror ?

Watch Video Solution

60. Which property of concave mirror is utilized for using them as shaving mirrors ?

Watch Video Solution

61. A man standing in front of a special mirror finds his image having a small face, big tummy and legs of normal size. What are the shapes of three parts of the mirror?

Watch Video Solution

62. What is the advantage of using a parabolic concave mirror over ordinary spherical concave mirror ?

Watch Video Solution

63. A parallel beam of light strikes a (i) plane mirror (ii) a convex mirror and (iii) a concave mirror. What is the deviation produced in each case in terms of the angle of incidence (i) ?

Watch Video Solution

64. Use the mirror equation to show that an object placed between f and $2f$ of a concave mirror forms an image beyond $2f$.

Watch Video Solution

65. If refractive indices of glass and water with respect to air are $3/2$ and $4/3$ respectively, what is the refractive index of glass with respect to water ?

Watch Video Solution

66. The wavelength of sodium light in air is 589 nm. (a) Find its frquency in air. (b) Find its wavelength in water (refactive index = 1.33). (c) find its frequency in water : (d) Find its speed in water.

Watch Video Solution

Watch Video Solution

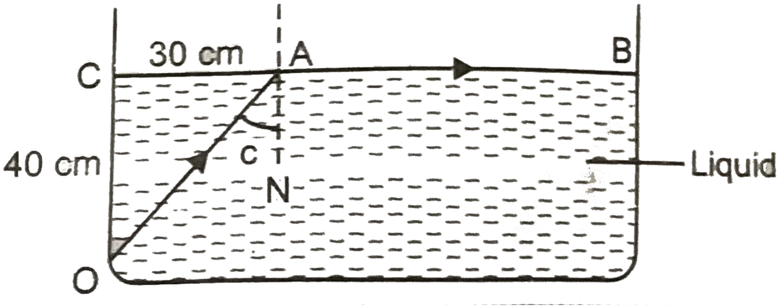
67. A small ink dot on a paper is viewed through a glass slab of thickness $10cm$, and refractive index 1.5. By what distance would the dot appear to be raised ?

Watch Video Solution

68. Calculate the minimum angle of incidence so that a ray travelling from glass $(\mu = 3/2)$ to water $(\mu = 4/3)$ does not emerge out in water.

Watch Video Solution

69. In the ray diagram shown here, calculate the speed of light in the liquid of unknown refractive index.



Watch Video Solution

70. Light from a point source in air falls on a convex spherical glass surface ($\mu = 1.5$ and $R = 20cm$). Calculate position of the image when the light source is at $1m$ from the glass surface.

Watch Video Solution

71. What curvature must be given to the bounding concave surface of refracting medium ($\mu = 3/2$) for a virtual image at $40cm$ of an object in this medium at a distance of $60cm$. The adjoining medium is air ($\mu = 1$).

Watch Video Solution

72. A small point objects is placed in air at a distance of $60cm$ from a convex spherical refractive surface of $\mu = 1.5$. If radius of curvature of spherical surface is $25cm$, calculate the position of the image and the power of the refracting surface.

Watch Video Solution

73. The radii of curvature of the surfaces of a double convex lens are $20cm$ and $40cm$ respectively, and its focal length is $20cm$. What is the refractive index of the material of the lens ?

Watch Video Solution

74. A double convex lens is made of glass of refractive index 1.55 with both faces of same radius of curvature. Find the radius of curvature required, if focal length is $20cm$.

Watch Video Solution

75. A diverging lens of focal length $15cm$ forms an image $10cm$ from the lens. Calculate the distance of the object from the lens, given $\mu = 1.5$. What is the linear magnification of the image ?

Watch Video Solution

76. Two lenses are placed in contact with each other and the focal length of combination is $80cm$. If the focal length of one is $20cm$, then the power of the other will be

Watch Video Solution

77. Some beverage glasses are made with very thick walls. Why ?

Watch Video Solution

78. What do you know about the SOFAR channel in the ocean ?

Watch Video Solution

79. A convex lens of focal length $20cm$ has a point object placed on its principal axis at a distance of $40cm$ from it. A plane mirror is placed $30cm$ behined the convex lens. Locate the position of image formed by this combination.

Watch Video Solution

80. A light of wavelength $6000A$ in air, enters a medium with refractive index 1.5 Inside the medium its frequency is....Hz and its wavelength is ....A

Watch Video Solution

81. What is the speed of light in glass of refractive index 1.5 ? Given speed of light in water is $2.25 \times 10^8 m/s$ and refractive index of water is 1.3.

Watch Video Solution

82. A rectangular glass slab rests at the bottom of a trough of water. A ray of light incident on water surface at an angle of 50° passes through water into glass. What is angle of refraction in glass ? Take μ for water $4/3$ and μ for glass $3/2$.

Watch Video Solution

83. What is the apparent position of an object below a rectangular block of glass $6cm$ thick, if a layer of water $4cm$ thicke ia on the top of the glass ? Given $\wedge(a)\mu_g = 3/2$ and ${}^a\mu_w = 4/3$.

Watch Video Solution

84. A ray of light is incident at an angle of 45° on one face of a rectangular glass slab of thickness $10cm$ and refractive index 1.5. Calculate the lateral shift produced.

Watch Video Solution

85. Refractive indices of water an glass are $4/3$ and $3/2$ respectively. A ray of light travelling in water is incident on the water glass interface at 30°. Calculate the angle of refraction.

Watch Video Solution

86. A ray PQ is incident normally on the refracting face of the prism BAC made of material of refractive index 1.5. Complete the path of ray through the prism. From which face will the ray emerge and at what angle ? Justify your answer. (angle of prism is 30)

Watch Video Solution

87. A transparent cube of side $210mm$ contains a small air bubble. Its apparent distance, when viewed from one face of the cube is $100mm$, and when viewed through opposite face is $40mm$. What is the actual distance of the bubble from the second face and what is the refractive index of the material of the cube ?

Watch Video Solution

88. Refractive indices of water an glass are $4/3$ and $3/2$ respectively. A ray of light travelling in water is incident on the water glass interface at 30°. Calculate the angle of refraction.

Watch Video Solution

89. Calculate the speed of light in a medium whose critical angle is 30°.

Watch Video Solution

90. The critical angle of incidence in a glass slab placed in air is 45°. What will be yhe critical angle when the glass slab is immersed in water of refractive index 1.33 ?

Watch Video Solution

91. Determine the direction in which a fish under water sees the setting sun. Given, for water $\mu = 1.33$.

Watch Video Solution

92. The refractive index of water is $4/2$. Determine the angle of the cone within which the entire outside view will be confined for a fish under water.

Watch Video Solution

93. A point source of light S is placed at the bottom of a vessel containing a liquid of refractive index $5/3$. A person is viewing the source from above the surface. There is an opaque disc of radius $1cm$ floating on the surface. The centre of disc lies vertically above the source O. The liquid from the vessel is gradually drained out through a tap. What is the maximum height of the liquid for which the source cannot be seen at all.

Watch Video Solution

94. Calculate the critical angle for a glass air interface, if a ray of light incident in air on the surface is deviated through 15°, when its angle of incidence is 40°.

Watch Video Solution

95. Calculate the critical angle for total internal refection of light travelling from (i) water into air (ii) glass into water. Given $.^{a}\mu_{w}$ and $.^{a}\mu_{g} = 1.5$

Watch Video Solution

96. One face of a prism of refractive index 1.5 and angle 75° is covered with a liquid of refractive index $\frac{3\sqrt{2}}{4}$. What should be the angle of incidence of light on the clear face of prism for which light is just totally refracted at the liquid covered face ?

Watch Video Solution

97. Calculate the critical angle for a glass air interface, if a ray of light incident in air on the surface is deviated through 15°, when its angle of incidence is 40°.

Watch Video Solution

98. A glass dumbbell of length $30cm$ and refractive index 1.5 has ends of radius of curvature $3cm$. A point object is situated at a distance of $12cm$ from one end of dumbbell. Find the position of the image formed due to refraction ai one end only.

Watch Video Solution

99. A mark placed on the surface of a sphere is viewed through glass from a position directly opposite. If the diameter of the sphere is $10cm$ and refractive index of glass is 1.5, find the position of the image.

Watch Video Solution

100. Light from a point source in air falls on a spherical glass surface $\mu = 1.5$ and $R = 20cm$. The image is formed at a distance of $100cm$ from the glass surface in the direction of incident light. Calculate the object distance from the centre of curvature of the spherical surface.

Watch Video Solution

101. Light from a point source in air falls on a spherical glass surface. If $\mu = 1.5$, and radius of curvature $= 20cm$, the distance of light source from the glass surface is $100cm$, at what position will the image be formed ? (NCERT Solved Example)

Watch Video Solution

102. Light from a point source in air falls on a spherical glass surface. If $\mu = 1.5$, and radius of curvature $= 20cm$, the distance of light source from the glass surface is $100cm$, at what position will the image be formed ? (NCERT Solved Example)

Watch Video Solution

103. What curvature must be given to the bounding surface of $\mu = 1.5$ for virtual image of an object in the medium of $\mu = 1at10cm$ to be formed at a distance of $40cm$. Calculate power of the refracting surface and also two principal focal lengths of the surface.

Watch Video Solution

104. A sunshine recorder globe of $30cm$ diameter is made of glass of $\mu = 1.5$. A ray enters the globe parallel to its axis. Find the position from the centre of the sphere, where the ray crosses the axis.

Watch Video Solution

105. A biconvex lens has focal length $\frac{2}{3}$ times the radius of curvature of either surface. Calculate refraction index f material of the lens.

Watch Video Solution

106. Fig. 6(b).54. shows a thin lens with centres of curvature C_1 and C_2. If $\mu = 1.5$, what is its focal length ?

Watch Video Solution

107. A diverging lens of refractive index 1.5 and focal length $15cm$ in air has same radii of curvature for both sides. If it is immersed in a liquid of refractive index 1.7, calculate focal length of the lens in liquid.

Watch Video Solution

108. A double convex lens made of glass of refractive index 1.56 has both radii of curvature of magnitude $20cm$.

If an object is placed at a distance of $10cm$ from this lens, find the position of image formed.

Watch Video Solution

109. Find the radius of curvature of convex surface of a plano convex lens, whose focal length is $0.3m$ and $\mu = 1.5$.

Watch Video Solution

110. A magician during a show makes a glass lens $\mu = 1.5$ disappear in a through of liquid. What is the refractive index of the liquid ? Is the liquid water ?

Watch Video Solution

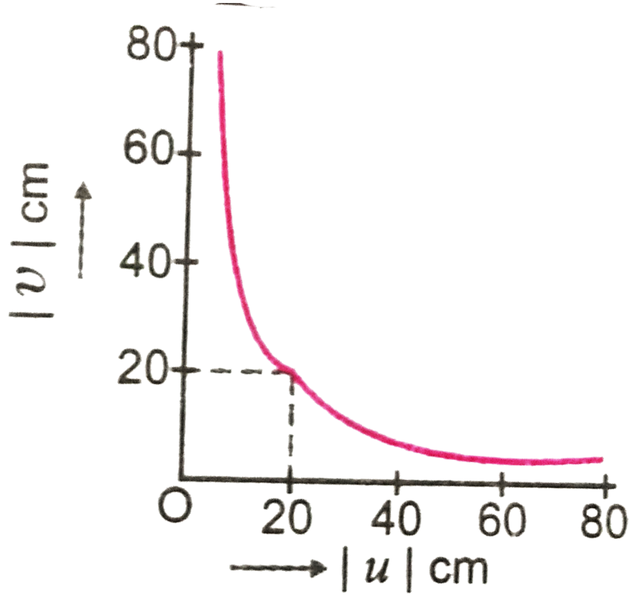
111. The focal length of an equiconvex lens is equal to radius of curvature of either surface. What is the refractive index of the material of the prism ?

Watch Video Solution

112. Explain what happens when a convex lens of refractive index 1.2 is immersed in a liquid of refractive index 1.3.

Watch Video Solution

113. The graph in shows the variation of image distance (v) with object distance (u) in case of a lens. Find focal length of the lens. What is the nature of the lens, if image formed is real ?



Watch Video Solution

114. At what distance should an object be placed from a convex lens of focal langth $15cm$ to obtain an image three times the size of the object ?

Watch Video Solution

Watch Video Solution

115. The image obtained with a convex lens is erect and its length is 4 times the length of the object. If the focal length of lens is $20cm$, calculate the object and image distances.

Watch Video Solution

116. An illuminated object and a screen are placed $90cm$ apart. What is the focal length and nature of the lens required to produce a clear image on the screen twice the size of the object ?

Watch Video Solution

117. A convergent beam of light passes through a diverging lens of focal length $0.2m$ and comes to focus at a distance of $0.3m$ behind the lens. Find the position of the point at which the beam would converge in the absence of the lens.

Watch Video Solution

118. The image obtained with a convex lens is erect and its length is 4 times the length of the object. If focal length of the lens is $20cm$, calculate the object and image distances.

Watch Video Solution

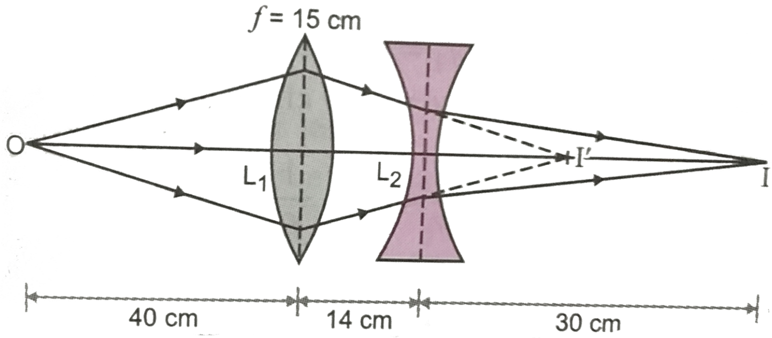
119. A converging lens of focal length $50cm$ is placed co-axially in cintact with another lens of unknown focal length. If the combination behaves like a diverging lens of focal length $50cm$, find the power and nature of second lens.

Watch Video Solution

120. Two lenses of power $+15D$ and $-5D$ are in contact with each other. What is the focal length of the combination ? What would be the position of image formed by the combination for an object at $30cm$?

Watch Video Solution

121. Use the following ray diagram, Fig. 6(b).56 to calculate focal length of lens L_2.



Watch Video Solution

122. A convex lens of focal length $10cm$ is placed co-axially $5cm$ away from a concave lens of focal length $10cm$. If an object is placed $30cm$ in front of the convex lens, find the position of final image formed by the combined system.

Watch Video Solution

123. A concave lens is placed in contact with a convex lens of focal length $25cm$. The combination produces a real image at a distance of $80cm$, when an object is at a distance of $40cm$. What is the focal length of concave lens ?

Watch Video Solution

124. (i) If $f = +0.5m$, what is the power of the lens ?

(ii) The radii of curvature of the faces of a double convex lens are $9cm$ and $15cm$. Its focal length is $12cm$. What is the refractive index of glass ?

(iii) A convex lens has $20cm$ focal length in air. What is the focal length in water ? (Refractive index of air-water $= 1.33$, refractive index of air-glass $= 1.5$).

Watch Video Solution

125. A real image of an object is formed at a distance of $20cm$ from a lens. On putting another lens in contact with it, the image is shifted $10cm$ towards the combination, Determine the power of the second lens.

Watch Video Solution

126. A convex lens of focal length $30cm$ and a concave lens of focal length $60cm$ are placed in combination. If an object is placed $40cm$ away from the combination, find the position of the image.

Watch Video Solution

127. A double convex lens of $+5D$ is made of glass of refractive index 1.5 with both faces of equal radii of curvature. Find the value of curvature.

Watch Video Solution

128. A convex lens of focal length $25cm$ is placed co-axially in contact with a concave lens of focal length $20cm$. Determine the power of the combination. Will the system be converging or diverging in nature ?

Watch Video Solution

129. (a) Explain with reason, how the power of a diverging lens changes when (i) it is kept in a medium of refractive index greater than that of the lens, (ii) incident red light is replaced by violet light.

(b) Three lenses L_1, L_2, L_3 each of focal length 30 cm are placed co-axially as shown in the figure. An object is held at 60 cm from the optic centre of lens L_1. The final real image is formal at the focus of L_3. Calculate the separation between (i) $\left(L_1 \text{ and } L_2\right)$ and (ii) $\left(L_2 \text{ and } L_3\right)$.

Watch Video Solution

130. A convex lens is placed in contact with a plane mirror. An axial point object at a distance of $20cm$ from this combination, has its image coinciding with itself. What is the focal length of the convex lens ?

Watch Video Solution

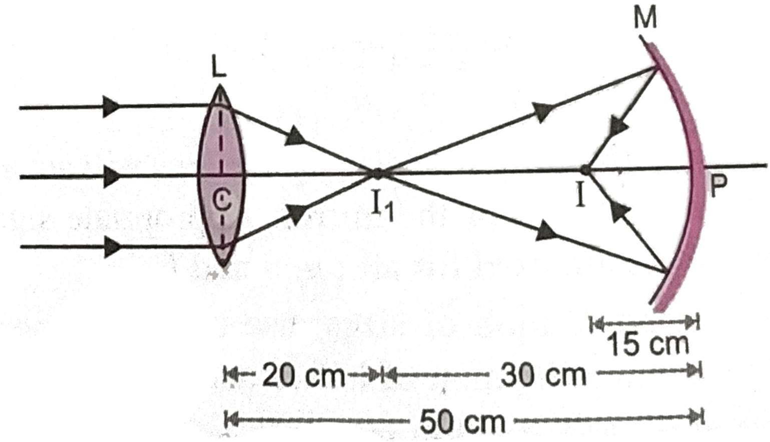
131. A convex lens and a convex mirror of radius of curvature $20cm$ are placed co-axially with the convex mirror placed at a distance of $30cm$ from the lens. For a point object at a distance of $25cm$ from the lens, the final image due to this combination coincides with the object itself. What is the focal length of convex lens ? (NCERT Solved Example)

Watch Video Solution

132. A convex lens of focal length $20cm$ is placed co-axially with a convex mirror of radius of curvature $20cm$. The two are kept $15cm$ apart from each other. A point object is placed $60cm$ in front of the convex lens. Find the position of the image formed by the combination.

Watch Video Solution

133. A convex lens of focal length $20cm$ and a convex mirror of focal length $10cm$ are placed co-axially $50cm$ apart from each other. An incident on the convex lens. Locate the position of final image formed due to the combination.



(NCERT Solved Example)

Watch Video Solution

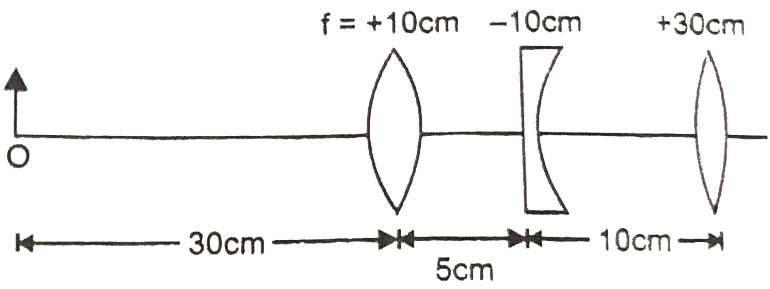
134. An object is placed $15cm$ in front of a convex lens of focal length $10cm$. Find the nature and position of image formed. Where should a concave mirror of radius of curvature $20cm$ be position of the object itself ?

Watch Video Solution

135. The power of a thin convex lens of glass is $5 dioptre$. When it is immersed in a liquid of refractive index μ, it behave like a diverging lens of focal length $1m$. Calculate μ of liquid, if μ of glass $= 3/2$.

Watch Video Solution

136. Find the position of the image formed by the lens combination given in Fig.



Watch Video Solution

Watch Video Solution

137. One face of a glass cube of side $0.06m$ from the face opposite to the silvered face. Object is 0.07 m away from the unsilvered face. Looking from the object side, the image of the object appears to be $0.11m$ behind the silvered face. Calculate the refractive index of material of glass.

Watch Video Solution

138. Radius of curvature of an equiconvex lens is $0.2m$. Its refractive index is 1.5. Calculate its focal length. If two such lenses are kept separated with common principal axis by a distance of $0.2m$, what will be the effective focal length of the combination ?

Watch Video Solution

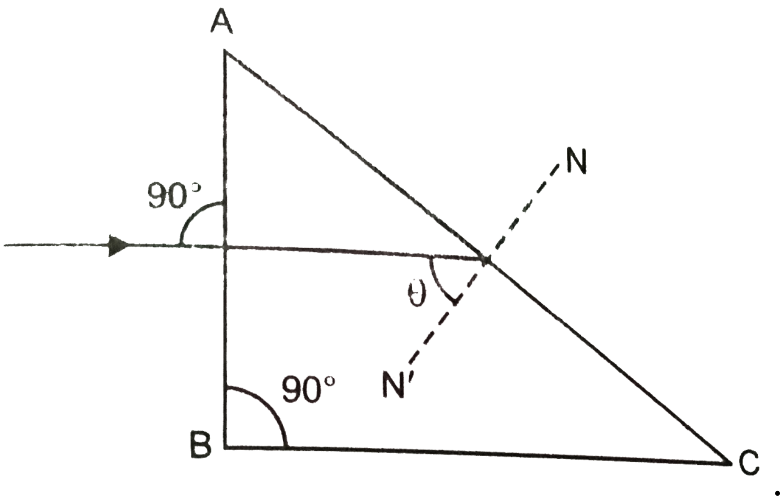
139. A beam of light of wavelength $400nm$ is incident normally on a right angled prism as shown in Fig.

It is observed that light just grazes along the surface AC after falling on it. If refractive index μ of the material of prism varies with wavelength

λ as $\mu = 1.2 + \dfrac{b}{\lambda^2}$

Calculate the value of b and μ of prism material for

$\lambda = 500nm$. Given $\theta = \sin^{-1}(0.625)$.



Watch Video Solution

140. Why does a ray of light bend towards normal as it passes from air to glass ?

Watch Video Solution

141. How do the frequency and wavelength of light change when it goes from a rarer to a denser medium ?

Watch Video Solution

142. Can the relative index of a medium w.r.t. another medium be less than unity ?

Watch Video Solution

143. Can the absolute value of refractive index of a meduim be less than unity ?

Watch Video Solution

144. When light comes from air to glass, the refracted ray is bent towards the normal. Why ?

Watch Video Solution

145. If a plane glass slab is placed on letters of different colours, then red coloured letter appears to be raised minimum, why ?

Watch Video Solution

146. The critical angle for glass air interface is C and for glass water interface ic C'. How are C and C' related ?

Watch Video Solution

147. Why does a diamond shine ?

Watch Video Solution

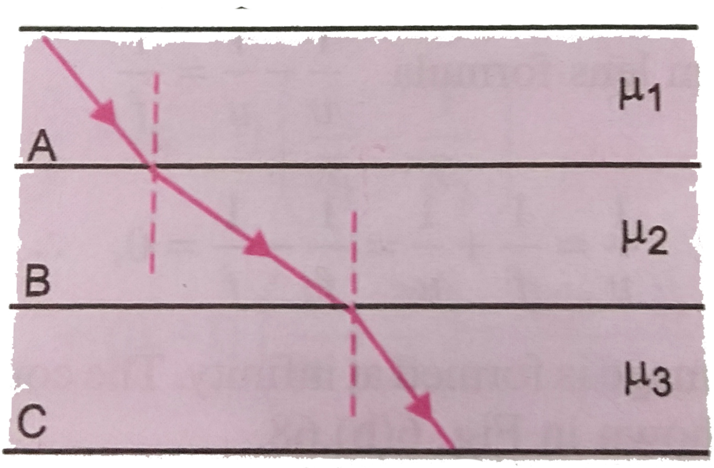
148. Explain why (a) A diamond glitters in a brightly lit room, but not in a dark romm.

(b) A crack in window pane appears silvery.

(c) The bubbles of air rising up in a water tank appear silvery when viewed from top.

Watch Video Solution

149. Path of a ray of light passing through three liquids of reflective indices μ_1, μ_2, μ_3 is as shown in Fig. Which liquid has the smallest index of reflection ?



Watch Video Solution

150. A ray of light after reflection through a concave lens becomes parallel to the principal axis after refraction through the concave lens. Wxplain with a ray diagram when this can happen.

Watch Video Solution

151. The surface of the sun glasses (goggles) are curved, yet their power may be zero. Why ?

Watch Video Solution

152. Calculate the position of the image of an object when placed at

(a) focus of a convex lens.

(b) focus of a concave lens.

Watch Video Solution

Watch Video Solution

153. The refractive index of the material of a concave lens is n. It is immersed in a medium of refractive index n_1. A paprallel beam of light is incident on the lens. Trace the path of emerged rays in each of the following cases :

(a) $n_1 > n$ (b) $n_1 < n$ (c) $n_1 = n$.

Watch Video Solution

154. A thin lens focal length f_1 and its aperture has diameter d. It forms an image of intensity I. Now the central part of the aperture up to diameter $\frac{d}{2}$ is blocked by an opaque paper. The focal length and image intensity will change to

Watch Video Solution

155. When does a convex lens behave as a concave lens ?

Watch Video Solution

156. A lens immersed in a transparent liquid becomes invisible. Under what condtion does it happen ?

Watch Video Solution

157. A lens is forming the image of an object on its axis. If the lens is placed with its faces reversed, will the position of image change ?

Watch Video Solution

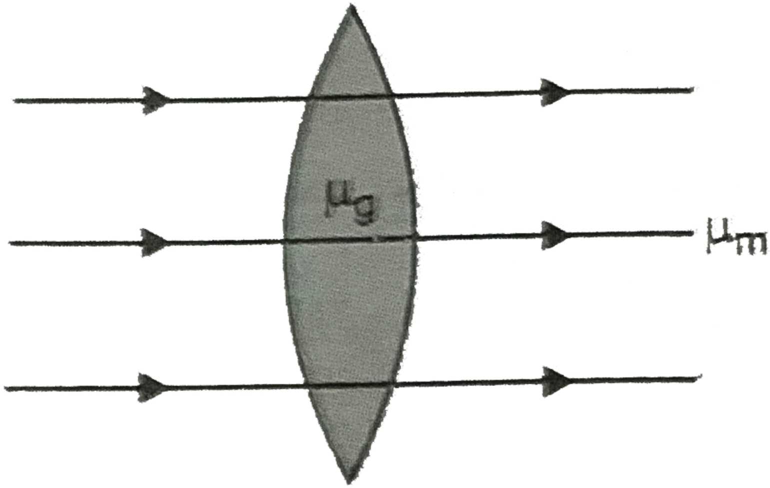
158. What happens to focal length of a convex lens when it is immersed in water ?

Watch Video Solution

159. The radii of curvature of both the surfaces of a lens are equal. How will its focal length and power change if one of the surfaces of the lens is made plane ?

Watch Video Solution

160. A convex lens of refractive index μ_g is held in a transparent medium of refractive index μ_m If course of rays is as shown in Fig., how are μ_g and μ_m related ?



Watch Video Solution

161. State the factor on which refractive index of a medium depend ?

Watch Video Solution

162. For which medium is refractive index maximum ?

Watch Video Solution

163. For which medium is refractive index maximum ?

Watch Video Solution

164. When does Snell's Law of refraction fail ?

Watch Video Solution

165. On what factors lateral shift of a ray on passing through a glass slab depend ?

Watch Video Solution

166. Can total internal reflection occur when light goes from a rarer to a denser medium.

Watch Video Solution

167. Which one has a greater critical angle diamond or glass ?

Watch Video Solution

168. What is the relation between refractive index and critical angle for a given pair of optical media ?

Watch Video Solution

169. When does Snell's Law of refraction fail ?

Watch Video Solution

170. Does critical angle depend on colour of light ?

Watch Video Solution

171. What is the cause of refraction of light ?

Watch Video Solution

172. What is critical angle for a material of refractive index $\sqrt{2}$?

Watch Video Solution

173. A beam of light is converging towards a certain point. A parallel sided glass plate is introduced in the path of the converging beam. How will the point of convergence be shifted ?

Watch Video Solution

174. What is the principal of optical fibre ?

Watch Video Solution

175. Determine refractive index of a substance if critical angle is 45°.

Watch Video Solution

176. What is the ratio of velocities of two light waves travelling in vacuum and having wavelength $4000Å$ and $8000Å$?

Watch Video Solution

177. What type of lens is a tumbler filled with water ?

Watch Video Solution

178. What type of lens is an air bubble inside water ?

Watch Video Solution

179. a lens of glass is immersed in water. How is power of lens affected ?

Watch Video Solution

180. a convex lens forms a virtual image of an object. What is the position of the object ?

Watch Video Solution

181. An object is placed at the focus of a concave lens. Where will be image ?

Watch Video Solution

182. A glass lens of refractive index 1.45 when immersed in a transparent liquid becomes invisible. Under what condition does it happen ?

Watch Video Solution

183. Two concave lenses each of focal length $30cm$ are placed in contact. What is focal of the compound lens ?

Watch Video Solution

184. Two thin lenses of power $+6D$ and $-2D$ are in contact. What is the focal length of the combination ?

Watch Video Solution

185. What is the basis of an optical fibre ?

Watch Video Solution

186. what is the deviation produced in ray passing through optical centre of the lens ?

Watch Video Solution

187. A lens forms a virtual, erect and diminished image whatever be the position of the object. Which type of lens this ?

Watch Video Solution

188. Define one dioptre of power of a lens.

Watch Video Solution

189. What is focal length of a lens of power $2.5D$?

Watch Video Solution

190. What is total magnification of three lenses of magnification $2, 3, 4$ in contact ?

Watch Video Solution

191. An ink mark on a sheet of paper is viewed through a glass slab of thickness t and refractive index μ. Through what distance the mark appears to be raised ?

Watch Video Solution

192. A candle flame is held $2meter$ above the water level in a tank $4meter$ deep. If μ of water is $4/3$, where will the image of candle flame be seen ?

Watch Video Solution

193. An air bubble in a jar of water shines brightly. Why ?

Watch Video Solution

194. For the same angle of incidence, the angles of refraction in media P, Q and R are $35^\circ, 25^\circ, 15^\circ$ resp. In which medium will the velocity of light be minimum ?

Watch Video Solution

195. Why does the rising sun appear oval shaped ?

Watch Video Solution

196. Where should an object be placed from a convex lens to from an image of the same size ? Can it happen in case of a concave lens ?

Watch Video Solution

197. The focal length of an equiconvex lens placed in air is equal to radius of curvature of either surface. Is it true ?

Watch Video Solution

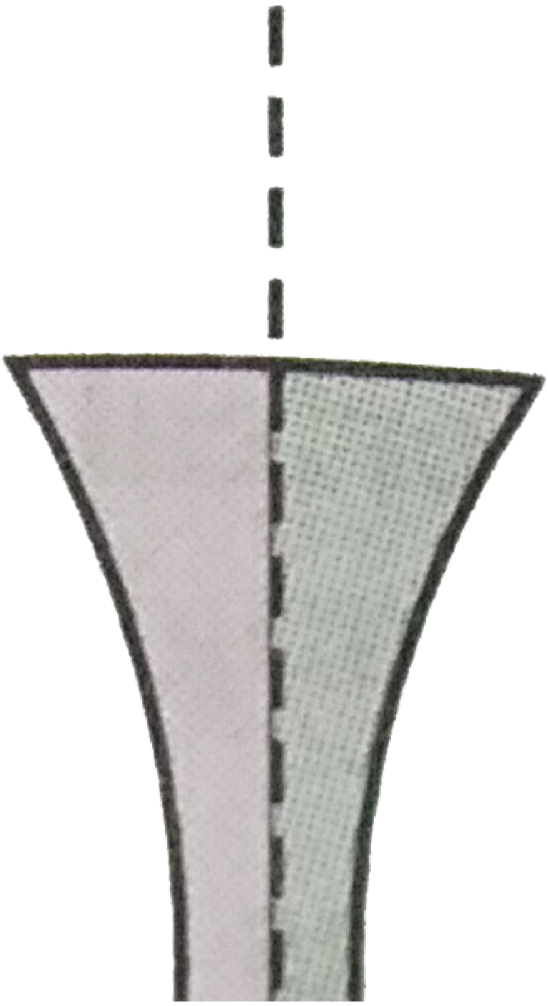
198. Within a glass slab, a double convex air bubble is formed. How would the air bubble behave ?

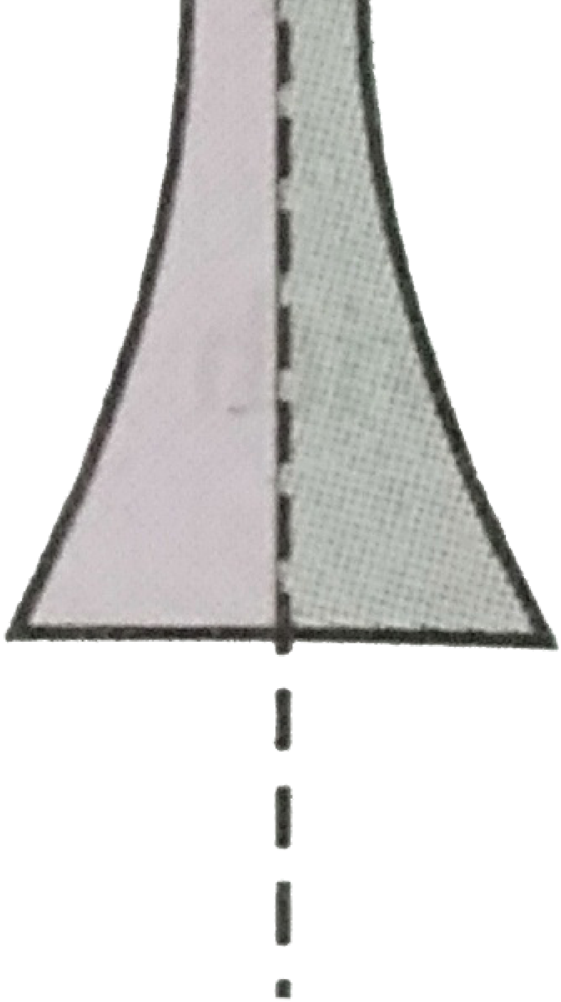
Watch Video Solution

199. Why does a convex lens of glass $\mu = 1.5$ behave as a diverging lens when immersed in carbon disulphide of $\mu = 1.65$?

Watch Video Solution

200. A diverging lens of focal length F is cut into two idential parts, each forming a plano concave lens, Fig. What is the focal length of each part ?





Watch Video Solution

201. Draw a plot showing the variation of power of a lens with the wavelength of incident light.

Watch Video Solution

202. A lens whose radii of curvature are different is forming the image of an object placed on its axis. If the lens is reversed, will the position of the image change ?

Watch Video Solution

203. The image of a candle is formed by a convex lens on a screen. If the lower half of the lens is painted black to make it completely opaque, will the full size of image be obtained ?

Watch Video Solution

204. A convex lens forms the image of the sun at a distance of $10cm$. Where will be the image when

(i) another lens of same power but dounle the aperture is used ?

(ii) another lens of same aperture but double the power is used ?

Watch Video Solution

205. An equiconvex lens of focal length $15 cm$ is cut into two equal halves in thickness. What is the focal length of each half ?

Watch Video Solution

206. A lens shown in Fig. 6(b).75 is made of two different materials. A point object is placed on the principal axis of the lens. How many images will be obtained ?

Watch Video Solution

207. What is focal length and power of a rectangular glass slab ?

Watch Video Solution

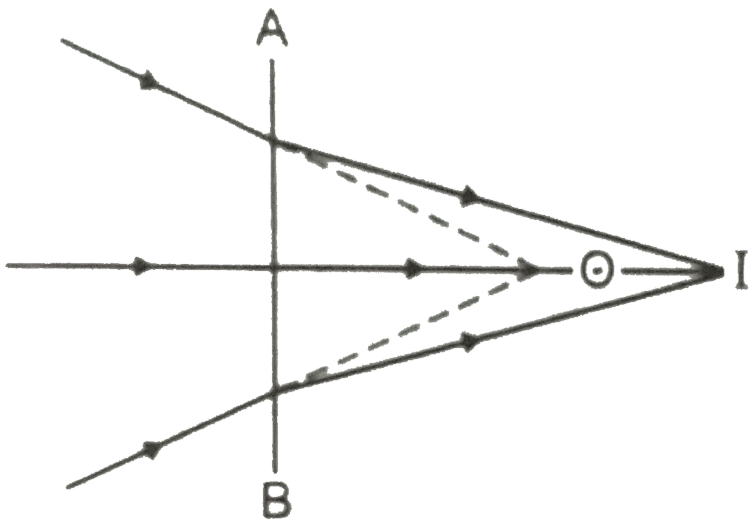
208. How does focal length of a convex lens change if violet light is used instead of red light.

Watch Video Solution

209. Two thin lenses of power $+3D$ and $-1D$ are held in contact with each other. Focal length of the combination is :

Watch Video Solution

210. In Fig., line AB represents a lens through which course of rays is as shwon. Is this lens convex or concave ?



Watch Video Solution

211. Explain with reason how the power of a diverging lens changes when

(i) it is kept in a medium of refractive by index greater than that of the lens.

(ii) incident red light is replaced by violet light.

Watch Video Solution

212. Calculate the deviation produced by a prism of angle 6°, given refractive index of the material of the prism is 1.644.

Watch Video Solution

213. A ray of light falling at an angle of 50° is refracted through a prism and suffers minimum deviation. The angle of the prism is 60°. Find the angle of minimum deviation and refractive index of the material of the prism.

Watch Video Solution

214. Calculate the dispersive power for crown glass from the given data

$\mu_v = 1.523$ and $\mu_r = 1.5145$.

Watch Video Solution

215. What is popularly known as 'A smile in the sky' ? How is it produced ?

Watch Video Solution

216. A ray of light passing through an equilateral triangular glass prism from air undergoes minimum deviation when angle of incidence is $\frac{3}{4}th$ of the angle of prism. Calculate speed of light in prism.

Watch Video Solution

217. A ray of light incident on an equilateral triangular glass prism of $\mu = \sqrt{3}$ moves parallel to the base of the prism inside it. What is the angle of incidence for this ray ?

Watch Video Solution

218. A thin prism of refracting angle 2° deviates an incident ray through an angle of 1°.Find the value of refractive index of material of prism.

Watch Video Solution

219. The angle of minimum deviation for prism of angle $\pi/3 is \pi/6$. Calculate the velocity of light in the material of the prism if the velocity of light in vacuum is $3 \times 10^{8} ms^{-1}$.

Watch Video Solution

Watch Video Solution

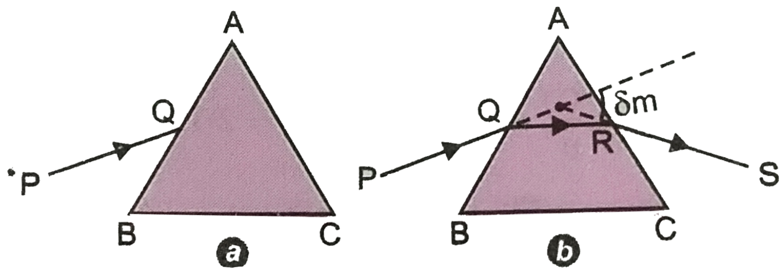
220. A ray of light passes through an equilateral prism (refractive index 1.5) such that angle of incidence is equal to angle of emergence and the latter is equal to $3/4th$ of the angle of prism. Calculate the angle of deviation.

Watch Video Solution

221. A prism of refractive index 1.53 is placed in water of refractive index 1.33. If the angle of prism is 60°, calculate the angle of minimum deviation in water.

Watch Video Solution

222. A ray PQ incident on face AB of a prism ABC, as shown in Fig., emerges from the face AC such that $AQ = AR$. Draw the ray diagram showing the pasage of the ray through the prism. If the angle of prism is 60° and refractive index of the material of the prism is $\sqrt{3}$, determine the values of angle of incidence and angle of deviation.



Watch Video Solution

223. A ray of light incident on face AB of an equilateral glass prism, shows minimum deviation of 30° .Calculate the speed of light through the prism.

Watch Video Solution

224. In the above example, find the angle of incidence at face AB, so that emergent ray grazes along the face AC' .

Watch Video Solution

225. White light is passed through a prism of 5°. If refractive indices for red and blue rays are

1.641 and 1.659 respectively, calculate the angular dispersion of the prism.

Watch Video Solution

226. Calculate the dispersive power for crown and flint glass prism from the following data :For crown glass, $m_b = 1.522, m_r = 1.514.$ For flint glass, $\mu'_b = 1.662, \mu'_r = 1.644$

Watch Video Solution

227. In a certain spectrum produced by a glass prism od dispersive power $0.031,$ it was found that

$\mu_r = 1.645$ and $\mu_b = 1.665$. What si the refractive index for yellow colour ?

Watch Video Solution

228. A combination of two prisms, one of flint and other of crown glass produces dispersion without deviation. The angle of flint glass prism is 15°. Calculate the angle of crown glass prism and angular separation of red and violet rays on emergence from the spectroscope. (μ for crown glass $= 1.52$, μ for flint glass $= 1.65$, ω for crown glass $= 0.02$, ω for flint glass $= 0.03$).

Watch Video Solution

229. A crown glass prism of refracting angle $A = 6^\circ$ is to be achromatised for red and blue light using a flint glass prism. Find the angle of flint glass prism (A') and also, the mean deviation from the following data : $\mu_b = 1.531$ $\mu_r = 1.520$ $\mu'_b = 1.684$ $\mu'_r = 1.662$

Watch Video Solution

230. A crown glass prism of refracting angle $A = 6^\circ$ is to be achromatised for red and blue light using a flint glass prism. Find the angle of flint glass prism (A') and also, the mean deviation from the following data : $\mu_b = 1.531$ $\mu_r = 1.520$ $\mu'_b = 1.684$ $\mu'_r = 1.662$

Watch Video Solution

231. An equilateral glass prism $(\mu = 1.6)$ is immersed in water $(\mu = 1.33)$. Calculate the angle of deviation produced for a ray of light incident at 40° on one face of the prism.

Watch Video Solution

232. A ray of light is incident at an angle of 60° on the face of a prism having refracting angle 30°. The ray emerging out of the prism makes an angle 30° with the incident ray. Show that the emergent ray is perpendicular to the face through which it emerges and calculate the refractive index of the material of prism.

Watch Video Solution

233. A 60° prism has a refractive index of 1.5. Calculate (a) the angle of incidence for minimum deviation (b) angle of minimum deviation (c) the angle of emergence of light at maximum deviation (d) angle of maximum deviation.

Watch Video Solution

234. In a spectrometer experiment, the angle of minimum deviation was found to be 48.6°. What is the percentage accuracy in the measurement of refractive index of the prism ? Given least count of spectrometer $= 0.2^\circ$ and angle of prism $= 60^\circ$.

Watch Video Solution

235. A prism is made of glass of unknown refractive index. A parallel beam of light is incident on a face of the prism. By rotating the prism, the minimum angle of deviation is measured to be 40°. What is the refractive index of the prism ? If the prism is placed in water $(\mu = 1.33)$, predict the new angle of minimum deviation of the parallel beam. The refracting angle of prism is 60°.

Watch Video Solution

236. Determine the value of the angle of incidence for a ray of light travelling from a medium of refractive index $\mu_1 = \sqrt{2}$ into the medium of refractive index $\mu_2 = 1$, so that it just grazes along the surface of separation.

Watch Video Solution

237. Why is there no dispersion of light refracted through a rectangular glass slab ?

Watch Video Solution

238. A ray of light falls normally on one face of a prism of angle 45°. If critical angle for material of the prism is

45°, trace the course of rays, calculate μ.

Watch Video Solution

239. Does a beam of white light give a spectrum on passing through a hollow prism ?

Watch Video Solution

240. What colour do you observe when white light passes through a blue and yellow filter ?

Watch Video Solution

241. Why does clear sky appear blue ?

Watch Video Solution

242. Why do clouds generally look white ?

Watch Video Solution

243. The sun looks reddish at the time of sunrise and sunset.

Watch Video Solution

244. what is the cause is due colour of ocean ?

Watch Video Solution

245. What is the wavelength region of visible spectrum ?

Watch Video Solution

246. For which colour, μ of material of a prism is

(i) minimum (ii) maximum ?

Watch Video Solution

247. Which colour deviates (i) most (ii) least on passing through a prism ?

Watch Video Solution

248. What is meant by dispersion of light ?

Watch Video Solution

249. What are the factors on which angular dispersion of a prism depend ?

Watch Video Solution

250. On what factors does the dispersive power of a prism depend ?

Watch Video Solution

251. What is angle of deviation through a prism ?

Watch Video Solution

252. On what factors does of deviation produced by a prism depend ?

Watch Video Solution

253. What is the relation between angle of prism A, angle of incidence i and angle of minimum deviation δ_m ?

Watch Video Solution

254. For which colour, red and blue, is the refractive index of glass greater ?

Watch Video Solution

255. A glass prism is immersed completely in water. How does angle of minimum deviation change ?

Watch Video Solution

256. When does a ray passing through a prism deviate away from the base of the prism ?

Watch Video Solution

257. In the minimum deviation position of a prism how are angle of incidence and angle of emergence related ?

Watch Video Solution

258. In the specturm of white light through a prism, violet colour is seen at the bottom. Why ?

Watch Video Solution

259. What is the purpose of adding "blue" to clothes ?

Watch Video Solution

260. What is a pure spectrum ?

Watch Video Solution

261. Give the formula that can be used to determine refractive index of material of a prism in minimum deviation position.

Watch Video Solution

262. What is an impure spectrum ?

Watch Video Solution

263. How does the speed of light in glass change

(a) on increasing the wavelength of light ?

(b) on increasing the intensity of light ?

Watch Video Solution

264. How is speed of light in vacuum affected by change in wavelength//intensity of light ?

Watch Video Solution

265. Which one, crown glass or flint glass, has a larger refractive index ?

Watch Video Solution

266. refractive indices of glass for blue, red and yellow colours are μ_b, μ_r and μ_y. Write them in decreasing order of values.

Watch Video Solution

267. What is the ratio of speed of IR rays and UV rays in vacuum ?

Watch Video Solution

268. Red light is incident on a converging lens of focal length f. State with reason hoe f will change if red light is replaced by blue light.

Watch Video Solution

269. A glass slab is placed over a page in which letters are printed in different colours. Will the image of all the letters lie in the same plane ?

Watch Video Solution

270. In the above question, which letter will appear to be raised maximum ?

Watch Video Solution

271. The intensity of light at a distance r from the axis of a long cylindrical source is inversely proportional to r.

Watch Video Solution

272. What is the essential difference between fluorescence and phosphroescence ?

Watch Video Solution

273. Why does a secoundary rainbow have inverted colours ?

Watch Video Solution

274. Why does one prefer a black umbrella to a white one, even in summer ?

Watch Video Solution

275. Why are danger signals red in colour ?

Watch Video Solution

276. What is meant by scattring of light ?

Watch Video Solution

277. (a) What is the essential condition for Rayleigh scattering ?

(b) In Rayleigh scattering, how is intensity of scattered light related to wavelength of light ?

Watch Video Solution

278. What happens when sixe of scatterer is much bigger than the wavelength of light ?

Watch Video Solution

279. what is a rainbow ? What is the essential condition for observing it ?

Watch Video Solution

280. In a primary rainbow, what is the order of colours ? And what is true for secondary rainbow ?

Watch Video Solution

281. Sodium lamps are used in foggy conditions because

Watch Video Solution

282. A man's shortest distance of distinct vision is $20cm$. What wil be the type and power of the spectacle lens which he would he would require to enable him to read a book at a distance of $60cm$?

Watch Video Solution

283. A person's far point is at $2m$. Find nature, focal length and power of the lens he must use to see distant objects clearly.

Watch Video Solution

284. Calculate the maximum magnifying power of a simple microscope consisting of a convex lens of focal length $5cm$. Distance of distinct vision is $25cm$.

Watch Video Solution

285. An astronomical telescope of magnifying power 7 consists of two thin lenses $40cm$ apart, in normal adjustment. Calculate the focal lengths of the lenses.

Watch Video Solution

286. In an astronomical telescope, focal length of eye piece is $5cm$ and focal length of objective is $75cm$. The final image is formed at the least distance of distinct vision ($= 25cm$) from the eye. What is the magnifying power of the telescope ?

Watch Video Solution

287. A person wears glasses of power $-2.5D$. Is the person short sighted or long sighted ? What is the far point of the person without glasses ?

Watch Video Solution

288. The near point of a hypermetropic person is $50cm$ from the eye. What is the power of the lens required to enable him to read clearly a book held at $25cm$ from the eye ?

Watch Video Solution

289. The far point of a myopic person is $150cm$ in front of the eye. Calculate the focal length and power of a lens required to enable him to see distant objects clearly.

Watch Video Solution

290. A person wears eye glasses with a power of $-5.5D$ for distance viewing. His doctor prescribes a correction of $+1.5D$ for his near vision. What is the focal length of his distance viewing part of the lens and also for near vision section of the lens ?

Watch Video Solution

291. A hypermetropic person whose near point is at $100cm$ wants to read a book at $25cm$. Find the nature and power of the lens needed.

Watch Video Solution

292. What focal length should the reading spectacles have for a person whose near point is $50cm$? (NCERT Solved Example)

Watch Video Solution

293. A short sighted person can see objects most distinctly at a distance of $16cm$. If he wears spectacles at a distance of $1cm$ from the eye, what focal length should he have so as to enable him to see distinctly at a distance of $26cm$?

(c) The person above prefers to remove his spectacles while reading a book. Explain why ? (NCERT Solved Example)

294. (a) The far point of a myopic person is $80cm$. In front of the eye. What is the power of the lens required to enable him to see very distant objects clearly ?

(b) In what way does the corrective lens help the person above ? Does the lens magnify very distant objects ? Explain carefully.

(c) The person above prefers to remove his spectacles while reading a book. Explain why ?

Watch Video Solution

295. (a) The near point of a hypermetropic person is at $75cm$ from the eye. What is the power of the lens required to enable him to read clearly a book held at $25cm$ from the eye ?

(b) In what way does the corrective lens help the person above ? Does the lens magnify objects held near the eye ?

(c) The person above prefers to remove his spectacles while looking at the sky. Explain why ?

Watch Video Solution

296. (a) A person can see clearly upto $80cm$. He uses spectacles of -$0.80 dioptre$, how far can he see clearly ?

(b) If a person uses spectacles of power $+1.0 dioptre$, what is the nearest distance of distinct vision for him ? Given that near point of the person is $75cm$ from the eye.

Watch Video Solution

297. A certain person can see clearly objects lying between $20cm$ and $250cm$ from his eye. What spectacles are required to enable him to see distant objects clearly ? When he is wearing these spectacles, what is his least distance of distinct vision ?

Watch Video Solution

298. A simple microscope is a combination of two lenses of power $+15D$ and $+5D$ in contact. Calculate magnifying power of microscope, if final image is formed at $25cm$ from the eye.

Watch Video Solution

299. A child has near point at $10cm$. What is the maximum angular magnification the child can have with a convex lens of focal length $10cm$?

Watch Video Solution

300. The focal lengths of objective and eye piece of a microscope are $1.25cm$ and $5cm$ respectively. Find the position of the object relative to the objective in order to obtain an angular magnification of 30 in normal adjustment.

Watch Video Solution

301. A compound microscope with an objective of $1.0cm$ focal length and an eye piece of $2.0cm$ focal length has a tube length of $20cm$. Calculate the magnifying power of microscope is final image is formed at the near point of eye.

Watch Video Solution

302. A compound microscope uses an objective lens of focal length $4cm$ and eye lens of focal length $10cm$. An object is placed at $6cm$ from the objective lens. Calculate magnifying power of compound microscope if final image is formed at the near point. Also, calculate length of the tube of compound microscope.

Watch Video Solution

303. A man with normal near point (25 cm) reads a book with small print using a magnifying glass : a thin convex lens of focal length $5cm$.

(a) What are the closest and the farthest distances at which he can read the book when viewing through the magnifying glass ?

(b) What is the maximum and the minimum angular magnifications (magnifying powers) possible using the above simple microscope ?

Watch Video Solution

304. You are given two converging lenses of focal lengths $1.25cm$ and $5cm$ to design a compound microscope. If it is desired to have a mignification of 30, find out separation between the objective and eye piece.

Watch Video Solution

305. A person uses $+1.5D$ glasses to have normal vision from $25cm$ onwards. He uses a $20D$ lens as a simple microscope to see an object. Calculate the maximum magnifying power, if he uses the microscope

(a) together with his glasses

(b) without the glasses.

Watch Video Solution

306. A compound microscope has an objective of focal length $1cm$ and an eye piece of focal length $2.5cm$ away frm the object has to be placed at a distance of $1.2cm$ away from the objective for normal adjustment. Find the angular mignification and length of the microscope tube.

Watch Video Solution

307. The total magnification produced by a compound microscope is 20. The magnification produced by the eye piece is 5. The microscope is focussed on a certain object. The distance between the objective and eye piece is observed to be $14cm$. If least distance of distinct vision is

$20cm$, calculate the focal length of objective and eye piece.

Watch Video Solution

308. The focal lengths of the objective and eye piece of a compound microscope are $4cm$ and $6cm$ respectively. If an object is placed at a distance of $6cm$ from the objective, calculate the magnification produced by the microscope. Take distance of distinct vision $= 25cm$.

Watch Video Solution

309. An astronomical telescope consists of the thin lenses, $36cm$ apart and has a magnifying power 8.

Calculate the focal length of lenses. Two stars have an actual separation of one minute of arc. Find the angle of separation as seen through the telescope.

Watch Video Solution

310. A small telescope has an objective lens of focal length $150cm$ and and eye piece of focal length $5cm$. If his telescope is used to view a $100m$ high tower $3km$ away, find the height of the final image when it is formed $25cm$ away from the eye piece.

Watch Video Solution

311. The diameter of the moon is $3.5 \times 10^3 km$ and its distance from the earth is $3.8 \times 10^5 km$. It is viewed by a telescope which has $f_o = 4m$ and $f_e = 10cm$. Find the angle subtended at the eye by the final image.

Watch Video Solution

312. An astronomical telescope has a magnifying power of 10. In normal adjustment, distance between the objective and eye piece is $22cm$ calculate focal length of objective lens.

Watch Video Solution

313. A telescope has an objective of focal length $50cm$ and eye piece of focal length $5cm$. The least distance of distinct vision is $25cm$. The telescope is focussed for distinct vision on a scale $200cm$ away from the objective. Calculate

(i) the separation between objective and eye piece

(ii) the magnification produced.

Watch Video Solution

314. In an astronomical telescope, focal length of objective lens is $75cm$ and that of eye piece is $5cm$. Calculate the magnifying power and the distance between the two lenses, when final image of distant object is seen at a distance of $25cm$ from the eye.

Watch Video Solution

315. A telescope has an objective of focal length $30cm$ and an eye piece of focal length $3.0cm$. It is focussed on a scale distant $2.0m$. For seeing with relaxed aye, calculate the separation between the objective and eye piece.

Watch Video Solution

316. The focal lengths of the objective and eye piece of an astronomical telescope are $25cm$ and $2.5cm$ respectively. The telescope is fucussed on an object $1.5m$ from objective, the final image being formed $25cm$ from eye of the observer. Calculate the length of the telescope.

Watch Video Solution

317. The separation between the eye piece of focal length $0.3m$ and objective of focal length $0.4m$ of a microscope is $0.2m$. The eye piece and objective are to be interchanged such that the angular magnification of the instrument remains the same. What is the new separation between the lenses ?

Watch Video Solution

318. A reflecting type telescope has a large concave spherical mirror of radius of curvature $80cm$ as objective. What is the magnifying power of telescope if eye piece used has a focal length of $1.6cm$?

Watch Video Solution

319. Why do some people use bifocal lenses ?

Watch Video Solution

320. A girl is using speces of $f = -50cm$. Name the defect of her vision and calculate power of lens to be used.

Watch Video Solution

321. Why has nature given us two eyes instead of one ?

Watch Video Solution

322. The diameter of the sun is $\approx 10^9 m$, but it appears to be a small disc, why ?

Watch Video Solution

323. The diameter of sun is several hundred times bugger than the moon, still at the time of solar eclips, the entire sun is covered by the moon. How ?

Watch Video Solution

324. Why should the objective of a microscope be of small aperture ?

Watch Video Solution

325. A telescope has been adjusted for relaxed eye. How will you change the distance between objective lens and eye if final image is to be seen at the least distance of distinct vision ?

Watch Video Solution

326. How will you distinguish between a compound microscope and a telescope just by looking at them ?

Watch Video Solution

327. By increasing the diameter of the objective of telescope, we can increase its range, why ?

Watch Video Solution

328. How does magnifying power change with change in length of tube for a given telescope ?

Watch Video Solution

329. Hoe does magnifying power change with change in length of tube for a given microscope ?

Watch Video Solution

330. (a) List some advantanges of a reflecting telescope, especially for high resolution astronomy.

(b) A reflecting type telescope has a large mirror for its objective with radius of curvature equal to $80cm$. What is the magnifying power of telescope if eye piece used has a focal length of $1.6cm$?

Watch Video Solution

331. The objective of telescope A has a diameter 3 times that of the objective of telescope B. How much greater amount of light is gathered by A compound to B ? Show that range of A is three times the range of B.

Watch Video Solution

332. What is blind spot ?

Watch Video Solution

333. What is yellow spot ?

Watch Video Solution

334. What is meant by accommodation of the eye ?

Watch Video Solution

335. What is range of vision ?

Watch Video Solution

336. What is the least distance of distinct vision for a normal eye ? Is it the same as the distance of near point ?

Watch Video Solution

337. A short sighted person may read a book without specs. Comment.

Watch Video Solution

338. A hypermetropic person has problem in driving without specs.

Watch Video Solution

339. A person looking at a mesh of crossed wires is able to see the vertical wires more distincly than the horizontal wires. Why ? How can it be corrected ?

Watch Video Solution

340. What is meant by depth of focus ?

Watch Video Solution

341. What is visual angle ?

Watch Video Solution

342. An astronomical telescope uses lenses of power $10D$ and 1 D`. What is its magnifying power in normal adjustment ?

Watch Video Solution

343. Why is the aperture of objective lens of a telescope taken large ?

Watch Video Solution

344. Why is power of objective lens of a telescope kept as small as possible ?

Watch Video Solution

345. Why does Galilean telescope have a smaller field of view ?

Watch Video Solution

346. In which, microscope or telescope, the difference in the focal lengths of the two lenses is larger ?

Watch Video Solution

347. Why do we prefer a maginfying glass of smaller focal length ?

Watch Video Solution

348. What do you understand by normal adjustment of a telescope ?

Watch Video Solution

349. What is the distance between objective and eye lens of telescope in normal adjustment ?

Watch Video Solution

350. Objective of a compound microscope should have small focal length. Why ?

Watch Video Solution

351. why should objective of a telescope have larger focal length ?

Watch Video Solution

352. Can a terrestrial telescope be used far observing astronomical objects ?

Watch Video Solution

353. What is the main limitation of Galileo's telescope ?

Watch Video Solution

354. What is the eye ring of a telescope or microscope ?

Watch Video Solution

355. Is angular magnification of a telescope equal to ratio of diameters of objective and eye lens ?

Watch Video Solution

356. What is meant by focal plane of a lens ?

Watch Video Solution

357. Does the magnifying power of a microscope depend on colour of light used ? Justify your answer.

Watch Video Solution

358. Where does a myopic eye focus the parallel rays falling in it ?

Watch Video Solution

359. Give one possible cause of hypermetropia.

Watch Video Solution

360. What is the difference between hypermetropia and presbyopia ?

Watch Video Solution

361. A myopic person prefers to remove his spectacles while reading a book. Why ?

Watch Video Solution

362. Through a simple microscope, an object is seen in red light first and then in violet light. In which case is magnifying power more ?

Watch Video Solution

363. The diameter of onjective of a telescope is doubled. What is its effect on intensity of image seen ?

Watch Video Solution

364. In the above question, how does the magnifying power change ?

Watch Video Solution

365. Can a microscope function as a telescope by inverting it. Can a telescope function as a microscope ?

Watch Video Solution

366. How does the magnifiaction of a magnifying glass differ from its magnifying power ?

Watch Video Solution

367. What is meant by range of a telescope ?

Watch Video Solution

368. By increasing the diameter of the objective of telescope, we can increase its range, why ?

Watch Video Solution

369. Name the factors on which brightness of image in a camera depends and how ?

Watch Video Solution

370. What is the relation between magnifying power and resolving power of a telescope ?

Watch Video Solution

371. Using the data given below, state which two of the given lenses will you prefer to construct a best possible (i) telescope (ii) microscope. Also, indicate which of the selected lenses is to be used as an objective and as an eye piece in each case

Lenses,L_1, L_2, L_3

Power(P), 6 D,3 D, 10 D

Aperture (A), 1 cm, 8 cm, 1 cm.

Watch Video Solution

372. Four double convex lenses with following specifications are available

Lens, A, B, C, D,

focal length, 100 cm, 100 cm, 10 cm, 5 cm,

aperture, 10 cm, 5 cm,2 cm, 2 cm.

Which of the given four lenses should be selected as objected and eyepiece to construct an astronomical telescope and why ? What will be the magnifying power and length of the tube of the telescope ?

Watch Video Solution

373. From the data of four lenses given in $Q.4$ which one will you select as objective of a compound microscope and which one as eye lens ? How can the magnifying power of such a microscope be increased ?

Watch Video Solution

374. State the condition under which a large magnification can be achieved in an astronomical telescope.

Watch Video Solution

375. Name common optical defects of eye. How are thry removed ?

Watch Video Solution

376. Explain what is meant by myopia and hypermetropia. How are they caused ? Briefly explain their removal.

Watch Video Solution

377. Draw course of rays through a compound microscope. Deduce an expression for its magnifying power. How can the magnifying power be increased ?

Watch Video Solution

378. Describe a reflecting type telescope. What are its advantage over the refracting telescope ?

Watch Video Solution

379. The relation between focal length f and radius of curvature R of a spherical mirror is.

Watch Video Solution

380. what is the relation between f and R of a spherical mirror ?

Watch Video Solution

381. Give some practical applications of spherical mirrors.

Watch Video Solution

382. Name two types of spheircal mirrors, Define pole, centre of curvature and angular aperture of the mirror.

Watch Video Solution

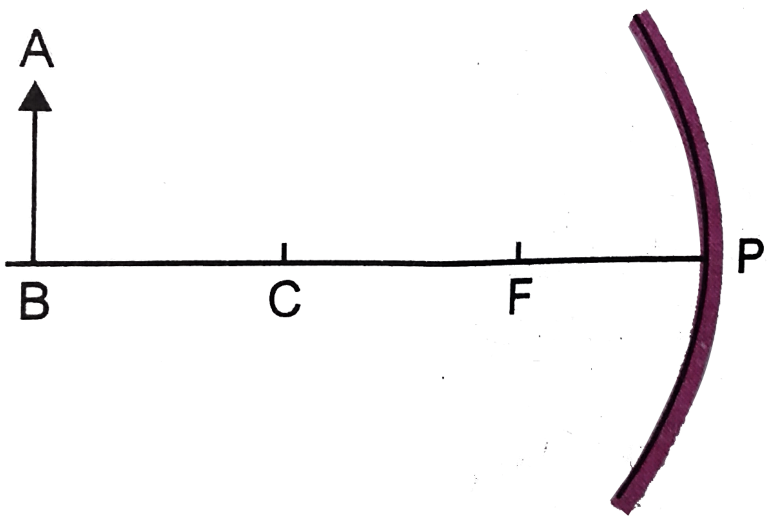
383. What is meant by linear magnification of spherical mirrors ? Deduce the formula for the same.

Watch Video Solution

384. Establish relation between the speeds of object and image formed by a spherical mirror.

Watch Video Solution

385. An object AB is kept in front of a concave mirror as shown in Fig.



(i) Complete the ray diagram showing the image formation of the object.

(ii) How will the position and intensity of the image be affected surface is painted black ?

Watch Video Solution

386. A ray of light suffers lateral displacement on passing through a parallel sided glass slab. What is the maximum possible value of lateral displacement ?

Watch Video Solution

387. Prove that $\mu = \frac{1}{\sin C}$' where C is the critical angle.

Watch Video Solution

388. What are optical fibers ? Give three appilications of these fibres.

Watch Video Solution

389. A microscope is focussed on a dot on the bottom of the beaker. Some oil is poured into the beaker to a height of $y cm$ and it found necessary to raise the microscope through a vertical distance of $x cm$ to bring the dot again into focus. Express refractive index of oil in terms of x and y.

Watch Video Solution

390. What is meant by power of a lens ? What is one dioptre ?

Watch Video Solution

391. How do magnification and focal length change for a combination of thin lenses ?

Watch Video Solution

392. What is meant by refraction of light ? State the laws of refraction. Show that emergent ray from a glass slab is parallel to incident ray.

Watch Video Solution

393. Explain the phenomenon of total internal reflection. What are the conditions for the phenomenon ? Explain the meaning of critical angle.

Watch Video Solution

394. Show by drawing ray diagrams how a totally reflecting glass prism can be used to deviate a ray of light through (i) 90° (ii) 180° and invert it.

Watch Video Solution

395. Define total internal reflection. State its conditions. How do optical fibres transmit light without absorption.

Watch Video Solution

396. Describe briefly any three applications of total internal reflection.

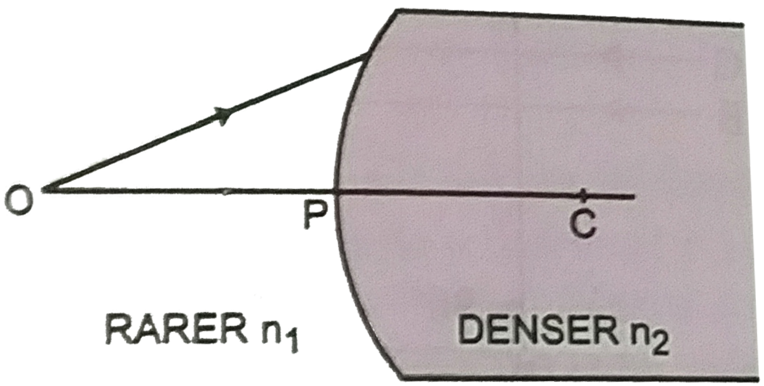
Watch Video Solution

397. Prove that $\frac{-\mu_1}{u} + \frac{\mu_2}{v} = \frac{\mu_2 - \mu_1}{R}$ when refraction occurs from rarer to denser medium at a concave spherical refracting surface.

Watch Video Solution

Watch Video Solution

398. A spherical of radius of curvature R, separates a rarer and a denser medium as shown in Fig. Complete the path of the incident ray of light, showing the formation of a real image. Hence derive the relation connecting object distance u, image distance v, radius of curvature R and the refractive indices n_1 and n_2 of the two media. Briefly explain how the focal length of a convex lens changes with increase in wavelength of incident light.



Watch Video Solution

399. Discuss briefly refraction from rarer to denser medium at a concave spherical refracting surface.

Watch Video Solution

400. Discuss refraction from denser to rerer medium at a convex spherical refracting surface.

Watch Video Solution

401. Derive lens maker's formula for a thin convex lens.

Watch Video Solution

Watch Video Solution

402. Draw a ray diagram to show the formation of the image of an object placed between the optical centre and focus of a convex lens. Deduce the relationship between object distance, image disatnce and focal length of lens.

Watch Video Solution

403. Derive lens formula for a concave lens.

Watch Video Solution

404. Obtain an expression for focal length of a combination of thin lenses in contact.

Watch Video Solution

405. what is a rainbow ? What is the essential condition for observing it ?

Watch Video Solution

406. Why does sky look blue and clouds look white?

Watch Video Solution

407. The sun looks reddish at the time of sunrise and sunset.

Watch Video Solution

408. Violet colour is seen at the bottom of the spectrum, when white light is dispersed by a prism. Explain.

Watch Video Solution

409. What is meant by dispersion of light ?

Watch Video Solution

410. Discuss the phenomenon of refraction through a prism. Prove that $\delta = (\mu - 1)A$ where the symbols have their usual meaning.

Watch Video Solution

411. State and prove prism formula.

Watch Video Solution

412. Define refractive index of a transparent medium. A ray of light passes through a triangular prism. Plot a graph showing the variation of angle of deviation with the angle of incidence.

Watch Video Solution

413. Explain the terms angular dispersion and dispersive power. How are the two related ?

Watch Video Solution

414. Briefly explain the phenomenon of scattering of light giving some examples.

Watch Video Solution

415. What is Raman Effect ? Give some of the salient features of this effect.

Watch Video Solution

416. A plane surface separates a denser medium of refractive index 1.5 from air. A plane wavefront travelling in air is incident on the interface at an angle of 30°. What will be the angle of refraction ?

Watch Video Solution

417. Light of wavelength 5890Å travelling in air enters water of $\mu = 4/3$. What will be the frequency and wavelength of light in water ?

Watch Video Solution

418. Light waves from two coherent sources having intensities I and $2I$ cross each other at a point with a phase diff. of 60°. What is the resultant intensity at the point ? If the sources were incoherent, what would be the resultant intensity ?

Watch Video Solution

419. Light waves form two coherent source having intensity ration $81:1$ produce interference. Then, the ratio of maxima and minima in the interference pattern will be

Watch Video Solution

420. If two slits in $YDSE$ have width ratio $4:1$, deduce the ratio of maxima and minima in the interference pattern.

Watch Video Solution

421. Two slits $0, 125mm$ apart are illuminated by light of wavelength 4500Å. The screen is $1m$ away, from the plane of the slits. Find the separation between the 2nd bright fringe on both sides of the central maximum.

Watch Video Solution

422. Light of wavelength $500nm$ is incident on two slits separated by $1mm$ in YDSE. What is the width of each dark band if the screen is $1 metre$ away from the slits ?

Watch Video Solution

423. In a moving car, radio signals are interrupted sometimes. Why ?

Watch Video Solution

424. Why cannot we obtain interference using two independent source of light ?

Watch Video Solution

425. The refractive index of diamond is 2.47 and that of window glass is 1.51. Find the ratio of speed of light in glass and diamond.

Watch Video Solution

426. Refractive index of air is 1.0003. The correct thickness of air column which will have one more wavelength of yellow light (6000Å) than in the same thickness in vacuum is

Watch Video Solution

427. Calculate the time taken by light to travel a distance of $10km$ in water of refractive index $4/3$.

Watch Video Solution

428. A light wave has a frequency of $5 \times 10^{14} Hz$. Find the difference in its wavelenghts in alcohol of refractive index 1.35 and glass of refractive index 1.5.

Watch Video Solution

429. Two plane monochromatic waves propagating in the same direction with amplitudes A and $2A$ and differing un phase by $\pi/3$ superimpose. Calculate the amplitude of the resulting wave.

Watch Video Solution

430. In a Young's double slit experiment, the intensity of light at a point on the screen where the path difference is λ is K units. Find the intensities at a point, where path diff. is

(i) $\lambda/4$ (ii) $\lambda/2$.

Watch Video Solution

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

Watch Video Solution

432. If the two slits in Young's experiment have width ratio $1:4$, deduce the ratio of intensity at maxima and minima in the intereference pattern.

Watch Video Solution

433. Find the ratio of intensities at the two points X and Y on a screen in Young's double slit experiment, where waves from the two source S_1 and S_2 have path difference of zero, and $\lambda/4$ respectively.

Watch Video Solution

Watch Video Solution

434. In Young's double slit experiment using monochromatic light of wavelength λ, the intensity of light at a point on the screen where path diff. is λ is K units. Find the intensity of light at a point where path difference is $\lambda/3$.

Watch Video Solution

435. The ratio of intensities of minima to maxima in Young's double slit experiment is $9:25$. Find the ratio of width of two slits.

Watch Video Solution

436. Light waves from two coherent source arrive at two points on a screen with path difference 0 and $\lambda/2$. Find the ratio of intensities at the points.

Watch Video Solution

437. Laser light of wavelength $630nm$ incident on a pair of slits produces an interference pattern where bright fringes are separated by $8.1mm$. Another light produces the interference pattern, where the bright fringes are separated by $7.2mm$. Calculate the wavelength of second light.

Watch Video Solution

438. In Young's double slit experiment, the light has a frequency of $6 \times 10^{14} Hz$ and the distance between the centres of adjacent fringes is $0.75 mm$. If the screen is $1.5 m$ away, what is the distance between the slits ?

Watch Video Solution

439. In Young's experiment, two slits are $0.2 mm$ apart. The interference fringes for light of wavelength $6000 Å$ are formed on a screen $8 cm$ away.

(a) How far is the second bright fringes from the central image ?

(b) How far is the second dark fringe from the central fringe ?

Watch Video Solution

440. Two slits are made one millimeter apart and the screen is placed one metre away. When blue-green light of wavelength 500 nm is used, the fringe separation is

Watch Video Solution

441. In Young's double slit experiment, the two slits $0.15mm$ apart are illuminated by light of wavelength $450nm$. The screen is $1.0m$ away from the slits. Find the distance of second bright fringe and second dark fringe from the central maximum. How will the fringe pattern change if the screen is moved away from the slits ?

Watch Video Solution

442. In YDSE, slits are separated by $0.24mm$ and the screen is kept $160cm$ away from slits. If fringe width is measured to be $0.4cm$, calculate the wavelength of light used.

Watch Video Solution

443. A beam of light consisting of two wavelength $800nm$ and $600nm$ is used to obtain the interference fringes in YDSE on a screen held $1.4m$ away. If the two slits are separated by $0.28mm$, calculate the least distance from thecentral bright maximum, where the bright fringes of the two waveength coincide.

Watch Video Solution

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

Watch Video Solution

445. The ratio of the intensity at the centre of a bright fringe to the intensity at a point one-quarter of the distance between two fringe from the centre is

Watch Video Solution

446. Find the maxinum intensity in case of interference of n identical waves each of intensity I_0 if the interference is (a) coherent and (b) incoherent.

Watch Video Solution

447. In a Young's double slit experiment $\lambda = 500 nm, d = 1.0 mm$ and $D = 1.0 m$. Find the minimum distance from the central maximum for which the intensity is half of the maximum intensity.

Watch Video Solution

448. In YDSE, two slits are separated by $3mm$ and illuminated by light of wavelength $480nm$. The screen is $2m$ from the plane of slits. Calculate the separation between 8th bright fringe and 3rd dark fringe observed on the same side of central bright fringe.

Watch Video Solution

449. Light of wavelength 6000Å is incident on a thin glass plate of refractive index 1.5 such that angle of refraction

into the plate is 60°. Calculate the smallest thickness of plate which will make it appear dark by reflection.

Watch Video Solution

450. When monochromatic light travels from one medium to another, its wavelength changes, but its frequency remains the same. Why ?

Watch Video Solution

451. Define the term coherence for light waves.

Watch Video Solution

452. In YDSE, two slits are illuminated by two light sources of same wavelength. Will you observe interference pattern ?

Watch Video Solution

453. Two identical coherent waves each of intensity I_0 are producing interference pattern. What are the values of resultant intensity at a point of (i) constructive interference (ii) destructive interference ?

Watch Video Solution

454. In YDSE, one of two slits is covered by a transparent paper which transmits only half the ligth intensity. How will the intensity of maxima and minima change ?

Watch Video Solution

455. Why does an excessively thin film appear black in reflected light ?

Watch Video Solution

456. Which phenomena establish the wave nature of light ?

Watch Video Solution

457. Show that maximum intensity in interference pattern is four times the intensity due to each slit. Hence show that interference involves only redistribution of energy.

Watch Video Solution

458. The two slits in Young's double slit experiment are illuminated by two different sodium lamps emitting light of the same wavelength. No interference pattern will be observed on the screen.

Watch Video Solution

459. The phase difference between light waves from two slits of Young's experiment is π radian. Will the central fringe be bright or dark ?

Watch Video Solution

460. Light from two coherent sources is reaching a point where path difference for yellow light is $3\lambda/2$. What will be the colour of the fringe at that point ?

Watch Video Solution

461. What is the difference in the origin of colours of a soap bubble seen in sun ligth and the colours emerging from a prism ?

Watch Video Solution

462. What are coherent sources of light ? Why nointerference pattern is observed when two coherent sources are (i) too close (ii) very far apart ?

Watch Video Solution

463. What are coherent sources of light ? Why nointerference pattern is observed when two coherent sources are (i) too close (ii) very far apart ?

Watch Video Solution

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

Watch Video Solution

465. What is effect on the interference fringes in a Young's double slit experiment due to each of the following operations :

(a) the screen is moved away from the plane of the slits,

(b) the monochromatic source is replaced by another monochromatic source of shorter wavelength,

(c) the separation between the two slits is increased,

(d) the source slit is moved closer to the double slit plane,

(e) the width of the source slit is increased.

(f) the width of two slits are increased,

(g) the monochromatic source is replaced by a source of white light ?

(In each operation, take all parameters, other than the one specified, to remain unchanged) NCERT Solved Example

Watch Video Solution

466. Why cannot we obtain interference using two independent source of light ?

Watch Video Solution

467. Find the intensity at a point on a screen in YDSE, where the interfering waves of equal intensity have a path difference of (i) $\lambda/4$ (ii) $\lambda/3$.

Watch Video Solution

468. A and B are two points on water surface where waves are generated. What is the phase diff. if

(i) A and B are on same wavefront separated by distance λ.

(ii) A and B are on successive crests separated by distance 2λ.

(iii) A and B are on successive troughs separated by distance 3λ.

Watch Video Solution

469. Over a given wavefront, is the amplitude constant ?

Watch Video Solution

470. A light wave enters into glass from water. How are its energy and frequency affected ?

Watch Video Solution

471. What si a wavelength ?

Watch Video Solution

472. What is the geomatrical shape of wavefront emitted from a source in the form of narrow slit ?

Watch Video Solution

473. A plane wavefront is incident normally on a convex lens. Sketch the reflected wavefront emerging from the lens.

Watch Video Solution

474. What is the relation between path diff. and wavelength for constructive interference of two waves ?

Watch Video Solution

475. what is the relation between path diff. and wavelength for destructive interference ?

Watch Video Solution

476. What is the shape of interference fringes in YDSE ?

Watch Video Solution

477. In YDSE, what is the ratio of fringe width for bright and dark fringes ?

Watch Video Solution

478. Does the phenomenon of interference violate the energy conservation principle ?

Watch Video Solution

479. Two waves pf amplitude $3nm$ and $5nm$ reach a point in opposite phases. What is the resultant amplitude ?

Watch Video Solution

480. What is the ratio of slit widths when amplitudes of light waves from them have ratio $\sqrt{3}:\sqrt{2}$?

Watch Video Solution

481. What is the geomatrical shape of the wavefront when a plane wave passes through a convex lens ?

Watch Video Solution

482. Out of speed, frequency and wavelength, name the parameter (s) which remain the same on reflection.

Watch Video Solution

483. Out of speed, frequency and wavelength, name the parameter (s) which remain the same on refraction.

Watch Video Solution

484. Out of electric field vector, $\vec{E}$ and magnetic field vector, vec(B)` in an electromagnetic wave, which is more effective and why ?

Watch Video Solution

485. Why cannot we obtain interference using two independent source of light ?

Watch Video Solution

486. When a wave undergoes reflection at a denser medium, what happens to its phase ?

Watch Video Solution

487. If a wave undergoes refraction, what happens to its phase ?

Watch Video Solution

488. In Young's doube slit experiment, what is the effect of following operations on interference fringes :

(i) The screen is moved away from the plane of the slits.

(ii) The monochromatic source is replaced by another monochromatic source of smaller wavelength.

(iii) The monochromatic source is replaced by a source of white light.

(iv) The width of the source slit is made wider

(v) The separation between the two slits is increased.

(vi) The distance between the source slit and the plane of the two slits is increased.

(vii) The width of each of the two slits is of the order of wavelength of light source.

Watch Video Solution

489. what type of wavefront will emerge from (i) a point source and (ii) distant light source ?

Watch Video Solution

490. In Young's double slit experiment, three lights, blue, yellow and red are used successively. For which colour, will the fringe width be maximum ?

Watch Video Solution

491. The refractive index of glass is 1.5 for light waves of $\lambda = 6000\text{Å}$ in vaccume. Calculate their wave length in glass.

Watch Video Solution

492. Calculate time taken by light to travel $1cm$ thickness of glass of $\mu = 1.5$.

Watch Video Solution

493. What is the main condtion to produce interference of light ?

Watch Video Solution

494. In Young's double slit experiment, the intensity of central maximum is I. What will be the intensity at the same place if one slit is closed ?

Watch Video Solution

495. What wil be the effect on the fringes, if Young's double slit experiment set up is immersed in water ?

Watch Video Solution

496. What is the phase difference corresponding to path difference λ of two waves reaching a point ?

Watch Video Solution

497. Does interference of light give information about longitudinal/transverse nature of light waves ?

Watch Video Solution

498. Which of the two colours red and violet travels slower in glass prism.

Watch Video Solution

499. How is a wavefront related to the direction of corresponding rays ?

Watch Video Solution

500. What is the phase difference between any two points on a wavefront ?

Watch Video Solution

501. Bubbles of colourless soap solution appear coloured in sun light. Why ?

Watch Video Solution

502. Two waves of amplitudes $3mm$ and $2mm$ reach a point in the same phase. What is the resultant amplitude ?

Watch Video Solution

503. Differential between a ray and a wavefront.

Watch Video Solution

504. Two waves of amplitude $5mm$ and $7mm$ reach a point in opposite phase. What is the resultant amplitude ?

Watch Video Solution

505. The phase difference between two waves reaching a point is $\pi/2$. What is the resultant amplitude, if the individual amplitudes are $3mm$ and $4mm$?

Watch Video Solution

506. Widths of two slits in Young's experiment are in the ratio $4:1$. What is the ratio of the amplitudes of light waves from them ?

Watch Video Solution

507. How would the angular separation of interference fringes in Young's double slit experiment change when the distance of separation between slits and screen is doubled ?

Watch Video Solution

508. What are the essential conditions for two light waves to be coherent ?

Watch Video Solution

509. What happens to the interference pattern if phase difference between two light sources varies continuously ?

Watch Video Solution

510. What happens to light energy when light waves interfere destrutively at a point ?

Watch Video Solution

511. In YDSE, when the entire apparatus is immersed in water, what happens to fringe width ?

Watch Video Solution

512. Why does a soap buuble show beautiful colours, when illuminated by white light ?

Watch Video Solution

513. Do interference effects occur for sound waves ? Recall that sound is a longitudinal mechanical wave while light is transverse and non- mechanical ?

Watch Video Solution

514. Oil floating on water looks cloured due to interference of light. What should be the approximate thickness of the film for such effects to be visible ?

Watch Video Solution

515. Mark the statement true or false :

`(a) In Young's double slit expt, performed with a source of white light, only black and white fringes are observed.

(b) Two slits in Young's double slit expt are illuminated by by two different sodium lamps emitting light of same wavelength. No interference pattern will be obtained.

Watch Video Solution

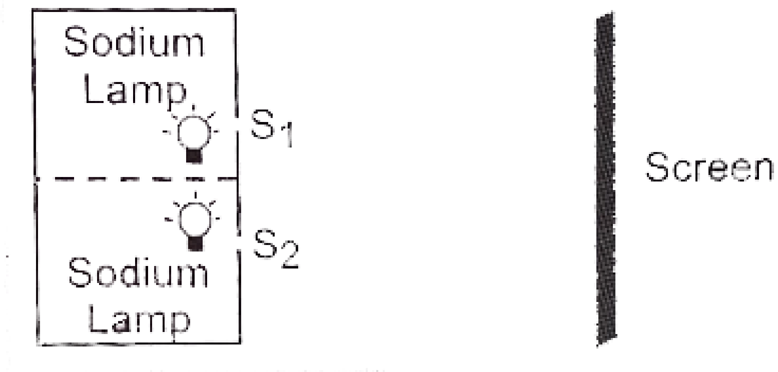
516. What are coherent sources of light ? Why nointerference pattern is observed when two coherent sources are (i) too close (ii) very far apart ?

Watch Video Solution

517. Explain the statement 'light added to light can produce darkness'.

Watch Video Solution

518. In the set up shown in Fig. will you observe interference fringes on the screen ?



Watch Video Solution

519. What is a wavefront ? State its relation with ray of light.

Watch Video Solution

520. What are the essential conditions for two light waves to be coherent ?

Watch Video Solution

521. State and explain Huygens principles. Name the type of wave front that corresponds to a beam of light.

(i) coming from a convex lens when point sources is placed its focus,

(ii) coming from very far off source,

(iii) diverging redially from a point source.

Watch Video Solution

522. What is meant by the term 'interference of light' ? Write any two conditions necessary for obtaining well define and sustained interfernce pattern of light.

Watch Video Solution

523. What is meant by wavefront ? Explain three types of wave front.

Watch Video Solution

524. State and explain superposition principle. Does it apply to electromagnetic waves?

Watch Video Solution

525. What are coherent sources of light ? Why are coherent sources required to obtain sustained interference pattern ?

Watch Video Solution

526. What is meant ny interference of light ? Describe briefly Young's double slit experiment to demonstrate of light.

Watch Video Solution

527. Derive the conditons for constructive and destrutive interference.

Watch Video Solution

528. Prove that the law of conservation of energy is obeyed during interference of light.

Watch Video Solution

529. What do you understand by fringe width ?

Derive an expression for fringe width in the interference pattern.

Watch Video Solution

530. 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.

Watch Video Solution

531. Determine the angular spread between central maximum and first order maximum of the diffraction pattern due to a single slit of width $0.25mm$, when light of wavelength $5890Å$ is incident on it normally ?

Watch Video Solution

532. Light of wavelength 5000Å is diffrated by an aperture of width $2mm$. For what distance by the diffracted beam does the spreading due to diffraction become greater than the width of the aperture ?

Watch Video Solution

533. What is the angular resolution of a $10cm$ diameter telescope at a wavelength of 0.6μ ?

Watch Video Solution

534. The spectral line for a given element in the light received from a distant star is shifted towards longer wavelength side by 0.025%. Calculate the velocity of star in the line of sight.

Watch Video Solution

535. Two polarising sheets are placed with their planes parallel, so that light intensity transmitted is max. Through what angle must either sheet be turned so that light intensity drops to half the maximum value ?

Watch Video Solution

536. Light reflected from the surface of glass plate of refractive index 1.57 is linearly polarised. Calculate the angle of refraction in glass.

Watch Video Solution

537. Light of wavelength $5 \times 10^{-7}m$ is diffracted by an aperture of width $2 \times 10^{-3}m$. For what distance travelled by the diffrated beam does the spreading due to diffraction become greater than width of the aperture ?

Watch Video Solution

538. For what distance is ray optics a good approximation when the aperture is $3mm$ wide and wavelength is $500nm$? (NCERT Solved Example)

Watch Video Solution

539. Light of wavelength $600nm$ is incident on an aperture of size $2mm$. Calculate the distance light can travel before its spread is more than the size of aperture.

Watch Video Solution

540. A slit of width 'd' is illuminated by light of wavelength $5000Å$. For what value od 'd' will the first maximum fall at an angle of diffraction of 30°.

Watch Video Solution

541. A parallel beam of light of $600nm$ falls on a narrow slit and the resulting diffraction pattern is observed on a screen $.12m$ away. It is observed that the first minimum is at a distance of $3mm$ from the centre of the screen. Calculate the width of the slit.

Watch Video Solution

542. Determine the angular separation between central maximum and first order secondary maximum of the diffraction pattern due to a single slit of width $0.25mm$ when light of wavelength 5890Å falls on it normally.

Watch Video Solution

543. A laser beam has a wavelength of $7 \times 10^{-7}m$ and aperure $10^{-2}m$. The beam is sent to moon at a distance of $4 \times 10^{5}km$ from earth. Find the angular spread and areal spread of the beam on reaching the moon.

Watch Video Solution

544. 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.

Watch Video Solution

545. Two spectral lines of sodium D_1 and D_2 have wavelengths of approximetely plane wave on to a slit of width $2 micrometer$. A screen is located $2m$ from the slit. Find the spacing between the first maxima of two sodium lines as measured on the screen.

Watch Video Solution

546. A screen is placed $50cm$ from a single slit, which is illuminated with 6000Å light. If the distance between the first and third minima in the diffraction pattern is $3.00mm$, what is the width of the slit ?

Watch Video Solution

547. In a single slit diffraction expriment, first minimum for red light $(660nm)$ coincide with first maximum of some other wavelength λ'. Calculate λ'.

Watch Video Solution

548. What should be the width of each slit to obtain 10 maxima of the double slit interference pattern within the central maximum of single slit diffraction pattern ? (NCERT Solved example)

Watch Video Solution

549. A slit of width d is illuminated by white light. For what value of d is the first minimum for red light of $\lambda = 650nm$, located at point P at 30°. For what value of the wavelength of light will the first diffraction maxima also fall at P ?

Watch Video Solution

550. Two wavelength of sodium light $590nm$ and $596nm$ are used in turn to study the diffraction at a single slit of size $4mm$. The distance between the slit and screen is $2m$. Calculate the separation between the positions of first maximum of the diffraction pattern obtained in the two cases.

Watch Video Solution

551. A monochromatic light of wavelength $500nm$ is incident normally on a single slit of width $0.2mm$ to produce a diffraction pattern. Find the angular width of central maximum obtained on the screen, $1m$ away.

Estimate the number of fringes obtained in YDSE with fringe width $0.5mm$, which can be accommodated within the region of total angular spread of the central maximum due to a single slit.

Watch Video Solution

552. Two wavelength of sodium light $590nm$ and $596nm$ are used in turn to study the diffraction at a single slit of size $4mm$. The distance between the slit and screen is $2m$. Calculate the separation between the positions of first maximum of the diffraction pattern obtained in the two cases.

Watch Video Solution

553. Calculate the resolving power of a microscope if its numerical aperture is 0.12 and wavelength of light used is 6000Å.

Watch Video Solution

554. A telescope is used to resolve two stars separated by 4.6×10^{-6} rad. If the wavelength of light used is 5460Å, what should be the aperture of the objective of the telescope ?

Watch Video Solution

555. Calculate the separation of two points on moon that can be resolve using $600cm$ telescope. Given distance of moon from earth $= 3.8 \times 10^{10}cm$. The wavelength most sensitive to eye is $5.5 \times 10^{-5}cm$.

Watch Video Solution

556. A telescope has an objective of diameter $60cm$. The focal lengths of the objective and eye piece are $2.0m$ and $1.0cm$. Respectively. The telescope is directed to view two distant almost point sources of light (e.g. two stars of a binary). The sources are roughly at the same distance (10^4 light years) along the line of sight, but separated transverse to the line of sight by a distance of $10^{10}m$. Will the telescope resolve the two objects ?

Watch Video Solution

557. Calculate the resolving power of a microscope with cone angle of light falling on the objective equal to 60°. Take $\lambda = 600nm\mu$ for air $= 1$.

Watch Video Solution

558. Assume that light of wavelength 6000Å is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 100 inch ? (NCERT Solved example)

Watch Video Solution

559. The diameter of the pupil of human eye is about $2mm$. Human eye is most sensitive to the wavelength $555nm$. Find the limit of resolution of human eye.

Watch Video Solution

560. A laser beam has a wavelength of $7 \times 10^{-7}m$ and aperure $10^{-2}m$. The beam is sent to moon at a distance of $4 \times 10^{5}km$ from earth. Find the angular spread and areal spread of the beam on reaching the moon.

Watch Video Solution

561. The diameter of human eye lens is $2mm$. What should be the minimum separation between two points situated at $50m$ from eye, to resolve tham. Take wavelength of light $= 5000Å$.

Watch Video Solution

562. A telescope can resolve two stars separated by $4.6 \times 10^{-6} radian$. If wavelength of light used is $5460 Å$, what is the aperture of the objective of telescope ?

Watch Video Solution

563. Earth is moving towards a fixed star with a velocity of $30 kms^{-1}$. An oberver on earth observes a shift of $0.58 Å$ in wavelength of light coming from star. What is the actual wavelength of light emitted by star ?

Watch Video Solution

564. A radar wave has frquency of $8.1 \times 10^9 Hz$. The reflected wave from an aeroplane shows a frequency difference of $2.7 \times 10^3 Hz$ on the higher side. Calculate velocity of aeroplane in the line of sight.

Watch Video Solution

565. The spectral line for a given element in the light received from a distant star is shifted towards longer wavelength side by $0.032\,\%$. Deduce the velocity of star in the line of sight.

Watch Video Solution

566. With what speed should a galaxy move with respect to us to that the sodium line at $589.0nm$ is observed at $589.6nm$?

Watch Video Solution

567. A star is moving towards the earth with a speed of $4 \times 10^7 m/s$. If the wavelength emitted by the star is $500nm$, what would be the change in wavelength received on earth ?

Watch Video Solution

568. At what angle θ above the horizon should the sun be situated so that its light reflected from the surface of still water in a pond is completely polarised. Take $\mu = 1.327$ and $\tan 53^\circ = 1.327$.

Watch Video Solution

569. If the angle between the pass axis of polariser and analyser is 45°, write the ratio of intensities of original light and the transmitted light after passing through analyser.

Watch Video Solution

570. Two nicols are so oriented that the maximum amount of light is transmitted. To what fraction of its maximum value is the intensity of transmitted light reduced when the analyser is rotated through (i) 30° (ii) 60° ?

Watch Video Solution

571. The refractive index of a medium is $\sqrt{3}$. What is the angle of refraction, if polarizing angle of the medium.

Watch Video Solution

572. An unpolarizing beam of light is incident on a group of four palarizing sheets, which are arranaged in such a way that the characteristic direction of each polarizing sheet makes an angle of 30° with that of the preceding sheet. What fraction of incident unpolarized light is transmitted ?

Watch Video Solution

573. Unpolarized light is incident on a plane glass surface. What should be the angle of incidence so that the reflected and refracted rays are perpendicular to eachother ?

Watch Video Solution

574. Unpolarized light is intensity I_0 passes through two polaroids P_1 and P_2 such that pass axis of P_2 makes an angle θ with the pass axis of P_1. A third polaroid P_3 is placed between P_1 and P_2 with pass axis of P_3 making an angle β with that of P_1. If I_1, I_2, I_3 represent intensities of light trnasmitted by P_1, P_2, P_3, determine the values of angle θ and β for which $I_1 = I_2 = I_3$.

Watch Video Solution

575. A narrow beam of unpolarised light of intensity I_0 is incident on a polaroid P_1. The light transmitted by it is then incident on a second polaroid P_2 with its pass axis making an angle of 60° to the pass axis of P_1. Find intensity of light transmitted by P_2.

Watch Video Solution

576. The objective of an astronomical telescope has a diameter of $150mm$ and focal length of $4.0m$. The eye piece has a focal length of $25.0mm$. Calculate the magnifying power and resolving power of telescope. What is the distance between objective and eye piece ? Take $\lambda = 6000\text{Å}$.

Watch Video Solution

577. The refractive index of water is $4/3$ and that of glass is $3/2$. A beam of light enters glass from water. For what angle of incidence will the refracted light be completely polarised ?

Watch Video Solution

578. For given medium, the polarising angle is 60°. What will be the critical angle for this medium ?

Watch Video Solution

579. The critical angle between a given transparaent medium and air is denoted by C. A ray of light in air enters this transparent medium at an angle of incidence equal to polarizing angle p. Deduce a relation for the angle of refraction in terms of C.

Watch Video Solution

580. A partially plane polarised beam of light is passes thorugh a polaroid. Show graphically the variation of transmitted light with angle of rotation of polaroid.

Watch Video Solution

581. Two poalroids are placed at 90° to eachother and the transmitted intensity is zero. What happens when one more polaroid is placed between these two bisecting the angle between them ? What will be the diraction of polarization of outcoming beam ?

Watch Video Solution

582. The polarising angle for a piece of glass for green light is 60°. Find the angle of minimum deviation for green light for its passage through 60° prism, made of the same glass.

Given 1sin $60^{\circ} = 0.866, \tan 60^{\circ} = 1.732.$

Watch Video Solution

583. The refractive index of a medium is $\sqrt{3}$. What is the angle of refraction, if unpolarizing light is incident on the polarising angle of the medium ?

Watch Video Solution

584. What is Fresnel's distance ?

Watch Video Solution

585. How can we increase the resolving power of a microscope ?

Watch Video Solution

586. What is meant by angular resolution of a telescope ?

Watch Video Solution

587. What is the essential conditon for diffraction of light ?

Watch Video Solution

588. In single slit diffraction pattern, how does the angular separation between firnges change when distance of screen from slit is doubled ?

Watch Video Solution

589. In single slit diffraction pattern, why is intensity of secondary maximum less than the intensity of central maximum ?

Watch Video Solution

590. In single slit diffraction experiment, yellow light is replaced by X-rays. How will the diffraction pattern be affected ?

Watch Video Solution

591. Why do we not encounter diffraction effects of light in everyday observations ?

Watch Video Solution

592. We hear a person behind a wall, but cannot see him, though both, light and sound are waves. Why ?

Watch Video Solution

593. A single slit diffraction experiment is immerged completely in water without changing any other parameter. How is width of central maximum affected ?

Watch Video Solution

594. What is the relation between magnifying power and resolving power of a telescope ?

Watch Video Solution

595. Estimate the distance for which ray optics is good approximately for an aperture of 2mm and wavelength 500 nm.

Watch Video Solution

596. Coloured spectrum is seen when we look through a muslin cloth. Why ?

Watch Video Solution

597. Diameter of the objective (or aperture) of an astronomical telescope is doubled. How does it affect resolving power of the telescope and intensity of the image ?

Watch Video Solution

598. The objective lenses of two telescope have the same apertures but their focal lengths are in the ration $1:2$. Compare the resolving powers of the two telescopes.

Watch Video Solution

599. Two convex lenses of same focal length but of paerture A_1 and $A_2\left(A_2 < A_1\right)$ are used as the objective lenses in two astronomical telescope having identical eye pieces. What is the ratio of their resolving power ? Which telescope will you prefer and why ? Give reason.

Watch Video Solution

600. You read a newspaper because of the light it reflects. Then why do you not see even a faint image of yourself in the newspaper ?

Watch Video Solution

601. What is the angle between the plane of polariser and that of analyser to reduce the transmitted light intensity to half ?

Watch Video Solution

602. When a given light beam is passed through a polaroid and polaoid is rotated about the incident light axis, what are the three possiblities ?

Watch Video Solution

603. What happens on polarisation by reflection ?

Watch Video Solution

604. If a light beam shows no intensity variation when transmitted through a polarised, which is rotated, does it mean that light is unpolarized ?

Watch Video Solution

605. Unpolarised light is passed through a polaroid P_1. When this poalrised beam passes through another polaroid P_2, and if the pass axis of P_2 makes an angle θ with pass axis of P_1, then write the expression for the polarised beam passing through P_2. Draw a plot showing the variation of intensity when θ varies from 0 to 2 π.

Watch Video Solution

606. What is meant by one shift ?

Watch Video Solution

607. The observed spectrum of a star shows red shift. What do you conclude ?

Watch Video Solution

608. Name any three application of Doppler's effect ?

Watch Video Solution

609. In diffraction due to a single slit, what is the condition for first minimum ?

Watch Video Solution

610. How is resolving power of an optical instrument related to wavelength of light ?

Watch Video Solution

611. Diffraction is interference between different parts of the same wavefront. Comment.

Watch Video Solution

612. Is the speed of light in glass independent of colour of light ?

Watch Video Solution

613. Does interference of light give information about longitudinal/transverse nature of light waves ?

Watch Video Solution

614. what should be the order of size of obstacle/aperture for diffrection of light ?

Watch Video Solution

615. How are resolving power and limit of resolution of an optical instrument related ?

Watch Video Solution

616. How does the resolving power of a microscope change on

(i) decreasing wavelength of light

(ii) decreasing diameter of objective lens ?

Watch Video Solution

617. Name one phenomenon that is shown by light waves, but not by sound waves.

Watch Video Solution

618. Can electromagnetic waves be polarised ?

Watch Video Solution

619. Is blue light from the sky polarised ?

Watch Video Solution

620. Unpolarised light of intensity I is passed through a polaroid. What is the intensity of emerging polaroised light ?

Watch Video Solution

621. Unpolarised light is incident on plane surface of a medium of refractive index μ at an angle i. If the refracted light is completely polarised, how are μ and i related. Name the Law.

Watch Video Solution

622. Will ultrasonic waves shows any polarisation ?

Watch Video Solution

623. Which field vactor is used to represent the polarisation of an e.m. wave ?

Watch Video Solution

624. In a plane polarised light, name three parameters which are mutually perpendicular.

Watch Video Solution

625. What is the value of refractive index of a mediumof polarizing angle 60° ?

Watch Video Solution

626. Is head light of a car or an air plane polarized ?

Watch Video Solution

627. Name two commonly used devices which use polarized light.

Watch Video Solution

628. Give three examples of laevo rotatory substances.

Watch Video Solution

629. A ray of light falls on a transparent slab of $\mu = 1.732$. If reflected and refracted rays are mutually perpendicular, what is the angle of incidence ?

Watch Video Solution

630. Which among X-rays, sound waves and ratio waves can be polarized ?

Watch Video Solution

631. Unpolarized light is incident on a plane surface of glass of refractive index μ at angle i. If the reflected light gets totally polarized, write the relation between the angle i and refractive index μ.

Watch Video Solution

632. Define the them 'Linearly polarized light'.

Watch Video Solution

633. Can you recognise by the unaided eye whether a given light is polarized or not ?

Watch Video Solution

634. Does the value of polarizing angle depend on colour of light ?

Watch Video Solution

635. Is light from a sodium lamp polarised ?

Watch Video Solution

636. Which phenomenon leads us to the conclusion that light is transverse in nature ?

Watch Video Solution

637. What is the angle between the reflected and refracted rays at polarizing angle ?

Watch Video Solution

638. Sound waves can not be polarized. Why ?

Watch Video Solution

639. If the angle between the pass axis of polariser and analyser is 45°, write the ratio of intensities of original light and the transmitted light after passing through analyser.

Watch Video Solution

640. Does the speed of light in vaccume depend upon relative motion between source and observer ?

Watch Video Solution

641. What does red shift in spectra of galaxies indicate ?

Watch Video Solution

642. What is the basis of measurement of plasma tempretures in thermonuclear reactions ?

Watch Video Solution

643. A diifraction grating has 5000 lines per cm. What is the grating element ?

Watch Video Solution

644. How can we increase the resolving power of a microscope ?

Watch Video Solution

645. How does the angular width of principal maximum in the diffraction pattern vary with the width of slit ?

Watch Video Solution

646. what is diffraction due to ?

Watch Video Solution

647. Diffraction is common in sound but not comon in light waves. Why ?

Watch Video Solution

648. How does the resolving power of a microscope change on

(i) decreasing wavelength of light

(ii) decreasing diameter of objective lens ?

Watch Video Solution

649. In a single slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band ?

Watch Video Solution

650. Why can we not get diffraction pattern from a wide slit illuminated by monochromatic light ?

Watch Video Solution

651. When light travels from a rarer to denser medium, it loses some speed. Does the reduction in speed imply a reduction in the energy carried by the light wave ?

Watch Video Solution

652. What evidence is there to show that sound is not electromagnetic in nature ?

Watch Video Solution

653. In a single slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band ?

Watch Video Solution

654. What is meant by circularly polarised light ?

Watch Video Solution

655. What is elliptically polarised light ?

Watch Video Solution

656. What is polarising angle ?

Watch Video Solution

657. What is the vlaue of refractive index of a medium of polarising angle 60° ?

Watch Video Solution

658. What is a polaroid ?

Watch Video Solution

659. Name two commonly used devices which make use of polaroids.

Watch Video Solution

660. A partially plane polarised beam of light is passes thorugh a polaroid. Show graphically the variation of transmitted light with angle of rotation of polaroid.

Watch Video Solution

661. When an objects is seen through a calcite crystal, we observe two images. Why ?

Watch Video Solution

662. If the polarising angle for air glass interface is 56.3°, what is the angle of refraction in glass ?

Watch Video Solution

663. A ray of light falls on a transparent slab of $\mu = 1.732$. If reflected and refracted rays are mutually perpendicular, what is the angle of incidence ?

Watch Video Solution

664. For a diven medium, the polarising angle is 60°. What will be the critical angle for this medium ?

Watch Video Solution

665. Discuss the intensity of transmitted light when a polaroid sheet is rotated between two crossed polaroids?

Watch Video Solution

666. Two polaroid A and B are kept in crossed position. How should a third polaroid C be placed between them so that the intensity of polarized light transmitted by polaroid B reduces to $\frac{1}{8}th$ of the intensity of unplarised light incident on A ?

Watch Video Solution

667. What is the speed of star in the line of sight if a spectral line shifts towards longer wavelength side by 0.032% ?

Watch Video Solution

668. The radial speed of a galaxy is $1.2 \times 10^6 m/s$ receding away from earth. What is the percentage change in wavelength in the observed spectrum ?

Watch Video Solution

669. Distinguish between interference and diffraction of light.

Watch Video Solution

670. Doppler's effect in light is symmetrical but the same effect in sound is asymmetrical. Explain.

Watch Video Solution

671. Write two points of difference between interference and diffraction pattern of light.

Watch Video Solution

672. Define limit of resolution of a microscope. Give the expression for it.

Watch Video Solution

673. What is the phenomenon of polarization ? Derive the relation connecting the polarising angle of a medium and its refractive index.

Watch Video Solution

674. Define plane of polarisation and plane of vibration.

Watch Video Solution

675. Explain what is meant by diffraction of light. Describe a simple experiment to demonstrate diffraction at a

single slit.

Watch Video Solution

676. In a single slit diffraction pattern, how is the angular width of central bright maximum changed when (i) the slit width is decreased.

(ii) the distance between the slit and screen is increased.

(iii) Light of smaller wavelength is used. Justify your answer.

Watch Video Solution

677. A monochromatic light of wavelength λ is incident normally on a narrow slit of width a to produce a diffraction pattern on the screen placed at a distacne D from the slit. With the help of a relevant diagram, deduce the condition for maxima and minima on the screen. use these condition to show that angular width of central maximum is twice the angular width of secondary maximum.

Watch Video Solution

678. Explain the concept of resolving power. Briefly discuss resolving power of a microscope and a telescope.

Watch Video Solution

679. What do you understand by polarization of light ? What are plane of polarisztion and plane of vibration ?

Watch Video Solution

680. What is meant by plane polarized light ? What type of waves show this property ? Describe a method for producing a beam of plane polarized light.

Watch Video Solution

681. Differentiate between polarised and unpolarized light. How are they represented ?

Watch Video Solution

682. Describe an experiment to demonstrate transverse nature of light.

Watch Video Solution

683. Can a naked eye detect polarization of light ? If not, how is polarization of light detected ?

Watch Video Solution

684. Describe briefly the construction and working of nicol prism.

Watch Video Solution

685. State and explain law of Malus.

Watch Video Solution

686. Explain polarisation (i) by scattering (ii) by reflection.

Watch Video Solution

687. State and explain Brewster's law of polarization.

Watch Video Solution

688. A beam of unpolarized light is incident on a glass air interface. Show, using a suitable ray diagram that light reflected from the interface is totally polarized by reflection from a transparent medium. Write expression for Brewster's angle.

Watch Video Solution

689. What is an unpolarized light ? Explian with the help of suitable ray diagram how an unpolarized light can be polarized by reflection from a transparent medium. Write expression for Brewster's angle.

Watch Video Solution

690. What are polaroids ? Mention some of their practical uses ?

Watch Video Solution

691. Define polarising angle, How is it related with critical angle ?

Watch Video Solution

692. Prove that spherical mirror formula is applicable equally to a plane mirror.

Watch Video Solution

693. An object is placed in front of a convex mirror at a distance of 50cm. A plane mirror is introduced covering the lower half of the convex mirror. If the distance between the object and the plane mirror is 30cm, it is found that there is no parallax between the images formed by the two mirrors. What is the radius of curvature of the convex mirror?

Watch Video Solution

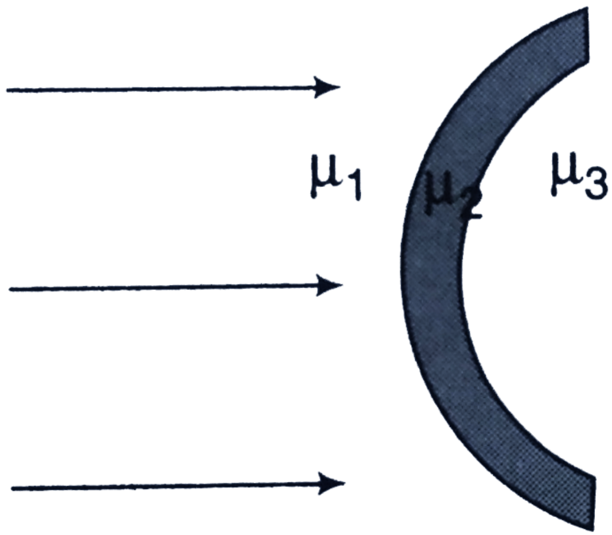
694. A motor car is fitted with a convex driving mirror of focal length $25cm$. Another motor car is $10m$ away from the driving mirror of the first car. Calculate the position of second car seen in the driving mirror. If the second car is overtaking the first car with a relative speed of $20m/s$, how fast will the image of the second car be moving ?

Watch Video Solution

695. A concave mirror of focal length $20cm$ forms a real image of a point object at O a distance of $40cm$ from the mirror. The mirror is cut into two halves, which are drawn $1.0cm$ apart in perpendicular direction, as shown in Fig. 6(APC).2. How will the two halves of the mirror produce the image of the point object at O ?

Watch Video Solution

696. In the figure, light is incident on a thin lens as shown. The radius of curvature for both the surfaces is R. Determine the focal length of this system.



Watch Video Solution

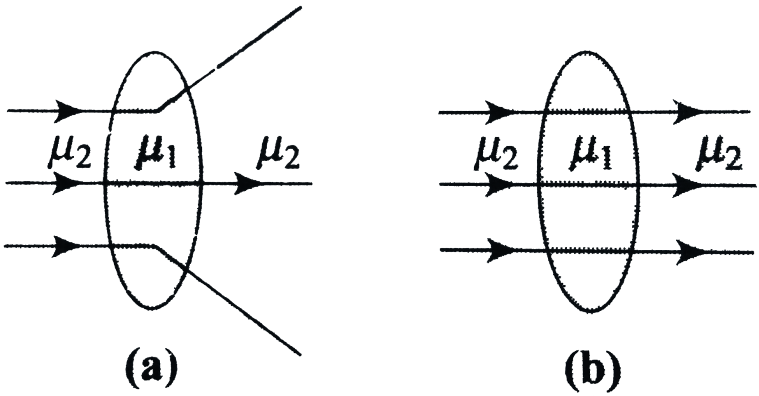
697. A convax and a concave mirror each of radius $10cm$ are placed facing eachother at $15cm$ distance. A point object is placed midway between them. Find the position of the final image if reflection takes place first at the concave mirror and then convex mirror.

Watch Video Solution

698. A ray of light enters the face AB of a glass prism of refractive index μ at an angle of incidence i. Find the value of i such that no ray emerges from the face AC of the prism, given angle of prism is A.

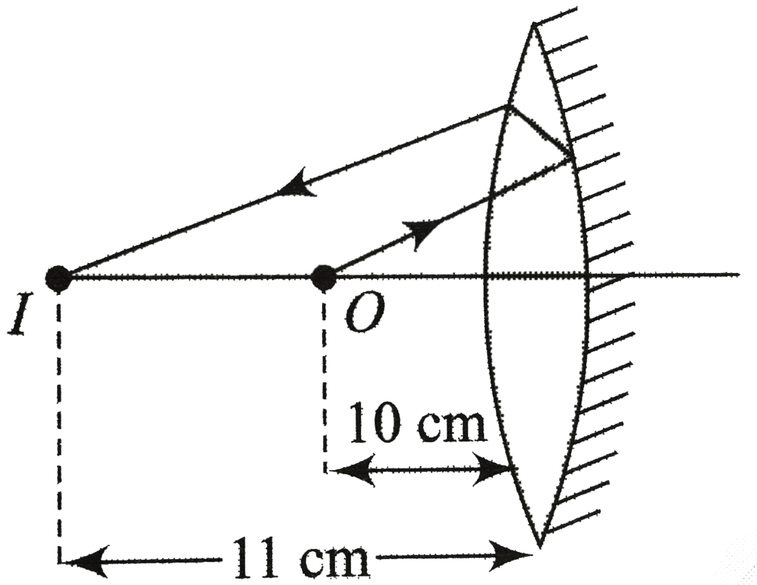
Watch Video Solution

699. What is the relation between the refractive indices μ, μ_1 and μ_2 if the behaviour of light rays is shown in Figure.



Watch Video Solution

700. A pin is placed 10cm in front of a convex lens of focal length 20cm, made of a material having refractive index 1.5 . The surface of lens farther away from the pin is silvered and has a radius of curvature 22cm. Determine the position of the final image. Is the image real or virtual?



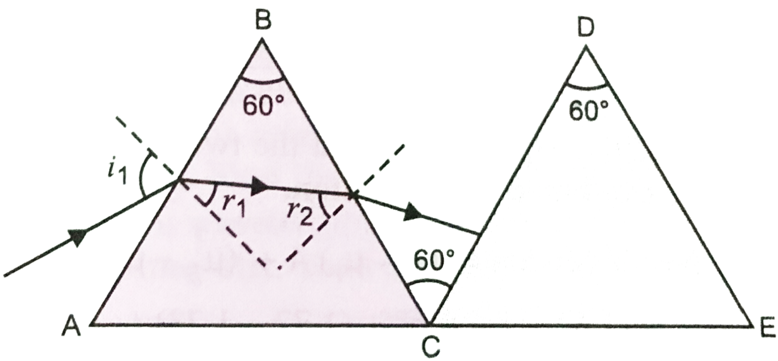
Watch Video Solution

701. Two this lenses, when in contact, produce a combination of power $+10$ diopters. When they are 0.25 m apart, the power reduces to $+6$ diopters. The focal length of the lenses are.... m and ...m.

Watch Video Solution

702. A ray of light is incident on a prism ABC of $\mu = \sqrt{3}$ as shown in Fig. Find the angle of incidence for which the deviation of light by the prism ABC is minimum.

By what angle should the second prism be rotated so that final ray suffers net minimum deviation ?



Watch Video Solution

703. A compound microscope is used to enlarge an object kept at a distance $0.03m$ from cuts objective which consists of serval convex lenses in contact and has focal length $0.03m$. If a lens focal length $0.1m$is removed from the objective, find out the distance by which the eye-piece of the microscope must be moved to refocus the image.

Watch Video Solution

704. A telescope has an objective of focal length $50cm$ and eye piece of focal length $5cm$. The least distance of distinct vision is $25cm$. The telescope is focussed for distinct vision on a scale $200cm$ away from the objective. Calculate

(i) the separation between objective and eye piece

(ii) the magnification produced.

Watch Video Solution

705. In YDSE, two wavelengths of $500nm$ and $700nm$ are used. What is the minimum their maxima coincide ? Take $D/d = 10^3$, symbols have standard meaning.

Watch Video Solution

706. A glass of refractive index 1.5 is coated with a thin layer of thickness t and refractive index 1.8 . Light of wavelength λ travelling in air is incident normally on the layer. It is partly reflected at the upper and the lower surfaces of the layer. It is partly reflected at the upper and the lower surfaces of the layer ant the two reflected rays interface . If $\lambda = 648nm$, obtain the least value of $t\left(\text{in}10^{-8}m\right)$ which the rays interface constructively.

Watch Video Solution

707. 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.

Watch Video Solution

708. A beam of plane polarised light falls normally on a polariser (cross sectional area $3 \times 10^{-4} m^2$) which rotates about the axis of the ray with an angular velocity of $31.4 rad/s$. Find the energy of light passing through polariser per revolution and the intensity of emergent beam, if flux of energy of the incident ray is $10^{-3} W$.

Watch Video Solution

709. Two polaroids are placed at 90° to eachother. What happens when $(N - 1)$ more polaroids are inserted between them ? Their axes are equally spaced. How does the transmitted intensity behave for large N ?

Watch Video Solution

710. A ray of light strikes a glass plate at an angle of incidence 57°. If the reflected and refracted rays are perpendicular to eachother, calculate critical angle for total internal reflection at glass air interface.

Watch Video Solution

711. A small candle $2.5cm$ in size is placed $27cm$ in front of a conacave mirror of radius of curvature $36cm$. At what distance from the mirror should a screen be placed in order to receive a sharp image ? Describe the nature and size of the image. If the candle is moved closer to the mirror, how would the screen have to be moved ?

Watch Video Solution

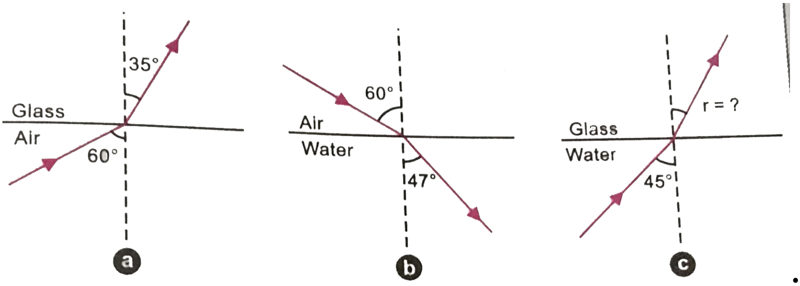
712. A $4.5cm$ needle is placed 12 cm away from a convex mirror of focal length 15 cm. Give the location of the image and the magnification. Describe what happens as the needle is moved farther from the mirror.

Watch Video Solution

713. A tank is filled with water to a height of $12.5cm$ The apparent depth of a needle lying at the bottom of the tank is measured by a microscope to be $9.4cm$. What is the refractive index of water ? If water is replaced by a liquid of refractive index 1.63 upto the same height, by what distance would the microscope have to be moved to focus on the needle again ?

Watch Video Solution

714. Fig. (a) and (b) show refraction of an incident ray in air at 60° with the normal to a glass-air and water-air interface respectively. Predict the angle of refraction of an incident ray in water at 45° with the normal to a water glass interface. Take $.^a\mu_g = 1.32$.



Watch Video Solution

715. A small bulb (assumed to be a point source) is placed at the bottom of a tank containing water to a depth of $80cm$. Find out the area of the surface of water through which light from the bulb can emerge. Take the value of refractive index of water to be $4/3$.

Watch Video Solution

716. A prism is made of glass of unknown refractive index. A parallel beam of light is incident on a face of the prism. By rotating the prism, the minimum angle of deviation is measured to be 40°. What is the refractive index of the prism ? If the prism is placed in water ($\mu = 1.33$), predict the new angle of minimum deviation of the parallel beam. The refracting angle of prism is 60°.

Watch Video Solution

717. A double convex lens is made of glass of refractive index 1.55 with both faces of same radius of curvature. Find the radius of curvature required, if focal length is $20cm$.

Watch Video Solution

718. A beam of light converges to a point P.A lens is placed in the path of the convergent beam $12cm$ from P. At what point does the beam converge if the lens is

(a) a convex lens of focal length $20cm$. (b) a concave lens of focal length $16cm$?

Watch Video Solution

719. An object of size $3.0cm$ is placed $14cm$ in front of a concave lens of focal length $21cm$. Describe the image produced by the lens. What happens if the object is moved further from the lens ?

Watch Video Solution

720. What is the focal length of a convex lens of focal length $30cm$ in contant with a concave lens of focal length $20cm$. Is the system a converging or a diverging lens ? Ignore thickness of the lenses.

Watch Video Solution

721. A compound microscope has an objective of focal length $2.0cm$ and an eye-piece of focal length $6.25cm$ and distance between the objective and eye-piece is $15cm$. If the final image is formed at the least distance vision $(25cm)$, the distance of the object form the objective is

Watch Video Solution

722. A person with a normal near point $(25cm)$ using a compound microscope with an objective of focal length $8.0mm$ and eye piece of focal length $2.5cm$ can bring an object placed $9.0cm$ from the objective in sharp focus. What is the separation between the two lenses ? Calculate the magnifying power of the microscope ?

Watch Video Solution

723. A small telescope has an objective lens of focal length $144cm$ and an eye-piece of focal length $6.0cm$.

What is the magnifying power of the telescope ? What is the separation between the objective and the eye-piece ?

Watch Video Solution

724. A gaint refrecting telescope at an observatory has an objective lens of focal length $15m$. If an eye piece lens of focal length $1cm$ is used, find the angular magnification of the telescope.

If this telescope is used to view the moon, what is the diameter of image of moon formed by objective lens ? The diameter of the moon is $3.42 \times 10^6 m$ and radius of lunar orbit is $3.8 \times 10^8 m$.

Watch Video Solution

725. Use the mirror equation to deduct that :

(a) an object between f and $2f$ of a concave mirror produces a real image beyond $2f$.

(b) a convax mirror always produces a virtual image independent of the location of the object.

(c) the virtual image produced by a convex mirror is always diminished in size and is located between the focus and the pole.

(d) an object placed between the pole and focus of a concave mirror produces a virtual and enlarged image.

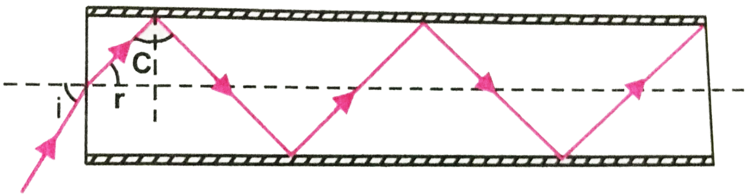
Watch Video Solution

726. A small pin fixed on a table top is viewed from above from a distance of $50cm$. By what distance would the pin appear to be raised, if it be viewed from the same point through a $15cm$. Thick glass slab held parallel to the table? μ of glass is 1.5. Does the answer depend on location of the slab ?

Watch Video Solution

727. (a) Fig. shows a cross-section of a 'light pipe' made of a glass fibre of refractive index 1.68. The outer covering of the pipe is made of a material of refractive index 1.44. What is the axis of the pipe for which total reflection inside the pipe take place as shwon.

(b) What is the answer if there is no outer covering if the pipe ?



Watch Video Solution

728. The image of a small electric bulb fixed on the wall of a room is to be obtained on the opposite wall $3m$ away by means of a large convex lens. What is the maximum possible focal length of the lens required for the purpose ?

Watch Video Solution

729. A screen is placed 90 cm from an object. The image an object on the screen is formed by a convex lens two different locations separated by 20 cm. the focus length of the lense is

Watch Video Solution

730. At what angle should a ray of light be incident on the face of a prism of refracting angle 60°, so that it just suffers total internal reflection at the other face ? The refractive index of the prism is 1.524.

Watch Video Solution

731. You are given prism made of crown glass and flint glass with a wide variety of angles. Suggest a combination of prism which will

(i) deviate a pencil of white light without much dispersion.

(ii) disperse and displace a pencil of white light without much deviation.

Watch Video Solution

732. For a normal eye, the far point is at infinity and the near point of distinct vision is about $25cm$ in front of the eye. The cornea of the provides a converging power of about $40 dioptre$ and the least converging power of eye lens behind the cornea is about $20 dioptre$. From this rough data, estimate the range of accommodation (i.e., the range of converging power of the eye lens) of a normal eye.

Watch Video Solution

733. Does short sightedness (myopia) or long sightedness (hypermetropia) imply necessarily that the eye has partially lost its ability of accomodation ? If not, what might cause these defects of vision ?

Watch Video Solution

734. A myopia person has been using spectacles of power -1.0 dioptre for distant vision. During old age, he also needs to use separate reading glasses of power $+2.0$ dioptre. Explain what may have happened.

Watch Video Solution

735. A person looking at a person wearing a shirt with a pattern comprising vertical and horizontal lines is able to see the vertical lines more distinctly than the horizontal ones. What is this defect due to ? How is much a defect of vision corrected ?

Watch Video Solution

736. A man with normal near point (25 cm) reads a book with small print using a magnifying glass : a thin convex lens of focal length $5cm$.

(a) What are the closest and the farthest distances at which he can read the book when viewing through the magnifying glass ?

(b) What is the maximum and the minimum angular magnifications (magnifying powers) possible using the above simple microscope ?

Watch Video Solution

737. A cardsheet divided into squares each of size $1mm^2$ is being viewed at a distance of $9cm$ through a magnifying glass (a conerging lens of focal length $10cm$) held close to the eye.

(a) What is the magnification produced by the lenas ? How much is the area of each square to the virtual image ?

(b) What is the angular magnification (magnifying power) of the lens ?

(c) Is the magnification in (a) equal to the magnifying power in (b) ? Explain

Watch Video Solution

738. (i) At what distance should the lens be held from the card sheet in order to view the squares distinctly with the maximum possible magnifying power ?

(ii) What is the magnification in this case ?

(iii) Is the magnification equal to magnifying power in this case ? Explain.

Watch Video Solution

739. What should be the distance between the object and magnifying glass if the virtual image of each square in the figure is to have an area of $6.25mm^2$.Would you be able to see the squares distinctly with your eyes very close to the magnifier ?

Watch Video Solution

740. An angular magnification (magnifying power) of $30X$ is desired using an objective of focal length $1.25cm$ and an eye piece of focal length $5cm$. How will you set up the compound microscope ?

Watch Video Solution

741. A small telescope has an objective lens of focal length $140cm$ and eye piece of focal length $5.0cm$. What is the magnifying power of telescope for viewing distant objects when

(a) the telescope is in normal adjustment (i.e. when the image is at infinity)

(b) the final image is formed at the least distance of distinct vision $(25cm)$.

Watch Video Solution

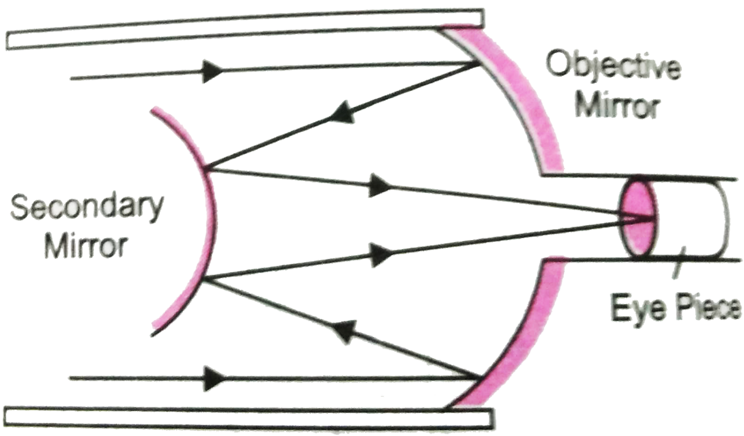
742. (a) For the telescope described what is the separation between the objective lens and eye piece ?

(b) If this telescope is used to view a $100m$ tall tower $3km$ away, what is the height of the image of the tower formed by the objective lens ?

(c) What is the height of the final image of the tower if it is formed at 25 cm` ?

Watch Video Solution

743. A Cassegrainian telescope uses two mirrors as shown in Fig. Such a telescope is built with the mirrors $20mm$ apart. If the radius of curvature of large mirror is $220mm$ and the small mirror is $40mm$, where will the final image of an object at infinity be ?

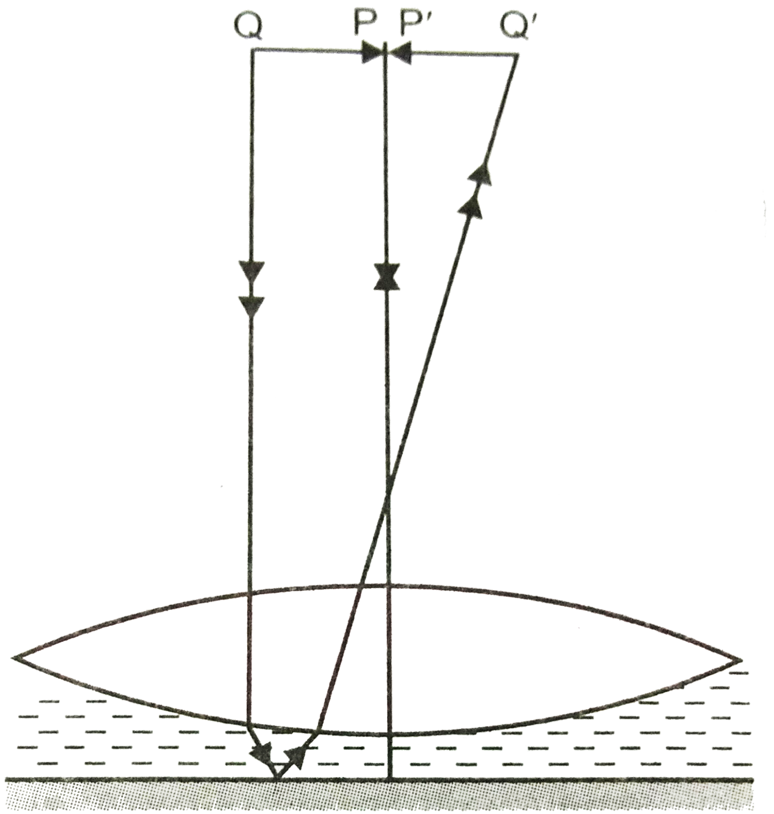


Watch Video Solution

744. Light incident normally on a plane mirror attached to a galvanometer coil retraces backwards a shown in Fig. 6(a). 14. A current in the coil produces a deflection of 3.5° in the mirror. What is the displacement of the reflected spot of light on a screen placed $1.5m$ away ?

Watch Video Solution

745. Fig. shows an equiconvex lens (of refractive index 1.5) in contact with a liquid layer on top of a plane mirror. A small needle with its tip on the principal axis is moved along the axis until its inverted image is found at the position of the needle. The distance of the needle from the lens is measured to be $45.0cm$. The liquid is removed and the experiment is repeated. The new distance is measured to be $30.0cm$. What is the refractive index of the liquid ?



Watch Video Solution

746. Monochromatic light of wvalength $589nm$ is incident from air on a water surface. What are the wavelength, frequency and speed of (a) reflected and (b) refracted light ? μ of water is 1.33`.

Watch Video Solution

747. What is the shape of the wavefront in each of the following cases ?

(a) light diverging from point source.

(b) light emerging out of a convex lens when a point source is placed at its focus.

(c) the portion of the wavefront of light from a distant star intercepted by earth.

Watch Video Solution

748. (a) The refractive index of glass is 1.5. What is the speed of light in glass ? (Speed of light in vaccum is $3 \times 10^8 ms^{-1}$).

(b) Is the speed of light in glass independent of colour of light ? If not, which of the two colours, red and violet travels slower in a glass prism ?

Watch Video Solution

749. In Young's experiement, the distance between slits is $0.28mm$ and distance between slits and screen is $1.4m$.

Distance between central bright fringe and third bright fringe is $0.9cm$. What is the wavelength of used light?

Watch Video Solution

750. In Young's double slit experiment, the intensity of light at a point on the screen where the path difference is $\lambda = l$. The intensity of light at a point where the path difference becomes $\lambda/3$ is

Watch Video Solution

751. A beam of light consisting of two wavelengths $650nm$ and $520nm$, is used to obtain interference fringes in a Young's double slit experiment. (a) Find the distance of the third bright fringe on the screen from the central maximum for wavelength $650nm$. (b) What is the least distance from the central maximum, where the bright fringes due to both the wavelength coincide ?

Watch Video Solution

752. In a double slit experiment the angular width of a fringe is found to be 0.2° on a screen placed I m away. The wavelength of light used in 600 nm. What will be the angular width of the fringe if the entire experimental apparatus is immersed in water ? Take refractive index of water to be $4/3$.

Watch Video Solution

753. What is Brewster angle for air to glass transtion ? (μ of glass is 1.5)

Watch Video Solution

754. Light of wavelength 5000Å falls on a plane reflecting surface. What are the wavelength and frequency of reflected light ? For what angle of incidence is the reflected ray normal to the incident ray ?

Watch Video Solution

755. Estimate the distance for which for which ray optics is good approximation for an aperture of $4mm$ and wavelength $400 nm$.

Watch Video Solution

756. The $6563 \text{Å} H_2$ line emitted by hydrogen in a star is found to be red shifted by 15Å. Estimate the speed with which the star is receding from earth.

Watch Video Solution

757. Assertion : Corpuscular theory fails to explain the velocities of light in air and water.

Reason : According to corpuscular theory, light should travel faster in denser media than in rarer media.

Watch Video Solution

Watch Video Solution

758. Let us list some of the factors which could possibly influence the speed of wave propagation : (i) Nature of source (ii) direction of propagation (iii) motion of source and//or observer (iv) wave length (v) intensity of the wave.

On which of these factors, if any does (a) the speed of light in vaccum (b) speed of light in a medium (say glass or water) depend ?

Watch Video Solution

759. For sound waves, the Doppler's formula for frequency shift differs slightly between the two situation

:

(i) source at rest , observer moving (ii) source moving , observer at rest.

The exact Doppler formulae for the case of light waves in vacuum, are however, strictly identical for the two situations in case of light travelling in a medium ?

Watch Video Solution

760. In double slit experiment using light of wavelength $600nm$, the angular width of a fringe formed on a distant screen is 0.1°. What is the spacing between the two slits ?

Watch Video Solution

761. A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observe on screen 1 m away. It is observed that the first minimum is at a distance of $2.5mm$ from the centre of the screen. Find the width of the slit.

Watch Video Solution

762. Answer the following questions :

(a) When a low flying aircraft passes overhead, we sometimes notice a slight shaking of the piture on our TV screen. Suggest a possible expanation.

(b) As you have learnt in the text, the principle of linear superposition of wave displacement is basic to understanding intensity distributions in diffractions and interference patterns. What is the justification of this principle ?

Watch Video Solution

763. In deriving the single slit diffraction pattern, it was stated that the intensity is zero at angle $n\lambda/a$. Justify this by suitable dividing the slit to bring out the cancellation.

Watch Video Solution

764. Will the focal length of a lens for red light be more, same or less than that for blue light ?

Watch Video Solution

Watch Video Solution

765. The near vision of an average person is $25cm$. To view an object with an angular magnification of 10, what should be the power of the microscope ?

Watch Video Solution

766. An unsymmeterical double convex thin lens forms the image of a point object on its axis. Will the position of the image change if the lens is reversed ?

Watch Video Solution

767. Three immiscible liquids of densities $d_1 > d_2 > d_3$ and refractive indices $\mu_1 > \mu_2 > \mu_3$ are put in a beaker. The height of each liquid column is $\frac{h}{3}$. A dot is made at the bottom of the beaker. For near normal vision, find the apparent depth of the dot.

Watch Video Solution

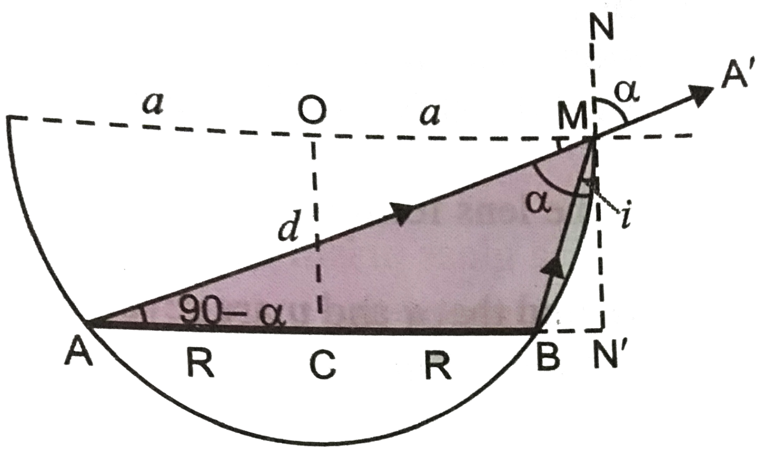
768. The angle of minimum deviation for a glass prism with $\mu = \sqrt{3}$ equals the refracting angle of the prism. What is the angle of the prism?

Watch Video Solution

769. A short object of length L is placed along the principal axis of a concave mirror away from focus. The object distance is u. If the mirror has a focal length f, what will be the length of the image ? You may take $L < < |u - f|$.

Watch Video Solution

770. A circular disc of radius 'R' is placed co-axially and horizontally inside and opaque hemispherical bowl of radius 'a', Fig. The far edge of the disc is just visible when viewed from the edge of the bowl. The bowl is filled with transparent liquid of refractive index μ and the near edge of the dise becomes just visible. How far below the top of the bowl is the disc placed ?



Watch Video Solution

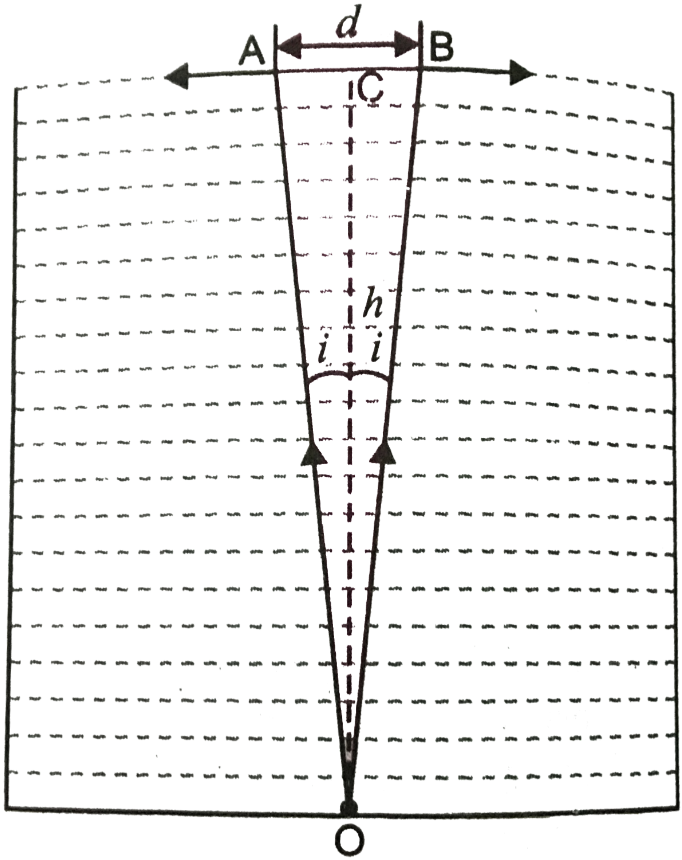
771. A thin convex lens of focal length $25cm$ is cut into two pieces $0.5cm$ above the principal axis. The top part is placed at (0,0) and an object placed at $(- 50cm, 0)$. Find the coordinates of the image.

Watch Video Solution

772. In may experimental set-ups the source and screen are fixed at a distance say D and the lens is movable. Show that there are two positions for the lens for which an image is formed on the screen. Find the distance between these points and the ratio of the image sizes for these two points.

Watch Video Solution

773. A jar of height h is filled wih a transparent liquid of refractive index μ, Fig. At the centre of the jar on the botom surface is a dot. Find the minimum diameter of a disc, such that when placed on the top surface symmetrically about the centre, the dot is invisible.



Watch Video Solution

774. A myopic adult has a far point at $0.1m$. His power of accomodation is 4 diopters.

(i) What power lenses are required to see distant objects ?

(ii) What is his near point without glasses ?

(iii) What is his near point with glasses ? (Take the image distance from the lens of the eye to the retina to be 2 cm).

Watch Video Solution

775. Show that for a material with refractive index $\mu \geq \sqrt{2}$, light incident at any angle shall be guided along a length perpendicular to the incident face.

Watch Video Solution

776. The mixture of a pure liquid and a solution in a along vertical column (i.e., horizontal dimensions $< <$ vertical dimensions) produces diffusion of solute particles and hence a refractive index gradient along the vertical dimension. A ray of light entering the column at right angles to the vertical is deviated from its original path. Find the deviation in travelling a horizontal distance $d < < h$, the height of the column.

Watch Video Solution

777. If light passes near a massive object, the gravitational interaction causes a bending of the ray. This can be thought of as happening due to a change in the effective refractive index of the medium given by

$n(r) = 1 + 2GM/rc^2$

where r is the distance of the point consideration from the centre of the mass of the massive body, G is the universal gravitational constant, M the mass of the body and c the speed of light in vacuum. Considering a spherical object, find the deviation of the ray from the original path as it grazes the object.

Watch Video Solution

778. An infinitely long cylinder of radius R is made of an unusal exotic material with refractive index (-1), Fig. The cylinder is placed between two planes whose normals are along the y direction. The center of the cylinder O lies along the y-axis. A narrow laser beam is directed along the y-direction from the lower plate. The laser source is at a horizontal distance x from the diameter in the y direction. Find the range of x such that light emmited from the lower plane does not reach the upper plane.

.

Watch Video Solution

779. (i) Consider a thin lens placed between a source (S) and an observer (O), Fig. Let the thickness of the lens vary as $w(b) = w_0 - \frac{b^2}{\propto}$, where b is the vertical distance from the pole. w_0 is a constant. Using Fermat's principle, i.e., the time of transit for a ray between the source and observer is an exptremum, find the condition that al paraxial rays starting from the source will converge at a point O on the axis. Find the focal length.

(ii) A gravitational lens may be assumed to have a varying width of the form

$$w(b) = k_1 In\left(\frac{k_2}{b}\right) b_{\min} < b < b_{\max}\, w(b) = k_1 In\left(\frac{k_2}{b_{\min}}\right) b < b_{\min}$$

Show that an observer will see an image of a point object as a ring about the center of the lens with an angular radius $\beta = \sqrt{\frac{(n-1)k_1 \frac{u}{v}}{u+v}}$.

.

Watch Video Solution

780. Huygen's principle of secondary waves

Watch Video Solution

781. Consider a point at the focal point of a convex lens. Another convex lens of short focal length is placed on the other side. Then the nature of wavefront emerging from the final image.

Watch Video Solution

782. What is the shape of the wavefront in each of the following cases ?

(a) light diverging from point source.

(b) light emerging out of a convex lens when a point source is placed at its focus.

(c) the portion of the wavefront of light from a distant star intercepted by earth.

Watch Video Solution

783. Statement - I : Diffraction of sound waves is evident in daily experince than that of light waves

Statement- II : The wave length of sound waves is comparitively higher than that of light waves.

Watch Video Solution

784. The human eye has an approximate angular resolution of $\phi = 5.8 \times 10^{-4}$ rad and a typical photo printer prints a minimum of 300 dpi (dots per inch,

$= 2.54 cm$). Aminimum distance 'z' should a printed page be held so that one doesnot see the indivdual dots is ______ .

Watch Video Solution

785. A polariod (I) is placed in front of a monochromatic source. Another polariod (II) is placed in front of this polariod (I) and rotated till no light passes. A third polariod (III) is now placed in between (I) and (II), then

Watch Video Solution

786. Statement - I : Reflection result in a plane polarised light, if the light is incident on the interface from the side with higher refractive index.

Statement - II : Brewster's angle is less than critical angle.

Watch Video Solution

787. For the same objective, the ratio of least separation between two points to be distiguised by a microscope for light of 5000Å and electrons acclerated through 100V used as illuminating substance is ________ (neraly)

Watch Video Solution

788. In a YDSE arrangement, the distance of screen from the slits is half the distance between the slits. If $'\lambda'$ is the wavelength of then the value of D such that first minima on the screen falls at a distance D from then centre 'O' is

Watch Video Solution

789. A small transparent slab $(\mu = 1.5)$ is placed along AS_2 as shown.

$AC = CO = D, S_1C = S_2S = d < \ < D$

The distance of princpal maxima front 'O' is

Watch Video Solution

790. Four identical monochromatic source A, B, C, D as shown in figure produce waves of the same wavelength λ

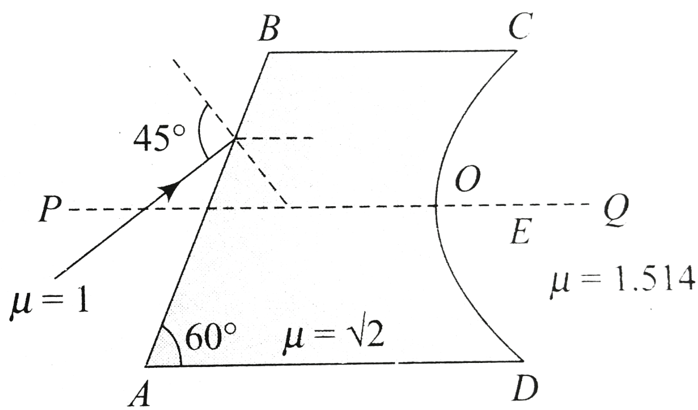
and are coherent. Two receivers R_1 and R_2 are at great but equal distance from B. The choose the correct statements.

Watch Video Solution

791. To ensure almost 100% transmittivity, photographic lenses are often coated with a thin layer of dielectric material, like $MgF_2(\mu = 1.38)$. The minimum thickness of the film to be used so that at the centre of visible spectrum $(\lambda = 5500\text{Å})$ there is maximum transmission.

Watch Video Solution

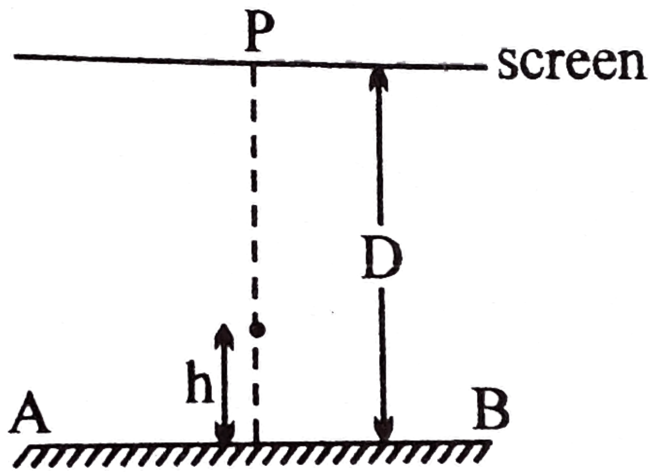
792. Figure shows an irregular block of material of refractive indec $\sqrt{2}$. A ray of light strikes the face AB as shown. After refraction, it is incident on a spherical surface CD of radius of curvature 0.4 m and enters a medium of refractive index 1.514 to meet PQ at E. Find the distance OE up to two places of decimal.



Watch Video Solution

793. A point sources S emitting light of wavelength $600nm$ is placed at a very small height h above the flat reflecting surface AB(see figure).The intensity of the reflected light is$36\,\%$ of the intensity.interference firnges are observed on a screen placed parallel to the reflecting surface a very large distance D from it.

(A)What is the shape of the interference fringes on the screen?

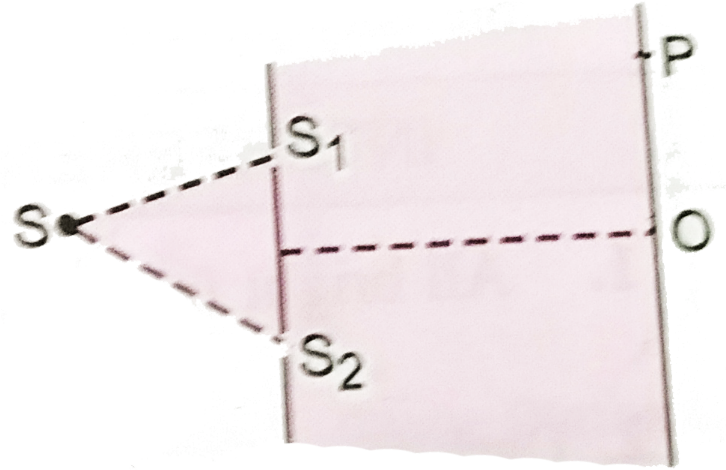


(B)Calculate the ratio of the minimum to the maximum to the maximum intensities in the interference fringes fromed near the point P (shown in the figure) (c) if the intenstities at point P corresponds to a maximum,calculate the minimum distance through which the reflecting surface AB should be shifted so that the intensity at P again becomes maximum.

Watch Video Solution

794. Fig. shows an experimental set up simillar to Young's double slit experiment to observe interference of light. Here $SS_2 - SS_1 = \lambda/4$. Write down the conditions of (i) Contstructive interference

(ii) Destructive interference at any point P in terms of path diff. $\left(S_2P - S_1P\right)$. Does the central fringe observed in the above set up lie above or below O ? Give reason.



Watch Video Solution

795. Two narrow slits are illuminated by a single monochromatic source. Name the pattern obtained on the screen. One of the slits is now completely covered. What is the name of the pattern obtained now on the screen ? Draw intensity pattern obtanied in the two cases. Also, write two difference between the pattern obtained in the above two cases.

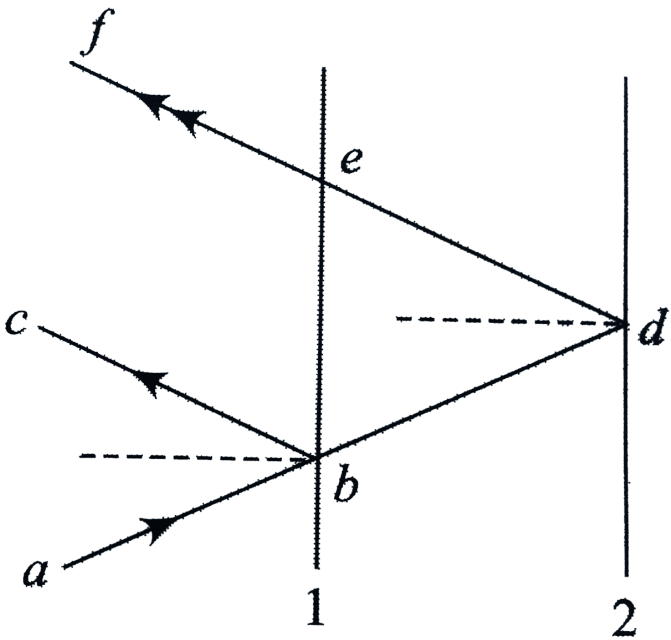
Watch Video Solution

796. A ray of light incident on the horizontal surface of a glass slab at 70° just grazes the adjacent vertical surface after refraction. Complete the critical angle and refractive index of glass.

Watch Video Solution

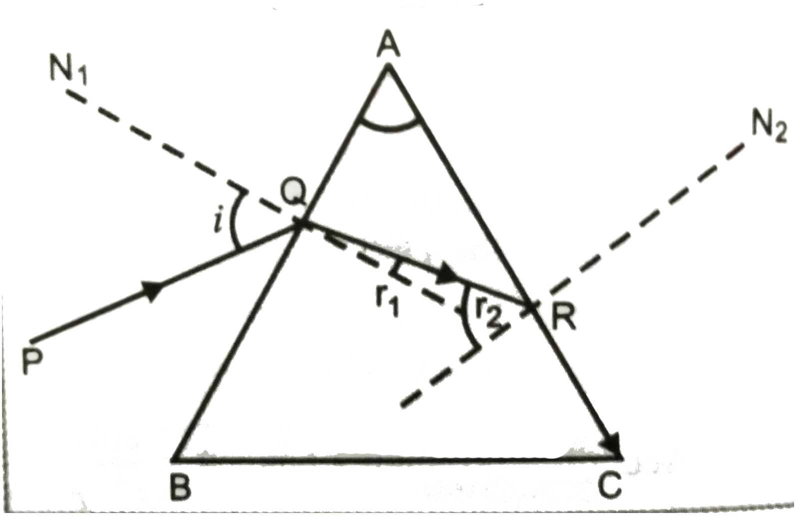
797. A narrow monochromatic beam of light of intensity 1 is incident on a glass plate as shown in figure Another identical glass plate is kept close to the first one and

parallel to it. Each glass plate reflects 25% of the light incident on it and transmits intensities in the interference pattern formed by two beams obtained after one reflection at each plate.



Watch Video Solution

798. A ray of light the face AB of a glass prism of refractive index μ at an angle of incidence i. Find the value of i such that no ray emerges from the face AC of the prism. Given angle of prism is A.



Watch Video Solution

799. The diameter of a plano convex lens is $6cm$ and thickness at the centre is $3mm$. If the speed of light in the material of the lens is $2 \times 10^8 m/s$, what is the focal length of the lens ?

Watch Video Solution

800. The rays of light falling on a convex lens in a direction parallel to principal axis of the lens, get refracted through the lens and meet actually at a single point F on the principal axis of the lens. This point is called principal focus of the lens.

Read the above passage and answer the following questions :

(i) Is principal focus of a convex lens, a real point ? Is the same true for a concave lens ?

(ii) A distinct image of a distant tree os obtained on a screen held at $40 cm$ from a convex lens. What is its focal length ?

(iii) Our teachers and parants advise us to stay focussed. What does it imply ?

Watch Video Solution

801. The formula governing reflection of light from a spherical mirror is

$\frac{1}{v} + \frac{1}{u} = \frac{2}{R}$, where

u = distance of object from pole of mirror,

v = distance of image from pole of mirror

f = focal length of mirror,

R = radius of curvature of mirror.

This is known as mirror formula and is applicable equally to concave mirror and convex mirror.

$$m = \frac{I}{O} = \frac{\upsilon}{u}$$

Read the above passage and answer the following questions :

(i) An object is held at a distance of $30cm$ in front of a concave mirror of radius of curvature $40cm$. Calculate distance of the image from the object ? What is linear magnification of the mirror ?

(ii) The object is moved to a distance of $40cm$ in front of the mirror. How is focal length of mirror affected ?

(iii) What values of life do you learn from the mirror formula ?

Watch Video Solution

802. In Indo China war of 1962, India suffered a large number of causalities because we were ill equipped and ill prepared. The then Prime Minister of India Jawahar Lal Nehru was an Apostle of peace and had given the slogen 'Hindi Chinni Bhai Bhai'. He could not bear the shock of chinese Aggression and died soon thereafter.

Read the above passage and answer the following questions :

(i) Should we stop strengthening our defence forces when we have friendly neighbours ?

(ii) What do you mean by ill equipped and ill prepared ?

(iii) What values do you learn from this ?

Watch Video Solution

Very short answer question

1. Which of the mirrors is diverging: concave or convex?

Watch Video Solution

2. What is a mirror formula?

Watch Video Solution

3. Is there any invisible spectrum ?

Watch Video Solution

4. Which has larger wavelength, violet or red colour ?

Watch Video Solution

5. What is angle of prism ?

Watch Video Solution

very short answer questions

1. What is refraction ?

Watch Video Solution

Sample problem (6(d))

1. If we need a magnification of 375 from a microscope of tube length $15cm$ and an objective of focal length $0.5cm$, what focal length eye lens should be used ?

Watch Video Solution

Curiosity Questions

1. What is the technique of coating mirrors ?

Watch Video Solution

2. Outline some of the latest methods of correcting myopia (short sightedness) without the use of corrective specs.

View Text Solution

3. What is star gazing ? How is it accomplished ?

View Text Solution

4. What is responsible for streaks of coloured light from a compact disc ?

Watch Video Solution

Long answer questions

1. Draw a labelled sketch of the human eye. Explain the functions of each part.

Watch Video Solution

2. Describe a simple microscope or a magnifying glass. Derive an expression for its magnifying power.

Watch Video Solution

3. Define principal focal length and redius of curvature of a mirror. Establish relation between them for (i), concave mirror and (ii) convex mirror.

Watch Video Solution

4. State and derive mirror formula for a concave mirror with the help of suitable ray diagram. State the sign conventions used.

Watch Video Solution

5. Establish mirror formula in case of a convex mirror. State the sign conventions used.

Watch Video Solution

6. Derive lens maker's formula for a thin convex lens.

Watch Video Solution

7. Derive lens maker's formula for a thin convex lens.

Watch Video Solution

8. What is a rainbow ? What is its two types ? How are they formed ? Discuss briefly.

Watch Video Solution

9. State Huygens principle and prove the laws of reflection on the basis of wave theory.

Watch Video Solution

10. Deduce Snell's Law of refraction for a plane wave using Huygen's principle.

Watch Video Solution

11. A plane wavefront is incident on (a) a prism (b) a convex lens (c) a concave mirror. Draw the shpaes of the refracted/reflected wavefront in each case.

Watch Video Solution

12. Light waves each pf amplitude 'a' and frequency ω emanating from two coherent light sources superpose at a point. If the displacement due to these waves are given by $y_1 = a\cos\omega t$ and $y_2 = a\cos(\omega t + \phi)$, where ϕ is the phase difference between the two, obtain the expression for the resultant intensity at the point.

Watch Video Solution

13. State three charecteristic features which distinguish the interference pattern due to two coherently illuminated sources as compared to that observed in a diffraction pattern due to a sngle slit.

Watch Video Solution

14. Define resolving power of compound microscope. How does the resolving power of a compound microscope change when

(i) refractive index of the medium between the object and objective lens increases ?

(ii) Wavelength of the radiation used is increased ?

Watch Video Solution

Sample Problem 6(e)

1. A plane wavefront is incident on a plane reflecting surface at an angle of 30°. What angle will the reflected rays make with the reflecting surface ?

Watch Video Solution

Example

1. Three indential polaroid sheets P_1, P_2 and P_3 are oriented so that the pass axis of P_2 and P_3 are inclined at 60° and 90° resp. with respect to pass axis of P_1. A monochromatic source of intensity I_0 is Kept in front of the polaroid sheet P_1. Find the intensity of this light as observed by O_1, O_2, O_3 positioned as shown in Fig.

View Text Solution

Conceptual problems

1. What are anastigmatic lenses ?

Watch Video Solution

2. (a) When monochromatic light is incident on a surface separating two media, the reflected and refracted ligth both have the same frequency as the incident frequency.

Explain why ?

(b) When light travels from a rarer to a denser medium, it loses speed. Does the reduction in speed imply a reduction in energy carried by the light wave ?

(c) In the wave picture of light, intensity of ligth is determined by the square of amplitude of wave. What determines the intensity of light in teh photon picture of light ? (NCERT Solved Example)

Watch Video Solution

3. A slit or an aperture diffracts light. Even then we say light travels in a straight line and ray optics is valid. Comment.

View Text Solution

4. For a single slit of width "a" the first minimum of the interference pattern of a monochromatic light of wavelength e occurs at an angle of $\frac{\lambda}{a}$. At the same angle of $\frac{\lambda}{a}$, we get a maximum for two narrow slits separated by distance "a". Explain.

Watch Video Solution

5. How does diffraction limit the resolving power of an optical instrument?

Watch Video Solution

6. (a) Explain how the intensity of diffraction pattern changes as the order (n) of the diffraction band varies.

(b) Two wavelengths of sodium light 590 nm and 596 nm are used in turn to study the diffraction at a single slit of size 4mm. The distance between the slit and screen is 2m. Calculate the separation between the positions of the first maximum of the diffraction pattern obtained in the two cases.

Watch Video Solution

7. Name one device for producing polarized light. Draw a graph showing the dependence of intensity of transmitted light on the angle between polarizer and analyser.

View Text Solution

8. when a sheet of transparent plastic is placed between two crossed palarizes, no light is transmitted. When the sheet is stretched in one direction, some light passes through the crossed polarizers. What is happening ?

Watch Video Solution

9. Distinguish between unpolarised light and linearly polarised light. How does one get linearly polarised light with the help of a polaroid ?

View Text Solution

Very short answer questions (Questions)

1. (a) How does one demonstrate, using a suitable diagram, that unpolarised light when passed through a Polaroid gets polarised?

(b) A beam of unpolarised light is incident a glass-air interface. Show using a suitable ray diagram, that light reflected from the interface is totally polarised, when $\mu = \tan i_B$, when μ is the refractive index of glass with respect to air and i_B, is the Brewster's angle.

Watch Video Solution

Short answer questios

1. (a) Explain two features to distinguish between the interference pattern in Young's double slit experiment with the difference pattern obtained due to a single slit.

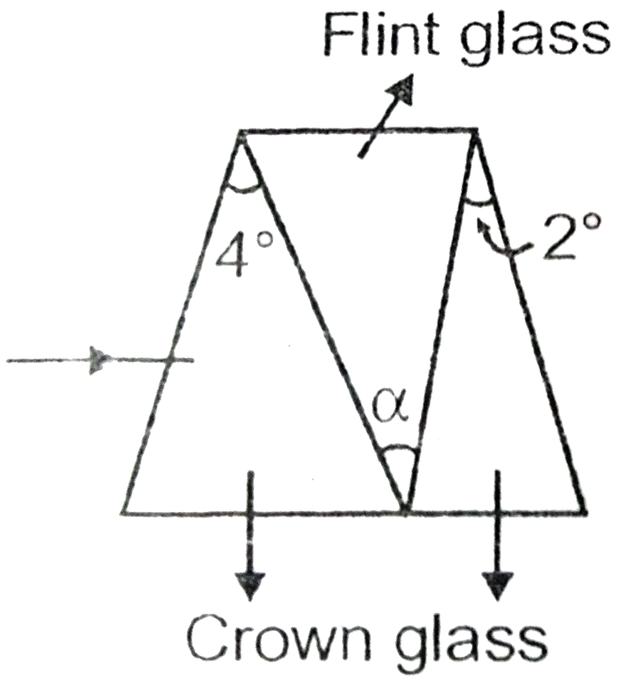
(b) A monochromatic light of wavelength $500nm$ is incident normally on a single slit of width 0.2 nm of produce a diffraction pattern. Find the angular width of the central maximum obtained on the screen.

Estimate the number of fringes obtained in Young's double slit experimental with fringe width $0.5mm$, which can be accommodated within the region of total angular spread of the central maximum due to single slit.

Watch Video Solution

Advanced Problems For Competitions

1. The refractive index of the crown glass for violet and red lights are 1.51 and 1.49 respectively and those of flint glass are 1.77 and 1.73 respectively. A narrow beam of white light is incident at a small angle of incident on shown combination of thin prism. Find values of α for which mean deviation of beam is zero. Also calculate net dispersing.



Watch Video Solution

NCERT Exercise with solution (9 chapter)

1. Answer the following questions :

Does the apparent depth of a tank of water change if viewed obliquely ? If so, does the apparent depth increase or decrease ?

Watch Video Solution

2. a) Determine the effective focal length of the combination of the two lenses in Exercise, if they are placed 8.0cm apart with their principal axes coincident.

Does the answer depend on which side of the combination a beam of paralel light is incident? Is the notions of effective focal length of this system useful at all?

b) An object 1.5 cm in size is placed on the side of the convex lens in the arrangement a) above. The distance between the object and the convex lens is 40cm. Determine the magnification produced by the two-lens system, and the size of the image.

Watch Video Solution

3. a) The anlge subtended at the eye by an object is equal to the angle subtended at the eye by the virtual image produced by a magnifying glass. In what sense then does a magnifying glass provide angular magnifications?

b) in viewing through a magnifying glass, one usually positions one's eyes very close to the lens. Does angular magnification change if the eye is moved back?

c) magnifying power of a simple microscopes is inversely proportional to the focal length of the lens. What then stops us from using a convex lens of smaller and smaller focal length and achieving greater and greater magnifying power?

d) Why must both the objective and the eyepiece of a compound microscope have short focal lengths?

e) When viewing through a compound microscope, our eyes should be positioned not on the eyepiece but a short distance away from it fot best veiwing. Why? How much should be that short distance between the eye and eyepiece?

Watch Video Solution

NCERT Exercise (10 chapter)

1. You have learnt in the text how Huygens' principle leads to the laws of reflection and refraction. Use the same principle to deduce directly that a point object placed in front of a plane mirror produces a virtual image whose distance from the mirror is equal to the object distance from the mirror.

Watch Video Solution

2. Answer the following questions :

(a) In a single slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band.

(b) In what way is diffraction from each slit related to interference pattern in a double slit experiment ?

(c) When a tiny circular obstacle is placed in the path if light from a distant source, a bright sound seen at the centre of the shadow of the obstacle. Explain why ? ltbr.

(d) Two students are separated by a $7m$ partition wall in a room $10m$ high. If both light and sound waves can bend round corners, how is it that the students are unable to see each other even through they can converse easily.

(e) Ray optics is based on the assumption that light travels in a straight line. Diffraction effects (observed when light propagates through small apertures//slits or around small obstacles) disprove this assumption. Yet the ray optics assumption is so sommonly used in understanding location and several other properties of images in optical instruments. What is the justification ?

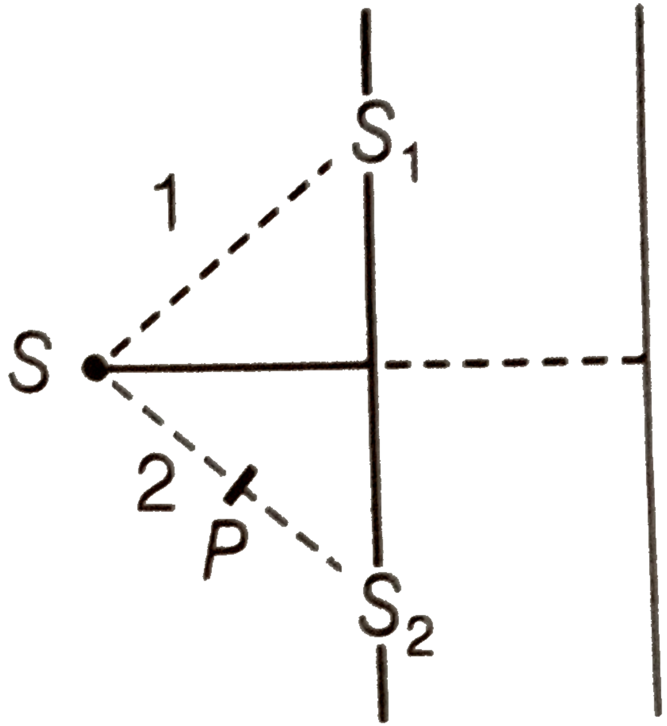
View Text Solution

3. Two towers on top of two hills are $40km$ apart. The line joining them passes $50m$ above a hill halfway between the towers. What is the longest wavelength of radio waves, which can be sent between the towers without appreciable diffraction effects ?

Watch Video Solution

Long answer questions (NCERT Ch - 10)

1. Figure shown a two slit arrangement with a source which emits unpolarised light. P is a polariser with axis whose direction is not given. If I_0 is the intensity of the principal maxima when no polariser is present, calculte in the present case, the intensity of the principal maxima as well as the first minima.



Watch Video Solution

2. The optical properties of a medium are governed by the relative permitivity (ε_r) and relative permeability

(μ_r). The refractive index is defined as $\sqrt{\mu_r \varepsilon_r} = n$. For ordinary material $\varepsilon_r > 0$ and $\mu_r > 0$ and the positive sign is taken for the square root. In 1964, a Russian scientist V. Veselago postulated the existence of material with $\varepsilon_r < 0$ and $\mu_r < 0$. Since then such 'metamaterials' have been produced in the laboratories and their optical properties studied. For such materials $n = -\sqrt{\mu_r \varepsilon_r}$. As light enters a medium of such refractive index the phases travel away from the direction of propagation.

(i) According to the description above show that if rays of light enter such a medium from air (refractive index = 1) at an angle θ in 2^{nd} quadrant, then the refracted beam is in the 3^{rd} quadrant.

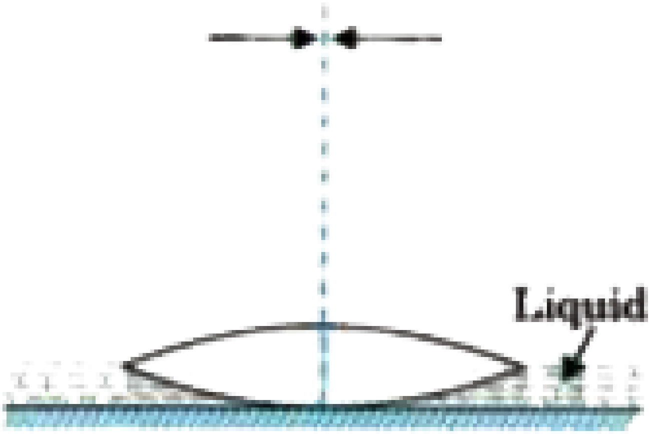
(ii) Prove that Snell's law holds for such a medium.

Watch Video Solution

Higher order thinking skills

1. An equiconvex lens with radii of curvature of magnitude R each is put over a liquid layer poured on top of a plane mirror. A small needle, with its tip on the principal axis of the lens, is moved along the axis until its inverted real image coincides with the needle itself. The distance of the needle from the lens is measured to be 'a'. On removing the liquid layer and repeating the experiment the distance is found to be 'b'.

Given that the two values of distances measured represent the focal length values in the two cases, obtain a formula for the refractive index of the liquid.



Watch Video Solution

2. In Young's double-slit experiment, two coherent source are used. Intensity of one of the sources is I but for the other it is slightly different $I + dI$. Show that intensity at the minima is approximately $\frac{(\delta I)^2}{4I}$.

Watch Video Solution

3. Light from an ordinary source (say a sodium lamp) is passed through a polaroid sheet P_1. The transmitted light is then made to pass through a second polaroid sheet P_2 which can be rotated so that the angle θ between the two polaroid sheets varies from 0° to 90°. Show graphically the variation of intensity of light transmitted by P_1 and P_2 as a function of angle θ. Take incident beam intensity I_0. Why does light from clear blue portion of sky show a rise and fall of intensity when viewed through a polaroid which is rotated ?

Watch Video Solution

Value based questions

1. Shweta's grand mother often comlains of headache. Shweta asked her to visit an eye specialist for a check up, but she refused saying that her eye sight is O.K. Some other day, her grand mother asked Shweta to thread a needle. Shweta understood her problem and took her to the eye specialist who prescribed her spectacles of suitable power.

Read the above passage and answer the following questions :

(i) What could Shweta make out ?

Can you guess the nature of lens prescribed ?

What values are displayed by Shweta ?

Watch Video Solution

2. Mona and Anushka are friends, both studying in class 12. Mona is in Science stream and Anushka in in Arts stream. Both of them go to market to purchase sunglasses. Anushka feels that any coloured glasses with fancy look are good enough. Mona tells her to look for UV protection glasses, polaroid glasses and photo sensitive glasses.

Read the above passage and answer the following questions :

(i) What are UV protection glasses, polaroid glasses and photo sensitive glasses ?

(ii) What values are displayed by Mona ?

Watch Video Solution

3. Mr. Chawla and Mr. Batra are two friends. Both are senior citizens. Mr. Batra once fell-ill. He took medicine from a quack who diagnosis by pulse check only. The medicine did not work and he continued ailing for along. Mr. Chawla then took him to a qualified doctor who diagnosed the cause of his illness by testing his blood sample and urine sample using clinical microscopes. The medicine prescribed by the doctor worked and Mr. Batra got well within a couple of days.

Read the above passage and answer the following questions :

(i) Should we go in for clinical tests ? Why ?

(ii) Should we go to specialists inspite of their exorbitant charges ?

(iii) What values did Mr. Chawla display ?

Watch Video Solution

Exercise

1. Which is not true for the image formed in a plane mirror ? The image is

A. virtual

B. erect

C. Laterally inverted

D. closer to the mirror than the object

Answer: D

Watch Video Solution

2. The relation between focal length f and radius of curvature R of a spherical mirror is.

A. $f = R$

B. $f = R/2$

C. $f = 2R$

D. none of these

Answer: B

Watch Video Solution

3. The correct mirror equation is.

A. $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

B. $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

C. $\frac{1}{f} = \frac{1}{u} - \frac{1}{v}$

D. none of these

Answer: A

Watch Video Solution

4. For any position of an object, image formed in a convex mirror is.

A. virtual

B. erect

C. smaller in size

D. as far behind the mirror as the object is in front

Answer: D

Watch Video Solution

5. Image of an object in a convex mirror is

A. always real

B. always virtual

C. always erect

D. real or virtual depending on position of object

Answer: D

Watch Video Solution

6. The linear magnification of a concave mirror is.

A. always positive

B. always virtual

C. positive or negative depending upon the position of the object

D. cannot say

Answer: C

Watch Video Solution

7. When an object is held between pole and focus of a concave mirror, the image formed is.

A. real and inverted

B. real and enlarged

C. virtual and diminished

D. virtual and enlarged

Answer: D

Watch Video Solution

8. The linear magnification of a convex mirror is always............because image formed in such a mirror is always.......... .

A. always positive

B. always negative

C. sometimes positive and sometimes negative

D. cannot predict

Answer: A

Watch Video Solution

9. An object is held in front of a concave mirror between f and C. The image formed is.

A. at F

B. at C

C. beyond C

D. none of the above

Answer: C

Watch Video Solution

10. Light of wavelength 6000Å falls on a plane reflecting surface. The reflected wavelength is

A. 6000Å

B. $< 6000\text{Å}$

C. $> 6000\text{Å}$

D. cannot say

Answer: A

Watch Video Solution

11. Reflection is the phenomenon of.........without........ .

Watch Video Solution

12. For a given incident ray, when a plane mirror is turned........... The reflected ray turns through.......... .

Watch Video Solution

13. ....of spherical mirror is called........... Of the mirror.

Watch Video Solution

14. In case of spherical mirrors, all distances are measured from.......... .

Watch Video Solution

15. Principal focal length of a spherical mirror is equal to........... Radius......... of the mirror.

Watch Video Solution

16. A real image can be...........but a ....cannot be........... .

Watch Video Solution

17. Image formed in a convex mirror is always ....whatever be.......... .

Watch Video Solution

18. Image formed in a concave mirror may be........... depending upon......... .

Watch Video Solution

19. The linear magnification of a convex mirror is always...........because image formed in such a mirror is always.......... .

Watch Video Solution

20. ....is used as a driver's mirror because it has a.......... .

Watch Video Solution

21. Light of wavelength 6000Å falls on a plane reflecting surface. What are the wavelength and frequency of reflected light. If angle between incident ray and reflected ray is 60°, what is the angle of incidence ?

Watch Video Solution

22. A ray of light is incident at an angle of 60° on a horizontal plane mirror. Through what angle should the mirror be tilted to make the reflected ray horizontal ?

Watch Video Solution

23. A point object is held between two plane mirrors inclined at 45°. What is the number of images seen ?

Watch Video Solution

24. A $12m$ tall tree is to be photographed with a pin hole camera. It is situated $15m$ away from the pin hole. How far should the screen be placed from the pin hole to obtain a $12cm$ tall image of the tree ?

Watch Video Solution

25. A concave mirror of focal length $10cm$ is placed at a distance of $35cm$ from a wall. How far from the wall should an object be placed to get its image on the wall ?

Watch Video Solution

26. An object is held in front of conacve mirror of focal length $15cm$. The image formed is 3 times the size of the object. Calculate two possible distances of the object from the mirror.

Watch Video Solution

27. When the distance of an object from a concave mirror is decreased from $15cm$ to 9 cm, the image gets magnified 3 times than that in first case. Calculate focal length of the mirror.

Watch Video Solution

28. Two objects A and B, when placed one after another in front of a conacve mirror of focal length $10cm$, from images of same size. Size of object A is four times that of B. If object A is placed at a distance of $50cm$ from the mirror, what should be the distance of B from the mirror ?

Watch Video Solution

29. A dentist concave mirror has a radius of curvature of $30cm$. How far must it be placed from a small cavity in order to get a virtual image magnified 5 times ?

Watch Video Solution

30. An object of size $10cm$ is placed at a distance of $50cm$ from a concave mirror of focal length $15cm$. Calculate location, size and nature of the image.

Watch Video Solution

31. An object $2cm$ high is placed at a distance of $16cm$ from a concave mirror, which produces a real image $3cm$ high. What is thr focal length of the mirror ? Find the position of the image ?

Watch Video Solution

32. An object is placed in front of a concave mirror of focal length $20cm$. The image formed is three times the size of the onject. Calculate focal length of the mirror and the position of the image.

Watch Video Solution

33. A concave mirror produces real image $10mm$ tall, of an object $2.5mm$ tall placed at $5cm$ from the mirror. Calculate focal length of the mirror and the position of the image.

Watch Video Solution

34. A square object is placed $15cm$ from a convex mirror of radius of curavture $90cm$. Calculate the position of the image and its areal magnification.

Watch Video Solution

35. The image formed by a convex mirror of focal length $30cm$. is a quarter of the object. What is the distance of the object from the mirror ?

Watch Video Solution

36. Calculate the distance of an object of height h from a concave mirror of focal length $10cm$ so as to obtain a real image of magnification 2.

Watch Video Solution

37. When an object is placed at a distance of $60cm$ from a convex spherical mirror, the magnification produced is $1/2$. Where should the object be placed to get a magnification of $1/3$?

Watch Video Solution

38. An object is placed in front of a concave mirror of radius of curvature $40cm$ at a distance of $10cm$. Find the position, nature and magnification of the image.

Watch Video Solution

Watch Video Solution

39. A concave mirror of focal length $20cm$ is placed at a distance of $50cm$ from a wall. How far from the wall should an object be placed to form its real image on the wall ?

Watch Video Solution

40. An object is placed $0.4m$ from a convex mirror and a plane mirror is placed at a distance of $0.3m$ from the object. The images formed in the two mirrors coincide without parallex. What is the focal length of the convex mirror ?

Watch Video Solution

Watch Video Solution

41. Two plane mirror are inclined to eachother at an angle $\theta = 70^\circ$, Fig. A ray SO of light falls at some angle i on the mirror M_1, falls after reflection from it, on the other mirror M_2 from which it gets reflected along a direction parallel to the plane mirror M_1. Find the value of $\angle i$.

Watch Video Solution

42. A rod $AB = 10cm$ in length is placed along the principal axis of a concave mirror having focal length equal to $10cm$ as shown in Fig. The distance $PB = 20cm$.

What is the length of the image of the rod AB ?

Watch Video Solution

43. Size of an object P is four times that of Q. It is required that the size of the image of P and Q, placed one after the other at certain distances away from a concave mirror of radius of curvature $20cm$ should be equal. To achieve this, if the distance of P from the mirror is $50cm$, what must be the distance of Q ?

Watch Video Solution

44. An object is placed at a distance of $36cm$ from a convex mirror. A plane mirror is placed inbetween so that the two virtual images so formed coincide. If the plane mirror is at a distance of $24cm$ from the object, find the radius of curvature of convex mirror.

Watch Video Solution

45. A motor car is fitted with a convex driving mirror of focal length $20cm$. A second motor car is $6m$ away from the driving mirror of the first car. Calculate (i) position of second car as seen in the first car mirror.

(ii) if the second car is overtaking the first car at a relative speed of $15m/s$, how will its image be moving and in what direction ?

Watch Video Solution

46. What is the refractive index of a medium in which light travels with a speed of $2 \times 10^8 m/s$?

A. $3/2$

B. $2/3$

C. 1

D. none of these

Answer: A

Watch Video Solution

47. Refractive index of glass w.r.t water is $9/8$. What is the speed of light in water ? Given speed pf light in glass is $2 \times 10^8 m/s$.

A. $2 \times 10^8 m/s$

B. $3 \times 10^8 m/s$

C. $2.25 \times 10^8 m/s$

D. none of these

Answer: C

Watch Video Solution

48. A small ink dot on a paper is seen through s glass slab of thickness $4cm$ and refractive index 1.5. The dot appears to be raised by

A. $1cm$

B. $2cm$

C. $3cm$

D. $1.33cm$

Answer: D

Watch Video Solution

49. For total internal reflection, light must travel

A. from rarer to denser medium

B. from denser to rarer medium

C. in air only

D. in water only

Answer: B

Watch Video Solution

50. Optical fibers are based on the phenomenon of

A. reflection

B. refraction

C. dispersion

D. total internal relflection

Answer: D

Watch Video Solution

51. The relation governing refraction of light from rarer to denser medium at a spherical refracting surface is

A. $-\frac{\mu_1}{u}+\frac{\mu_2}{v}=\frac{\mu_2-\mu_1}{R}$

B. $\frac{\mu_1}{u}+\frac{\mu_2}{v}=\frac{\mu_2-\mu_1}{R}$

C. $\frac{\mu_1}{u}-\frac{\mu_2}{v}=\frac{\mu_2-\mu_1}{R}$

D. none of these

Answer: A

Watch Video Solution

52. In the above question, the ralation remains the same whether

(A) image is real or virtual

(B) refracting surface is convex or cancave

(C)light is going from rarer to denser medium or from denser to rarer medium

(D) object is close to far off from the refracting surface

Choose the wrong statement

A. A

B. B

C. C

D. D

Answer: C

Watch Video Solution

53. The focal length of a double convex lens is equal to radius of curvature of either surface. The refractive index of its material is

A. $3/2$

B. 1

C. $4/3$

D. none of these

Answer: A

Watch Video Solution

54. One dioptre is the power of a lens of facal length

A. $1cm$

B. $1m$

C. $-1cm$

D. $-1m$

Answer: B

Watch Video Solution

55. Two lenses of focal lengths $20cm$ and $-40cm$ are held in contact. The image of an object at infinity will be formed by the combination at

A. ∞

B. $20cm$

C. $40cm$

D. $60cm$

Answer: C

Watch Video Solution

56. Refraction of light is the phenomenon of.......... When it............. .

Watch Video Solution

57. The basic cause of refraction is............in going............. .

Watch Video Solution

58. The sun is visible to us before actual.............and after.......... . This is because of ....

Watch Video Solution

59. Total internal reflection of light is the phenomenon of..........into........from........... .

Watch Video Solution

60. For toat internal reflection, light must travel.............. to.............. .

Watch Video Solution

61. Total internal reflection will occure only when................. in.............medium is.................than............for the pair of media in contact.

Watch Video Solution

62. Mirage is accounted for by.............. .

Watch Video Solution

63. When reflection occurs from denser to.............., then $\frac{\mu_2}{\mu_1} = \ldots\ldots\ldots$.

Watch Video Solution

64. For a double convex lens R_1 is.............. And R_2 is............... . Therefore, its focal length is............ .

Watch Video Solution

65. One dioptre is..............of focal length......... .

Watch Video Solution

66. A mark is made on the bottom of beaker and a microscope is focussed on it. The microscope is raised through $1.5cm$. To what height water must be poured into the beaker to bring the mark again into focus ? Given that μ for water is $4/3$.

Watch Video Solution

67. Calculate the speed and wvaelength of light (i) in glass (ii) in air, when light waves light waves of frequency

$6 \times 10^{14} Hz$. travel from air to glass of $\mu = 1.5$.

Watch Video Solution

68. The refractive index of diamond is 2.47 and that of glass is 1.51. How much faster does light travel in glass than in diamond ?

Watch Video Solution

69. A pond of depth $20cm$ is half filled with an oil of $\mu = 1.4$ and the other half is filled with water of refractive index 1.33. Calculate apparent depth of the tank when viewed normally.

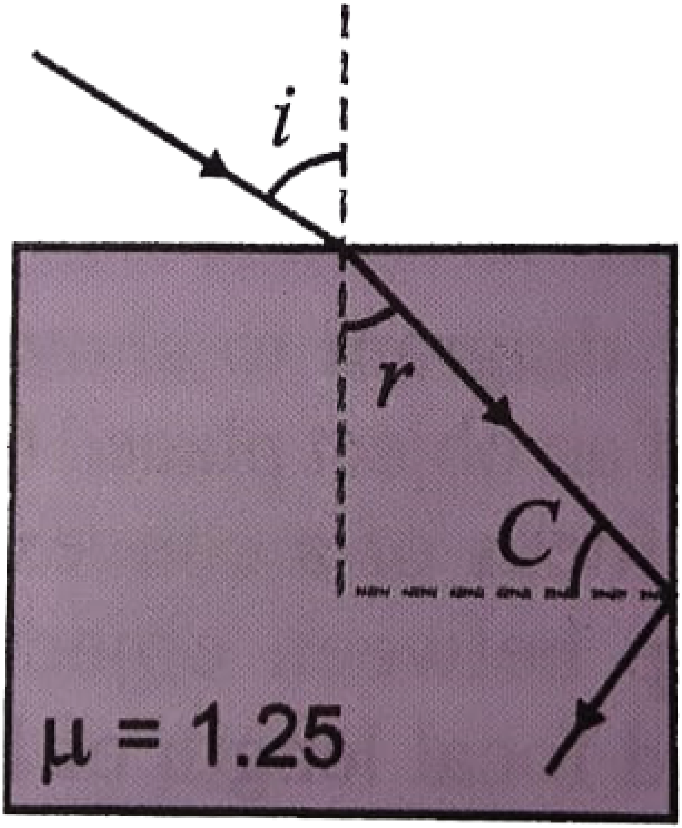
Watch Video Solution

Watch Video Solution

70. A ray of light is incident at an angle of 60° on one face of a rectangular glass slab of thickness $0.1m$, and refractive index 1.5.Calculate the lateral shift produced.

Watch Video Solution

71. In Fig. find the maximum angle i for which light suffers total internal reflection at the vertical surface.



Watch Video Solution

72. Calculate the critical angle for glass air surface if a ray of light which is nicident ni air on the glass surface is deviated through 15°, when the angle of incidence is 45°.

Watch Video Solution

73. A small bulb (assumed to be a point source) is placed at the bottom of a tank containing water to a depth of $80cm$. Find out the area of the surface of water through which light from thr bulb can emerge. Take the value of refractive index of water to be $4/3$.

Watch Video Solution

74. The refractive indices of glycerine and water are 1.46 and 1.33 repectively. What is the critical angle when the ray passes from glycerine to water ?

Watch Video Solution

75. A point source of monochromatic light 'S' is kept at the centre of the bottom of a cylinder of radius $15.0cm$. The cylinder contains water (refractive index 4//3) to a height of $7.0cm$. Draw the ray diagram and calculate the area of water surface through which the light emerges in air.

Watch Video Solution

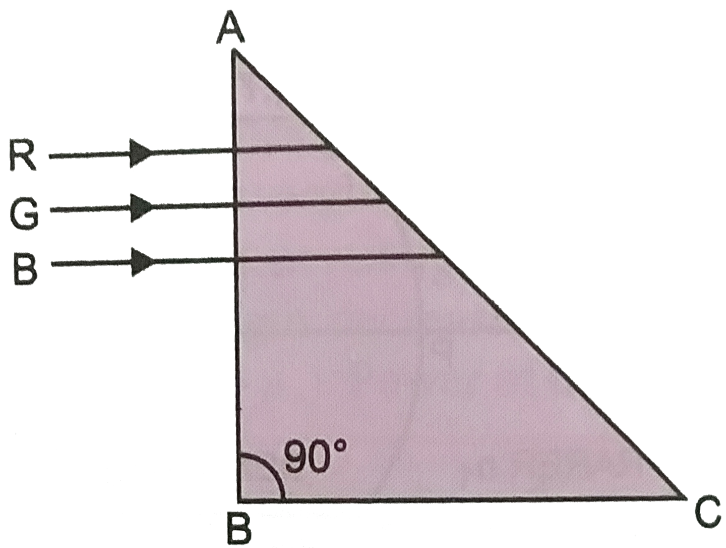
76. When a fish looks up the surface of a perfectly smooth lake, the surface appears dark except inside a circular area directly above it. Calculate the angle that this illuminated region subtends. Given μ of water $= 1.333$.

Watch Video Solution

77. A right prism is to be made by selecting a proper material and the angles A and B $(B \leq A)$ as shown in figure. It is desired that a ray of light incident normally on AB emerges parallel to the incident direction after two internal reflection.a. What should be the minimum refractive index μ for this to be possible? b. F or $\mu = \frac{5}{3}$ is it possible to achieve this with the angle A equl to 60 degrees?

Watch Video Solution

78. In Fig. 6(b).80, light rays of blue, green and red wavelength are incident on an isoscels right angled prism. Explain with reason which ray of light will be transmitted through the face AC. The refractive index of the prism for red, green and blue light are 1.39, 1.424 and 1.476 respectively.



Watch Video Solution

79. Calculate the speed of light in a medium whose critical angle is 45°.

Watch Video Solution

80. Velocity of light in a liquid is $1.5 \times 10^8 m/s$ and in air, it is $3 \times 10^8 m/s$. If a ray of light passes from this liquid to air, calculate the value of critical angle.

Watch Video Solution

81. An air bubble in sphere having 4cm diameter appears of 1 cm from surface nearest to eye when looked along diameter. If nga = 1.5, the distance of bubble from refracting surface is

A. 1.2 cm

B. 3.2 cm

C. 2.8 cm

D. 1.6 cm

Answer: A

Watch Video Solution

82. An object is placed $50cm$ from the surface of a glass sphere of radius $10cm$ along the diameter. Where will the final image be formed after refraction at both the surfaces ? μ of glass $= 1.5$.

Watch Video Solution

83. A spherical surface of radius 30 cm separates two transparent media A and B with refractive indices 1'33 and 1.48 respectively. The medium A is on the convex side of the surface. Where should a point object be placed in medium A so that the paraxial rays become parallel after refraction at the surface ?

Watch Video Solution

84. An air bubble in a glass sphere $(\mu = 1.5)$ is situated at a distance $3cm$ from a convex surface of diameter $10cm$. At what distance from the surface will be the bubble appear ?

Watch Video Solution

85. A convex refracting surface of radius of curvature $20cm$ separates two media of refractive indices $4/3$ and 1.60. An object is placed in the first medium $(\mu = 4/3)$ at a distance of $200cm$ from the refracting surface. Calculate the position of image formed.

Watch Video Solution

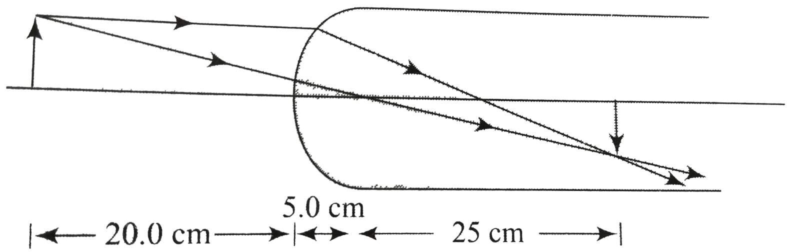
86. A sphere of glass $(\mu = 1.5)$ is of $20cm$ diameter. A parallel beam enters it from one side. Where will it get focussed on the other side ?

Watch Video Solution

87. A beam of light strikes a glass sphere of diameter $15cm$ convering towards a point $30cm$ behind the pole of the spherical surface. Find the position of the image, if μ of glass is 1.5.

Watch Video Solution

88. One end of a horizontal cylindrical glass rod $(\mu = 1.5)$ of radius $5cm$ is rounded in the shape of a hemisphere. An object $0.5mm$ high is placed perpendicular to the axis of the rod at a distance of $20.0cm$ from the rounded edge. Locate the image of the object and find its height`



Watch Video Solution

89. A spherical convex surface separates object and image space of refractive index 1.0 and $4/3$. If radius of curvature of the surface is $10cm$, find its power.

Watch Video Solution

90. The radii of curvatureof double convex lens of glass ($\mu = 1.5$) are in the ratio of $1:2$. This lens renders the rays parallel coming from an illuminated filament at a distance of $6cm$. Calculate the radii of curvature of its surfaces.

Watch Video Solution

91. A convex lens of focal legnth $0.2m$ and made of glass ($\mu = 1.50$) is immersed in water ($\mu = 1.33$). Find the change in the focal length of the lens.

Watch Video Solution

92. A converging lens has a focal length of $20cm$ in air. It is made of a material of refractive index 1.6. If it is immersed in a liquid of refractive index 1.3, what will be its new foacl length ?

Watch Video Solution

93. The radii of curvature of each surface of a convex lens is $20cm$ and the refractive index of the material of the lens is $3/2$ (i) Calculate its focal length (ii) If this is cut along the plane AB. What will be formed ? (iii) What happens if the lens is cut along CD ?

Watch Video Solution

94. A convex lens made up of glass of refractive index 1.5 is dippedin turn

(i) in a medium of refractive index 1.65

(ii) in a medium of refractive index 1.33

(a) Will it behave as converging or diverging lens in the two cases ?

(b) How will its focal length changes in the two media ?

Watch Video Solution

95. A converging lens of refractive index 1.5 and of focal length $15cm$ in air, has the same radii of curvature for both sides. If it is immersed in a liquid of refractive index 1.7, find the focal length of the lens in the liquid.

Watch Video Solution

96. The radii of curvature of the surfaces of a double convex lens are $20cm$ and $30cm$. What will be its focal length and power in air and water respectively ? Refractive indices for glass and water are $3/2$ and $4/3$ respectively.

Watch Video Solution

97. A convex lens made up of glass of refractive index 1.5 is dippedin turn

(i) in a medium of refractive index 1.65

(ii) in a medium of refractive index 1.33

(a) Will it behave as converging or diverging lens in the two cases ?

(b) How will its focal length changes in the two media ?

Watch Video Solution

98. A biconvex lens is made of glass with $\mu = 1.52$. Each surface has a radius of curvature equal to $30cm$. An object of height $3cm$ is placed $14cm$ from the lens. Find the focal length of the lens and the position and size of image.

Watch Video Solution

99. A concave lens has same radii of curvature for both sides and is made of material of refractive in index 1.6 It is immersed in a liquid of $\mu = 1.4$ Calculate ratio of focal lengths of lens in air and liquid.

Watch Video Solution

100. A double convex lens of glass of refractive index 1.6 has its both surfaces of equal radii of curvature of $30cm$ each. An object of height $5cm$ is placed at a distance of $12.5cm$ from the lens. Calculate the size of the image formed.

Watch Video Solution

101. Convex lens is made of glass of refractive index 1.5 If the radius of curvature of each of the two surfaces is

$20cm$ find the ratio of the powers of the lens, when placed in air to its power, when immersed in a liquid of refractive index 1.25.

Watch Video Solution

102. A glass convex lens has a power of $+10D$. When this lens is totally immersed in a liquid, it acts as a concave lens of focal length $50cm$. Calculate the refractive index of the liquid. Given $.^a\mu_g = 1.5$.

Watch Video Solution

103. A convex lens of focal length $20cm$ and made of glass $(\mu = 1.5)$ is immersed in water of $\mu = 1.33$ Calculate change in focal length of the lens.

Watch Video Solution

104. A thin converging lens made of glass of refractive index 1.5 acts as a concave lens of focal length $50cm$, when immersed in a liquid of refractive index $15/8$. Calculate the focal length of converging lens in air.

Watch Video Solution

105. Find the radius of curvature of convex surface of a plano convex lens, whose focal length is $0.3m$ and $\mu = 1.5$.

Watch Video Solution

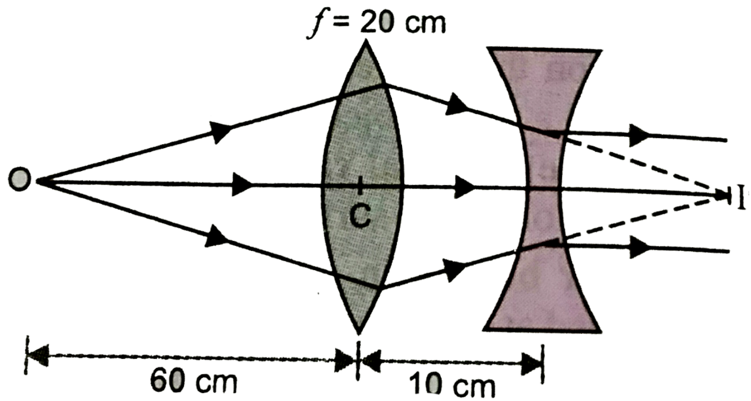
106. A corverging lens has a focal length of $20cm$ in air. It is made of a material of refractive index 1.6. If is immersed in a liquid of refractive index 1.3, what will be its new focal length ?

Watch Video Solution

107. A converging lens of refractive index 1.5 and of focal length $15cm$ in air, has the same radii of curvature for both sides. If it is immersed in a liquid of refractive index 1.7, find the focal length of the lens in the liquid.

Watch Video Solution

108. From the ray diagram shown in Fig. calculte the focal length of concave lens.



Watch Video Solution

109. A convex lens is used to throw on a screen $10m$ from the lens, a magnified image of an object. If the magnification is to be 19, find the focal length of the lens.

Watch Video Solution

110. An object is placed at a distance of $1.5m$ from a screen and a convex lens is interposed between them. The magnification produced is 4. What is the focal length of the lens ?

Watch Video Solution

111. A screen is placed $80cm$ from an object. The image of the object on the screen is formed by a convex lens at two different locations separated by $10cm$. Calculate the focal length of the lens used.

Watch Video Solution

112. A convergent beam of light passes through a diverging lens of focal length $0.2m$ and comes to focus at a distance of $0.3m$ behind the lens. Find the position of the point at which the beam would converge in the absence of the lens.

Watch Video Solution

113. The image obtained with a convex lens is erect and its length is 4 times the length of the object. If the focal length of lens is $20cm$, calculate the object and image distances.

Watch Video Solution

114. An illuminated object and a screen are placed $90cm$ apart. What is the focal length and nature of the lens required to produce a clear image on the screen twice the size of the object ?

Watch Video Solution

115. A convex lens of focal length $25cm$ is placed co-axially in contact with a concave lens of focal length $20cm$. Determine the power of the combination. Will the system be converging or diverging in nature ?

Watch Video Solution

116. The radius of curvature of the faces of a double convex lens are $10cm$ and $15cm$. If focal length of lens of lens is $12cm$, find the refractive index of the material of th lens.

Watch Video Solution

117. A biconvex lens has focal length $\frac{2}{3}$ times the radius of curvature of either surface. Calculate refraction index f material of the lens.

Watch Video Solution

118. An object is placed at a distance of $1.5m$ from a screen and a convex lens is interposed between them. The magnification produced is 4. What is the focal length of the lens ?

Watch Video Solution

119. Find the focal length and power of a convex lens, which when placed in contact with a concave lens of focal length $25cm$ forms a real image 5 times the size of the object placed $20cm$ from the combination.

Watch Video Solution

120. Find the focal length and power of a convex lens, which when placed in contact with a concave lens of focal length $25cm$ forms a real image 5 times the size of the object placed $20cm$ from the combination.

Watch Video Solution

121. Two lenses, one diverging of power 2 dioptre and the other converging of power $6 dioptre$ are combined together. Calculate focal length and power of the combination.

Watch Video Solution

122. Two lenses of power $+10D$ and $-5D$ are placed in contact,

(i) Calculate the focal length of the combination

(ii) where should an object be held from the combination so as to obtain a virtual image of magnification 2 ?

Watch Video Solution

123. A point object is placed $60cm$ in front of a convex lens of focal length $15cm$. A plane mirror is placed $10cm$ behind the convex lens. Where is the image formed by the system ?

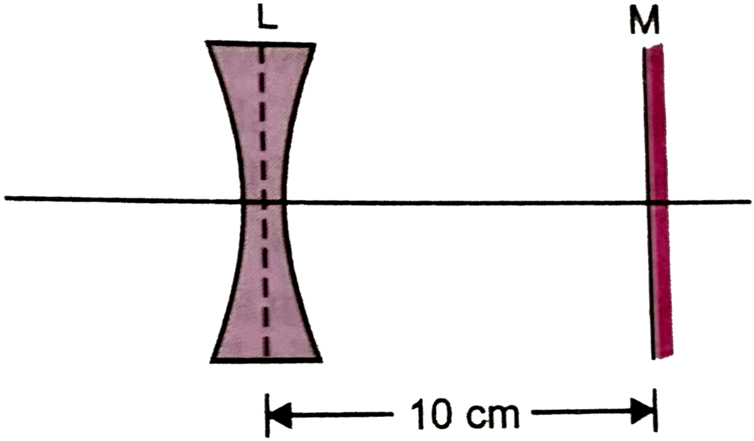
Watch Video Solution

124. A convex lens of focal length $15cm$, and a concave mirror of radius of curvature $20cm$ are placed co-axially $10cm$ apart. An object is placed in front of convex lens so that there is no parallax between the object and its image formed by the combination. Find the position of the object.

Watch Video Solution

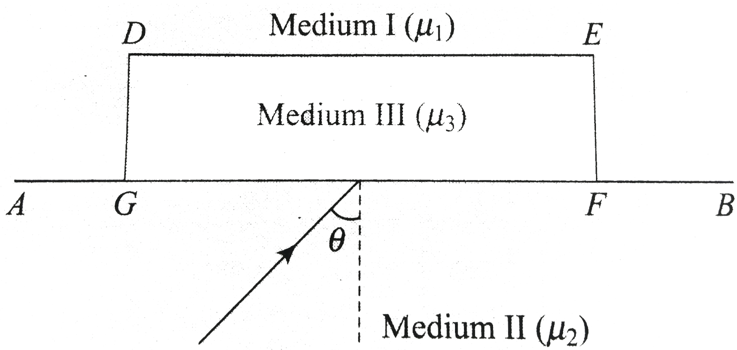
125. Fig. shows a plane mirror M placed at a distance of $10cm$ from a concave lens L. A point object is placed at a distance of $60cm$ from the lens. The image formed due to refraction by the lens and reflection by the mirror is $30cm$

behind th mirror. What is the focal length of this lens ?



Watch Video Solution

126. A monochromatic light is incident on the plane interface AB between two media of refractive indices μ_1 and $(\mu_2 > \mu_1)$ at an angle of incidence θ as shown in Fig. The angle θ is infinitesimally greater than the critical angle for the two media so that total internal reflection takes place. Now, if a transparent slab DEFG of uniform thickness and of refractive index μ_3 is introduced on the interface (as shown in the figure), show that for any value of μ_3 all light will ultimately be reflected back into medium II.

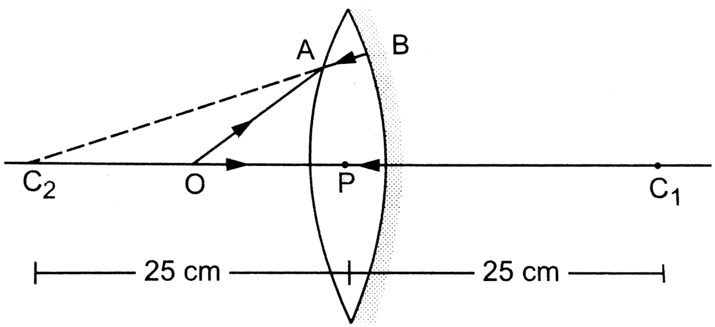


Watch Video Solution

127. The image of a needle placed $45cm$ from a lens is formed on a screen placed $90cm$ on the other side of lens. Find displacement of image if object is moved $5cm$ away from lens.

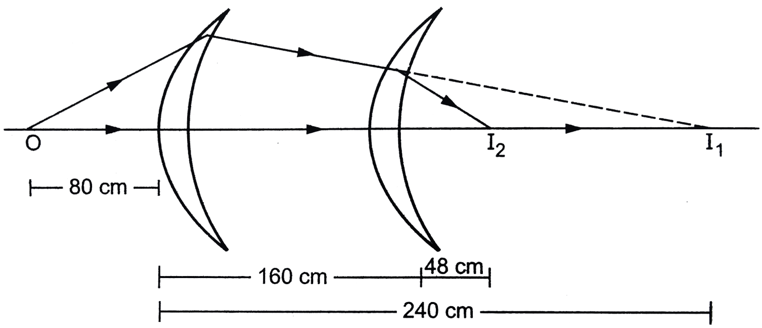
Watch Video Solution

128. A biconvex thin lens is prepared from glass ($\mu = 1.5$), the two bounding surfaces having equal radii of 25 cm each. One of the surfaces is silvered from outside to make it reflecting. Whee should an object be placed before this lens so that the image is formed on the object itself?



Watch Video Solution

129. A concave convex figure lens made of glas $(\mu = 1.5)$ has surface of radii 20 cm and 60 cm. a. Locate the image ofan object placed 80 cm to the left of the lens along the principal axis. B. A similar lens is placed coaxially at distanc of 160 cm right of it. Locate the position of the image.

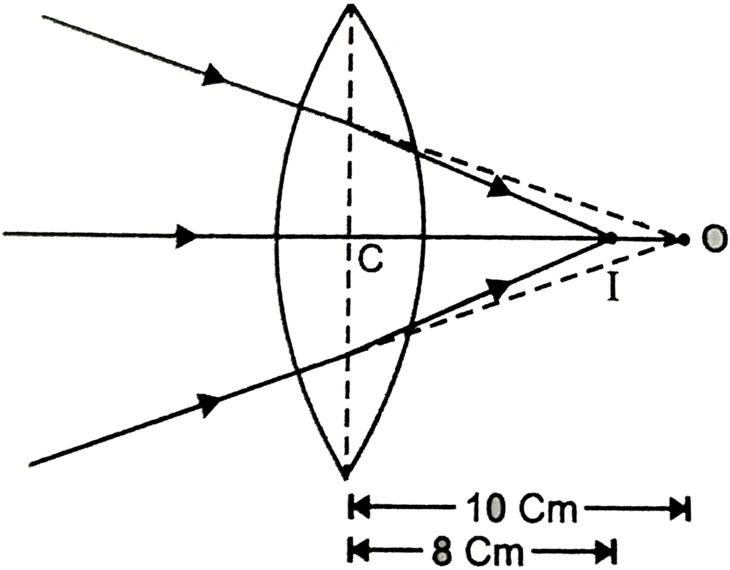


Watch Video Solution

130. A converging beam of light forms a sharp image on a screen. A lens is placed in the path of the beam at $10cm$ from the screen. It is found that the screen has to be moved $8cm$ further away from the lens to obtain a sharp image. Find the focal length and nature of the lens.

Watch Video Solution

131. Rays of light are falling on a convex lens of focal length $40cm$. As shown in Fig. Determine the position of the image.



Watch Video Solution

132. Which of the following colours has maximum wavelength

A. red

B. violet

C. yellow

D. green

Answer: A

Watch Video Solution

133. In vaccum, which colour travels fastest ?

A. red

B. violet

C. green

D. none of the above

Answer: D

Watch Video Solution

134. In glass, the velocity of light is minimum for

A. red

B. violet

C. yellow

D. green

Answer: B

Watch Video Solution

135. The deviation δ of a ray on passing through a prism of small angle A is.

A. $\dfrac{\mu - 1}{A}$

B. $\dfrac{A}{\mu - 1}$

C. $(\mu - 1)A$

D. None of these

Answer: C

Watch Video Solution

136. What is the relation between angle of prism A, angle of incidence i and angle of minimum deviation δ_m ?

A. $i = A + \delta_m$

B. $i = \dfrac{A + \delta_m}{2}$

C. $\delta_m = i + A$

D. $\delta_m = i - A$

Answer: B

Watch Video Solution

137. When size of scatterer (x) is very much less than the wavelength (λ) of light, intensity of scattered light $\left(I_s\right)$ varies as :

A. $I_s \propto \dfrac{1}{\lambda}$

B. $I_s \propto \frac{1}{\lambda^2}$

C. $I_s \propto \frac{1}{\lambda^4}$

D. $I_s \propto \frac{1}{\lambda^6}$

Answer: C

Watch Video Solution

138. A thin prism of 6° angle gives a deviation of 3°. The refractive index of the material of the prism is.

A. 1

B. $4/3$

C. $3/2$

D. 2

Answer: C

Watch Video Solution

139. An equilateral prism is made of made of material of refractive index $\sqrt{3}$. Angle of minimum deviation through the prism is.

A. 60°

B. 30°

C. 45°

D. 90°

Answer: A

Watch Video Solution

140. One cannot cannot see through fog, because

A. fog absorbs the light

B. light suffers total reflection at droplets

C. refractive index of fog is infinity

D. light is scattered by droplets

Answer: D

Watch Video Solution

141. The angle of minimum deviation for prism of angle $\pi/3 is \pi/6$. The refractive index of the material of the prism is.

A. $\sqrt{3}$

B. $\sqrt{2}$

C. $3/2$

D. $2/3$

Answer: B

Watch Video Solution

142. A ray of light undergoes.........on passing through a prism.

Watch Video Solution

143. The deviation δ of a ray on passing through a prism of small angle A is.

Watch Video Solution

144. For prisms with bigger refracting angles, the deviation is calculated from the relation........... .

Watch Video Solution

145. The deviation through a prism is minimum when..........

.

Watch Video Solution

146. In the minimum deviation position, the......... In the prism is........ to the base of the prism.

Watch Video Solution

147. According to Cauchy's formula, the refractive index μ of a material is related to wavelength λ as......... .

Watch Video Solution

148. Wavelength of violet colour is......... wavelength of red colour. Therefore, μ_v ....μ_r. Hence, δ_v .... δ_r.

Watch Video Solution

149. Angular dispersion of a prism is..........of...........and..........colours.

Watch Video Solution

150. Dispersive power of a prism is..........of..........and.......... .

Watch Video Solution

151. Intensity of scattered light varies....................as................of wavelength of incident light.

Watch Video Solution

152. Calculate the refractive index of the material of an equilaterial prism for which angle of minimum deviation is 60°.

Watch Video Solution

153. A ray of light suffers minimum deviation, while passing through a prism of refractive index 1.5 and refracting angle 60°. Calculate the angle of deviation and angle in incidence.

Watch Video Solution

154. A ray of light is inclined to one face of a prism at an angle of 60°. If angle of prism is 60° and the ray deviated through an angle of 42° find the angle which the emergent ray makes with second face of the prism.

Watch Video Solution

155. A glass prism has a refracting angle of 60°. The angle of minimum deviation is 40°. If velocity of light in vacuum is $3 \times 10^8 m/s$. Calculate the velocity of light in glass. What is the angle of incidence ?

Watch Video Solution

156. A small angled prism $(\mu = 1.62)$ gives a deviation of 4.8. Calculate the angle of prism.

Watch Video Solution

157. Show that the angle of deviation produced by a thin prism is reduced to one fourth (w.r.t. air) when it is immersed in water. Given $.^a\mu_g = 3/2$ and $.^a\mu_g = 4/3$.

Watch Video Solution

158. The refractive index of the material of a prism of 60° angle for yellow light is $\sqrt{2}$. Calculate angle of minimum deviation, angle of incidence and angle of refraction.

Watch Video Solution

159. A prism of refractive index 1.53 is placed in water of refractive index 1.33. If the angle of prism is 60°, calculate the angle of minimum deviation in water.

Watch Video Solution

160. A ray of light is inclined to one face of a prism at an angle of 60°. If angle of prism is 60° and the ray deviated through an angle of 42° find the angle which the emergent ray makes with second face of the prism.

Watch Video Solution

161. A glass prism has a refracting angle of 60°. The angle of minimum deviation is 40°. Find the refractive index. At what angle should the ray be incident so as to suffer minimum deviation ?

Watch Video Solution

162. The angle of minimum deviation for prism of angle $\pi/3 is \pi/6$. Calculate the velocity of light in the material of the prism if the velocity of light in vacuum is $3 \times 10^8 ms^{-1}$.

Watch Video Solution

163. A glass prism of angle 72° and refractive index 1.66 is immersed in a liquid of $\mu = 1.33$. Calculate the angle of minimum deviation.

Watch Video Solution

164. A prism with refracting angle 60° gives angle of minimum deviation, $53^\circ, 51^\circ$ and 52° for blue, yellow and red light respectively. What is the dispersive power of the prism ?

Watch Video Solution

165. The refractive indices of a prism for red, violet and yellow lights are $1.52, 1.62$ and 1.59 recp.What is the dispersive power of the prism ? If mean deviation is 40°. What is angular dispersion produced by the prism ?

Watch Video Solution

166. Find the angle of flint glass prism which produces the same angular dispersion for c and F wavelengths in 10° crown glass prism.

For crown glass : $\mu_F = 1.5230, \mu_c = 1.5145$

For flint glass : $\mu'_F = 1.6637, \mu'_c = 1.6444.$

Watch Video Solution

167. The deviations produced for violet, yellow and red lights in case of flint glass prism are $3.32^{\circ}, 3.27^{\circ}$ and 3.22° respectively. Calculate dispersive power of flint glass.

Watch Video Solution

168. The refractive indices of crown and flint glasses for violet and red light are $1.523, 1.513, 1.773$ and 1.743 respectively. Find the dispersive powers of the glasses.

Watch Video Solution

169. The minimum deviations suffered by red, yellow and violet beam passing through an equilateral transparent prism are 38.4°, 38.7° and 39.2° respectively. Calculate the dispersive power of the medium.

Watch Video Solution

170. Determine the angle of flint glass prism, which should be combined with a crown glass prism of 5° so as to give dispersion, but no deviation. Given for crown glass, $\mu_v = 1.523, \mu_r 1.515$ For flint glass, $\mu_v' = 1.688, \mu_r' = 1.650$.

Watch Video Solution

171. Calculate angle of dispersion between red and violet colours produced by a flint glass prism of refracting angle 60°. $\mu_v = 1.663$ and $\mu_r = 1.622$.

Watch Video Solution

172. Calculate the angle of a prism of dispersive power 0.021 and refractive index 1.53 to form an achromatic combination with prism of angle 4.2°, and dispersive power 0.045, having refractive index 1.65. Find also the net deviation.

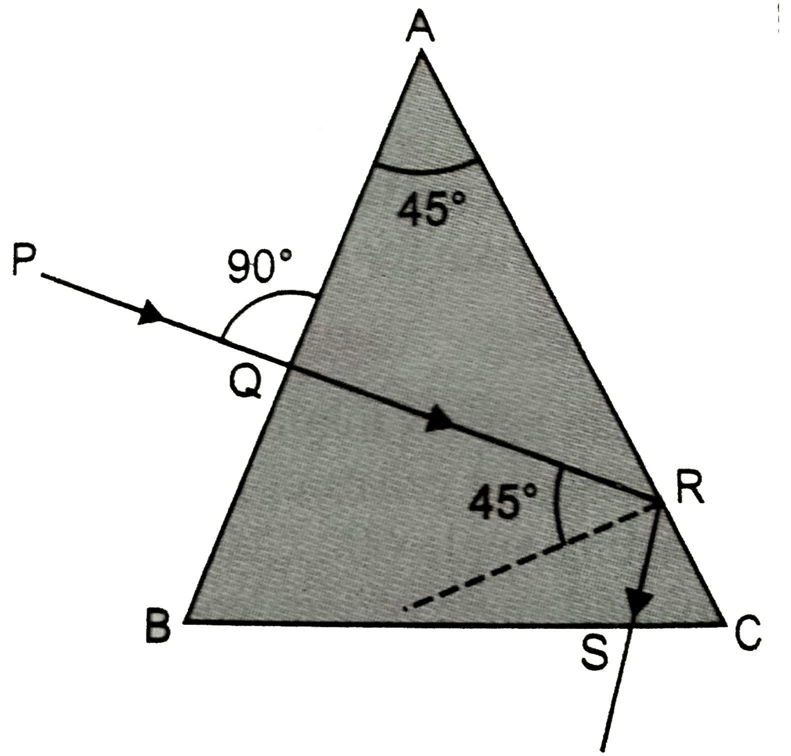
Watch Video Solution

173. One face of prism of refracting angle 30° and refractive index 1.414 is silvered. At what angle must a ray of light fall on the unsilvered face so that it retraces its path out of the prism ?

Watch Video Solution

174. As shown in Fig. PQ is a ray incident on prism ABC. Show the corresponding refracted and emergent rays. The critical angle for the material of the prism is 45°.

What is refractive index of the material of prism ?



Watch Video Solution

175. The refractive index of a material M_1 changes by 0.014 and that of another material M_2 changes by 0.024 as the colour of the light is changed from red to violet.

Two thin prisms one made of $M_1\left(A = 5.3^\circ\right)$ and other made of $M_2\left(A = 3.7^\circ\right)$ are combined with their refracting angles oppositely directed.

(a) Find the angular dispesion produced by the combination.

(b) the prisms are now combined with their refracting angles similarly directed. Find the angular dispersion produced by the combination.

Watch Video Solution

176. The refractive index of a prism with apex angle A is $\cot A/2$. Prove that the angle of minimum deviation is $\delta_m = \left(180^\circ - 2A\right)$.

Watch Video Solution

Watch Video Solution

177. The refracting angle of a glass prism is 60° and μ of its material is 1.45. Calculate angle of incidence at the first that will just reflect internaly the ray at the second face.

Watch Video Solution

178. In all optical instruments, we use.

A. (a) ray optics

B. wave optics

C. (c) physical optics

D. (d) none of these

Answer: A

Watch Video Solution

179. For a normal eye, distance of near point from the eye is.

A. ∞

B. $25cm$

C. $25m$

D. none of these

Answer: B

Watch Video Solution

180. The lens used for correcting myopia is.

A. concave

B. convex

C. plano concave

D. none of these

Answer: A

Watch Video Solution

181. The correct formula for magnifying powerof a simple microscope is.

A. $m = \left(1 + \frac{f}{d}\right)$

B. $m = \left(1 - \frac{d}{f}\right)$

C. $m = \left(1 + \frac{d}{f}\right)$

D. $m = \left(1 - \frac{f}{d}\right)$

Answer: C

Watch Video Solution

182. In a compound microscope, the distance between objective lens and eye lens is.

A. fixed

B. variable

C. infinite

D. $1 metre$

Answer: A

Watch Video Solution

183. For a total magnification of 175 from a compound microscope, the magnification produced by objective is 7.

What should be the magnification produced by eye piece ?

A. 7

B. 25

C. 175×7

D. none of these

Answer: B

Watch Video Solution

184. The final image in a astronomical telescope (w.r.t. object) is.

A. virtual and erect

B. real and erect

C. real and inverted

D. virtual and inverted

Answer: D

Watch Video Solution

185. A telescope uses an objective lens of focal length f_0 and an eye lens of focal length f_e. In normal adjustment, distance between the two lenses is.

A. f_0/f_e

B. f_e / f_0

C. $\left(f_0 - f_e\right)$

D. $\left(f_0 + f_e\right)$

Answer: D

Watch Video Solution

186. What focal length should the reading spectacles have for a person whose near point is $50cm$? (NCERT Solved Example)

A. $25cm$

B. $50cm$

C. $-50cm$

D. $25cm$

Answer: B

Watch Video Solution

187. An astronomical telescope has a magnifying power of 10. In normal adjustment, distance between the objective and eye piece is $22cm$ calculate focal length of objective lens.

A. $10cm$

B. $22cm$

C. $20cm$

D. $2cm$

Answer: C

Watch Video Solution

188. A myopia eye can see clearly.........but the.........cannot be seen distinctly.

Watch Video Solution

189. A myopia eye can see clearly.........but the.........cannot be seen distinctly.

Watch Video Solution

190. Presbyopia is also called.......... .

Watch Video Solution

191. For a normal eye, the least distance of distinct vision is........and far point is............ .

Watch Video Solution

192. Magnifying power of a simple microscope is defined as the.........of angles.........when both are.......... .

Watch Video Solution

193. In a compound microscope, the objective lens and........are.......... .

Watch Video Solution

194. Focussing in a compound microscope is carried out by changing the........from the......... .

Watch Video Solution

195. In an astronomical telescope, the distance between..........and.......can be varied.

Watch Video Solution

196. In normal adjusment of telescope, final image is....... .

And distance between objective lens and eye lens is.......... .

Watch Video Solution

197. In Cassegrainian telescope, objective lens is......... by............ .

Watch Video Solution

198. The far point of a myopic person is $150cm$ in front of the eye. Calculate the focal length and power of a lens required to enable him to see distant objects clearly.

Watch Video Solution

199. A short sighted person is wearing specs of power -$3.5D$. His doctor prescribes a correction of $+2.5D$ for his near vision. What is focal length of his distance viewing part and near vision.

Watch Video Solution

200. A short sighted person cannot see clearly beyond $2m$. Calculate power of the lens required to correct his eye to normal vision.

Watch Video Solution

201. A myopic person can see things clearly only when they lie between $10cm$ and $100cm$ from his eye. Which lens will enable him to see the moon clearly.

Watch Video Solution

202. A person cannot see the objects distinctly, when placed at a distance less than $100cm$. What is the power of the spectacles that he should use to see clearly, the objects placed at $25cm$?

Watch Video Solution

203. The distance of distinct vision of a person is $50 cm$. He wants to read a book placed at $25 cm$. What should be the focal length of the spectacles ?

Watch Video Solution

204. A person can see the objects lying between $25 cm$ and $10 m$ from his eye. His vision can be corrected by using lens of power -$0.1 D$, Is the statement true or false ?

Watch Video Solution

205. A person has normal far point (infinity) and normal near point (25 cm). He intends to read a book using a magnifying glass of $f = 5cm$. What is the

(i) Closest and

(ii) farthest distance at which he can read the book through the magnifying glass.

Watch Video Solution

206. An object is to be seen through a simple microscope of power $10D$. Where should an object be placed to produce maximum angular magnification ? Least distance of distinct vision is $25cm$.

Watch Video Solution

207. A simple microscope is rated $5X$ for a normal relaxed eye. What will be its magnifying power for a relaxed far sighted eye whose near point is $40cm$.

Watch Video Solution

208. The focal lengths of the objective and eye piece of a microscope are $2cm$ and $5cm$ respectively, and the distance between them is $20cm$. Find the distance of the object from the objective when the final image seen by the eye is $25cm$ from the eye piece. What is the magnifying power ?

Watch Video Solution

209. The focal lengths of the eye piece and objective of a compound microscope are $5cm$ and $1cm$ respectively, and the length of the tube is $20cm$. Calculate magnifying power of microscope when the final image is formed at infinity. The least distance of distinct vision is $25cm$.

Watch Video Solution

210. A convex lens of focal length $5cm$ is used as a simple microscope. What will be the magnifying power when the image is formed at the least distance of distinct vision ?

Watch Video Solution

211. A compound microscope has a magnifying power 30. The focal length of its eye-piece is $5cm$. Assuming the final to be at the least distance of distinct vision $(25cm)$, calculate the magnification produced by objective.

Watch Video Solution

212. A compound microscope is made using a lens of focal $10mm$ as objective and another lens of focal length $15mm$ as eye piece. An object is held $1.1cm$ from the objective and final image is obtained at ∞. Calculate distance between objective and eye piece.

Watch Video Solution

213. A compound microscope uses an objective lens of focal length $4cm$ and eye lens of focal length $10cm$. An object is placed at $6cm$ from the objective lens. Calculate magnifying power of compound microscope if final image is formed at the near point. Also, calculate length of the tube of compound microscope.

Watch Video Solution

214. The total magnification produced by a compound microscope is 20. The magnification produced by the eye piece is 5. The microscope is focussed on a certain object. The distance between the objective and eye piece is observed to be $14cm$. If least distance of distinct vision is

$20cm$, calculate the focal length of objective and eye piece.

Watch Video Solution

215. The magnifying power of an astronomical telescope is 5. When it is set for normal adjustment, the distance between the two lenses is $24cm$. Calculate the focal lengths of eye piece and objective lens.

Watch Video Solution

216. The magnifying power of an astronomical telescope in the normal adjustment position is 100. The distance between the objective and eye piece is $101 cm$. Calculate the focal lengths of objective and eye piece.

Watch Video Solution

217. An astronimical telescope is to be designed to hve a magnifying power of 50 in normal adjustment. If the length of the tube is 102 cm, fid the powers of the objective and the eyepiece.

Watch Video Solution

218. A refracting telescope has an objective of focal length $1 m$ and an eye piece of focal length $20 cm$. The final image of the sun $10 cm$ in diameter is formed at a distance of $24cm$ from eye piece. What angle does the sun subtend at the objective ?

Watch Video Solution

219. A gaint refrecting telescope at an observatory has an objective lens of focal length $15m$. If an eye piece lens of focal length $1cm$ is used, find the angular magnification of the telescope.

If this telescope is used to view the moon, what is the diameter of image of moon formed by objective lens ? The diameter of the moon is $3.42 \times 10^6 m$ and radius of lunar orbit is $3.8 \times 10^8 m$.

Watch Video Solution

220. A telescope has an objective of focal length $30cm$ and an eye piece of focal length $3.0cm$. It is focussed on a scale distant $2.0m$. For seeing with relaxed aye, calculate the separation between the objective and eye piece.

Watch Video Solution

221. A telescope consists of two lenses of focal lengths $20cm$ and $5cm$. Obtain its magnifying power when final image is

(i) at infinity

(ii) at $25cm$ from the eye.

Watch Video Solution

222. A telescope consists of two lenses of focal lengths $0.3m$ and $3cm$ respectively. It is fucussed on moon which subtends an angle of 0.5° at the obejctive. Calculate the angle subtended at the eye by the final image in normal adjustment of the telescope.

Watch Video Solution

223. A reflecting type telescope has a concave reflector of radius of curvature $120cm$. Calculate focal length of eye piece to secure a magnification of 20.

Watch Video Solution

224. How would you combine two lenses of focal lengths $25cm$ and $2.5cm$ to make a telescope ? What is the magnifying power of this telescope ?

Watch Video Solution

225. Two boys one 52 inches tall and the other 55 inches tall, are standing at distances 4.0 m and 5.0 m respectivley from an eye. Which boy will taller?

Watch Video Solution

226. The angular magnification of a telescope is 300 What should be the diameter of the objective, if our eyes at the eye ring, are just able to collect all the light refracted from the objective. Take diameter of pupil of eye $= 3mm$.

Watch Video Solution

227. The image of the moon is focussed by a converging lens of focal length 50 cm on a plane screen. The image is seen by an unaided eye from a distance of 25 cm. Find te angular magnificatioin achievd due to the converging lens.

Watch Video Solution

228. A telescope objective lens has a focal length of $100cm$. When the final image is formed at the least distance of distinct vision, the distance between the lenses is $105cm$. Calculate the focal length of eye piece and magnifying power of telescope.

Watch Video Solution

229. A compound microscope has lenses of focal length $10mm$ and $30mm$. An object placed at $1.2cm$ from the first lens is seen through the second lens at $0.25m$ from the eye lens. Calculate

(i) magnifying power

(ii) distance between the two lenses.

Watch Video Solution

230. In a compound microscope, the objective and eye piece have focal lengths $0.95cm$ and $5cm$ respectively, and are kept at a distance of $20cm$. The final image is formed at a distance of $25cm$ from the eye piece. Calculate the position of the object and the total magnification.

Watch Video Solution

231. A reflecting type telescope has a concave reflector of radius of curvature $120cm$. Calculate the focal length of eye piece to secure a magnification of 15.

Watch Video Solution

232. The lens of human eye has a diameter of $0.8cm$. How much fainter star can be seen through $508cm$ objective of an astronomical telescope at Mount Polomar in USA ?

Watch Video Solution

233. Out of speed, frequency and wavelength, name the parameter (s) which remain the same on reflection.

A. speed

B. frequency

C. wavelength

D. none of these

Answer: B

Watch Video Solution

234. A plane wave front falls on a convex lens. The emergent wave front is

A. plane

B. diverging spherical

C. converging spherical

D. none of these

Answer: C

Watch Video Solution

235. Out of electric field vector, $\vec{E}$ and magnetic field vector, vec(B)` in an electromagnetic wave, which is more effective and why ?

A. $\vec{E}$

B. $\vec{B}$

C. Both $\vec{E}$ and $\vec{B}$

D. neither $\vec{E}$ nor $\vec{B}$

Answer: A

Watch Video Solution

236. When a wave undergoes reflection at a denser medium, what happens to its phase ?

A. 0°

B. 45°

C. 90°

D. 180°

Answer: D

Watch Video Solution

237. In YDSE, when separation between two slits is increased, fringe width

A. decreases

B. increases

C. remains the same

D. none of these

Answer: A

Watch Video Solution

238. In Young's double slit experiment, three lights, blue, yellow and red are used successively. For which colour, will the fringe width be maximum ?

A. red

B. violet

C. green

D. same for all

Answer: A

Watch Video Solution

239. The phase difference between two points A and B on a wavefront separated by distance λ is

A. 0

B. 2π

C. π

D. $\pi/2$

Answer: A

Watch Video Solution

240. what type of wavefront will emerge from (i) a point source and (ii) distant light source ?

A. converging spherical

B. Diverging spherical

C. plane

D. cyclindrical

Answer: C

Watch Video Solution

241. In Young's double slit experiment, the intensity of central maximum is I. What will be the intensity at the same place if one slit is closed ?

A. I

B. $I/2$

C. $I/4$

D. $2I$

Answer: C

Watch Video Solution

242. What is the ratio of slit widths when amplitudes of light waves from them have ratio $1:\sqrt{2}$?

A. $1:\sqrt{2}$

B. $\sqrt{2}:1$

C. $1:2$

D. $2:1$

Answer: C

Watch Video Solution

243. Which phenomena establish the wave nature of light ?

Watch Video Solution

244. A wavefront is..........of all the particales of a medium which are................. .

Watch Video Solution

245. The rays are.......................to the............whatever be its shape.

Watch Video Solution

246. A wavefront is propagated.............. .

Watch Video Solution

247. According to superposition principle, the............at any instant is equal to...........of the displacements due to..........at that instant.

Watch Video Solution

248. The sources which emit continous light waves of same wavelength//frequency and...............or having............ are called..........sources.

Watch Video Solution

249. Interference of light is the phenomenon of..........in a medium on account of.............from............. .

Watch Video Solution

250. The condition for constructive interference at a point is that.............between two waves reaching the point should be............or..............of full wavelength.

Watch Video Solution

251. In interference, all................and.............are of.............. width.

Watch Video Solution

252. The widths of two slits in Young's double slit experiment are in thr ratio $2:1$. The ratio of amplitudes of light waves from them is........... .

Watch Video Solution

253. Calculate the time which light will take to travel normally through a glass plate of thickness $1mm$. Refractive index of glass is 1.5.

Watch Video Solution

254. The optical path of monochromatic light is same if it travels $2cm$ thickness of glass or $2.25cm$, thickness of water. If refractive index of glass is 1.5, what is the refractive index of water ?

Watch Video Solution

255. Red light of wavelength $750nm$ enters a glass plate of refractive index 1.5. If velocity of light in vacuum is $3 \times 10^8 m/s$, calculate velocity, wavelength and frequency of light in glass.

Watch Video Solution

256. In Young's double slit experiment, if I_0 is intensity of light from each sources, what is the intensity at a point on screen where two waves arrive having a phase diff. of 60° and 120°.

Watch Video Solution

257. Find the ratio of intensities at the two points X and Y on a screen in Young's double slit experiment, where waves from the two source S_1 and S_2 have path difference of zero, and $\lambda/4$ respectively.

Watch Video Solution

258. The ratio of intensities at amxima and minima is $25:16$. What will be ratio of the widths of two slits in YDSE ?

Watch Video Solution

259. In Young's double slit experiment, the widths of two slits are n the ratio $4:1$. The ratio of maximum and minimum intensity in the interference pattern will be :

Watch Video Solution

260. The intensity ratio in the interference pattern is $1:9$. What is the amplitude ratio and the ratio of widths of two slits ?

Watch Video Solution

261. Two interfering sources have an intensity ratio $16:1$. Deduce ratio and ratio of intensity between the maxima and minima in interference pattern.

Watch Video Solution

262. The ratio of intensities of minima to maxima in Young's double slit experiment is $9:25$. Find the ratio of width of two slits.

Watch Video Solution

263. Yellow light of wavelength 6000Å produces fringes of width $0.8mm$ in YDSE. What will be the fringe width if the light source is replaced by another monochromatic source of wavelength 7500Å and the separation between the slits is doubled ?

Watch Video Solution

264. The fringe width in YDSE is $2.4 \times 10^{-4}m$, when red light of wavelength 6400Å is used. By how much will it change, if blue light of wavelength 4000Å is used ?

Watch Video Solution

265. State two conditions to obtain sustained interference of light. In young's double slit experiment, using light of wavelength 400 nm, interference fringes of width X are obtained. The wavelength of light is increased to 600 nm and the separation between the slits is halved. if one wants the observed fringe width on the screen to be the same in the two cases, find the ratio of the distance between the screen and the plane of the slits in the two arrangements.

Watch Video Solution

266. In a Young's expt., the width of the fringes obtained with the light of wavelength $6000Å$ is $2.00mm$. What will be the fringe width if the entire apparatus is immersed in a liquid of $\mu = 4/3$?

Watch Video Solution

267. State two conditions to obtain sustained interference of light. In young's double slit experiment, using light of wavelength 400 nm, interference fringes of width X are obtained. The wavelength of light is increased to 600 nm and the separation between the slits is halved. if one wants the observed fringe width on the screen to be the same in the two cases, find the ratio of the distance between the screen and the plane of the slits in the two arrangements.

Watch Video Solution

268. The two slits in Young's double slit experiments are separted by a distance of $0.03mm$. When light of wavelength 5000Å falls on the slits, an interference pattern is produced on the screen 1.5 m away. Find the distance of fourth bright fringe from the central maximum.

Watch Video Solution

269. A double slit is illuminated by light of wave length 6000 Å. The slit are 0.1 cm apart and the screen is placed one metre away. Calculate.

(i). The angular position of the 10^{th} maximum in radian and

(ii). Separation of the two adjacent minimal.

Watch Video Solution

270. In Young's double-slit experiment the angular width of a fringe formed on a distant screen is 1°. The wavelength of light used is 6000Å. What is the spacing between the slits?

Watch Video Solution

271. In Young's double slit experiment, the slits are $0.2mm$ apart and the screen is $1.5m$ away. It is observed that the distance between the central bright fringe and fourth dark fringe is $1.8cm$. Calculate wavelength of light used.

Watch Video Solution

272. In a Young's expt., the width of the fringes obtained with the light of wavelength 6000Å is $2.00mm$. What will be the fringe width if the entire apparatus is immersed in a liquid of $\mu = 4/3$?

Watch Video Solution

273. In Young's experiment, two coherent sources are $1.5mm$ apart and the fringes are obtained at a distance of $2.5m$ from them. If the sources produce light of wavelength $589.3 nm$, find the number of fringes in the interference pattern, which is $4.9 \times 10^{-3} m$ long.

Watch Video Solution

274. A central fringe of interference pattern produced by light of wavelength $6000 Å$ is shifted to the position of 5th bright fringe by introducing thin film of $\mu = 1.5$. Calculate thickness of the film.

Watch Video Solution

275. The interference fringes for sodium light $(\lambda = 5890 Å)$ in a double slit experiment have an angular width of 0.2°. For what wavelength will width be 10% greater.

Watch Video Solution

276. Laser light of wavelength $630nm$ incident on a pair of slits produces an interference pattern where bright fringes are separated by $8.1mm$. Another light produces the interference pattern, where the bright fringes are separated by $7.2mm$. Calculate the wavelength of second light.

Watch Video Solution

277. In YDSE, light of wavelength 5000Å is used. The third bright band on the screen is formed at a distance of $1cm$ from the central bright band. If the screen is at a distance of $1.5m$ from the centre of narrow slits, calculate the separation between the slits.

Watch Video Solution

278. In YDSE, the slits are separated by $0.5mm$ and screen is placed $1.0m$ away. It is found that the ninth bright fringe is at a distance of $8.835mm$ from the second dark fringe. Find the wavelength of light used.

Watch Video Solution

279. In Young's double slit experiment, the two slits $0.15mm$ apart are illuminated by light of wavelength $450nm$. The screen is $1.0m$ away from the slits. Find the distance of second bright fringe and second dark fringe from the central maximum. How will the fringe pattern change if the screen is moved away from the slits ?

Watch Video Solution

280. Two waves of intensity ration $1:9$ cross eachother at a point. Calculate the ratio of resultant intensities at a point, when (a) waves are incoherent (b) waves are coherent and differ in phase by 60°.

Watch Video Solution

281. In Young's experiment, what will be the phase difference and the path difference between the light waves reaching (i) third bright fringe and (ii) third dark fringe from the central fringe. Take $\lambda = 5000 Å$.

Watch Video Solution

282. Among two interfering sources, let A be ahead in phase by 54° relative to B. If the observations be taken from point P, such that $PB - PA = 1.5\lambda$, deduce the phase difference between the waves from A and B reaching P.

Watch Video Solution

283. In Young's experiment, interference pattern is obtained on a screen at a distance of $1m$ from slits separated by $0.05cm$ and illuminated by sodium light of wavelength 5893Å. Calculate distance between $4th$ bright fringe on one side and 3rd bright fringe on other side of central bright fringe.

Watch Video Solution

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

Watch Video Solution

285. A beam of light consisting of two wavelenths, 6500 Å and 5200 Å is used to obtain interference fringes in a Young's double slit experiment $\left(1\text{Å} = 10^{-10}m\right)$. The distance between the slits is 2.0 mm and the distance between the plane of the slits and the screen in 120 cm. (a) Find the distance of the third bright frings on the screen from the central maximum for the wavelength 6500 Å (b) What is the least distance from the central maximum where the bright frings due to both the wavlelengths coincide ?

Watch Video Solution

286. 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.

Watch Video Solution

287. A transparent paper (refractive index = 1.45) of thickness 0-02 mm is pasted on one of the slits of a Young's double slit experiment which uses monochromatic light of wavelength 620 nm. How many fringes will cross through the centre if the paper is removed ?

Watch Video Solution

288. In a Young's double slit experiment using monochromatic light, the fringe pattern shifts by a certain distance on the screen when a mica sheet of refractive index 1.6 and thickness 1.964 microns is introduced in the path of one of the interfering waves. The mica sheet is then removed and the distance between the slits and screen is doubled. It is found that the distance between successive maxima now is the same as observed fringe shift upon the introduced of the mica sheet . Calculate the wavelength of the monochromatic light used in the experiment .

Watch Video Solution

289. In YDSE, the central bright fringe produced by light of wavelength 5600Å shifts to the position of $5th$ bright fringe when a thin transparent film of refractive index 1.28 is introduced in the path of light from one of the two slits. Find the thickness of the film.

Watch Video Solution

290. In YDSE, slits are $0.2mm$ apart. The interference fringes for light of wavelength 6000Å are formed on a screen distant $1.5m$ from the slits. Calculate

(i) angular position of $3rd$ maxima,

(ii) angular position of $5th$ minima,

(iii) fringe width

Watch Video Solution

291. For an aperture of $2mm$ and wavelength of $500nm$, Fresnel distance is

A. $5m$

B. $8m$

C. $10m$

D. $40m$

Answer: B

Watch Video Solution

292. When diameter of objective of an astronomical telescope is doubled, its limit of resolution is

A. (a) doubled

B. (b) quardrupled

C. (c) halved

D. unaffected

Answer: C

Watch Video Solution

293. What is the vlaue of refractive index of a medium of polarising angle 60° ?

A. 1.732

B. 1

C. 1.414

D. 2

Answer: A

Watch Video Solution

294. Which of the following cannot be polarised?

A. X-rays

B. radio waves

C. sound waves

D. light waves

Answer: C

Watch Video Solution

295. Which of the following statements indicates that light waves are transverse?

A. interference

B. diffraction

C. dispersion

D. polarization

Answer: D

Watch Video Solution

296. A ray of light falls on a transparent slab of $\mu = 1.0$. If reflected and refracted rays are mutually perpendicular, what is the angle of incidence ?

A. 45°

B. 60°

C. 30°

D. 90°

Answer: A

Watch Video Solution

297. In a single slit diffraction pattern, how is the angular width of central bright maximum changed when (i) the slit width is decreased.

(ii) the distance between the slit and screen is increased.

(iii) Light of smaller wavelength is used. Justify your answer.

A. decreases

B. increases

C. remains unaffected

D. cannot be predicted

Answer: A

Watch Video Solution

298. Sound waves are not electromanetic waves as

A. they can undergo interference

B. they can undergo diffraction

C. they cannot be polarized

D. they cannot pass through vacuum

Answer: D

Watch Video Solution

299. The angle between pass axis of polarizer and analyser is 45°. The percentage of polarized light passing through analyser is

A. 100 %

B. 50 %

C. 25 %

D. 75 %

Answer: B

Watch Video Solution

300. In going from a rarer to a denser medium, light loses some speed. What happens to energy carried by light waves ?

A. decreases

B. increases

C. remains the same

D. none of the above

Answer: C

Watch Video Solution

301. Diffraction of light is

Watch Video Solution

302. Diffraction is common in sound but not comon in light waves. Why ?

Watch Video Solution

303. In diffraction at a single slit, condition for nth secondary minimum is................ .

Watch Video Solution

304. The width of central maximum is the................between..........on either side of............... .

Watch Video Solution

305. Angular width of central maximum in diffraction at a single slit is................ .

Watch Video Solution

306. Fresnel distance is the............before its deviation from.............becomes............. .

Watch Video Solution

307. Resolvingpower of an optical instrument is the ability of the instrument to............or...........the images of............ .

Watch Video Solution

308. The.............distance between two objects which............is called..................of the instrument.

Watch Video Solution

309. When an unpolarised light is polarized, then the intensity of light of the polarized waves

Watch Video Solution

310. When angles between principal sections of two nicols are 0° and 180°, they are referred to as.......... .

Watch Video Solution

311. The slit of width d is illuminated by light of wavelength 5000Å. If Fresnel distance is $2m$. What is the slit width ?

Watch Video Solution

312. For what distance is ray optics a good approximation when the aperture is 3 mm wide and the wavelength is 500 nm ?

Watch Video Solution

313. For what distance is ray optics a good approximation when the aperture is $2mm$ wide and wavelength is $600nm$?

Watch Video Solution

314. A parallel beam of light of wavelenght $600nm$ is incident normally on a slit of width $'d'$. If the distance between the slit and screen is $0.8m$ and distance of 2nd order maximum from the centre of the screen is $15mm$, calculate the width of the slit.

Watch Video Solution

315. Light of $\lambda = 550nm$ is incident as parallel beam on a slit of width $0.1mm$. Find the angular width and linear width of the principal maximum in the diffraction pattern on a screen at a distance of $1.1m$ from thw slit. Which of these widths will not change if the screen were moved to a distance of $2.2m$ from the slit ?

Watch Video Solution

316. Light of wavelength $500nm$ falls from a distant source on a slit $0.5mm$ wide. Find the distance between the two dark bands on either side of central maximum, if diffraction pattern is observed on a screen at $2m$ from the slit.

Watch Video Solution

317. A slit of width d is illuminated by a monochromatic light of wavelength $700nm$ at normal incidence. Calculate the value of d for position of (i) first minimum at an angle of diffraction of 30° (ii) first maximum at an angle of diffraction of 30°.

Watch Video Solution

318. Light of wavelength $600nm$ is incident normally on a slit of width $3mm$. Calculate linear width of central maximum on a screen kept $3m$ away from the slit.

Watch Video Solution

319. A parallel beam of light of $600 nm$ falls on a narrow slit and the resulting diffraction pattern is observed on a screen $.12 m$ away. It is observed that the first minimum is at a distance of $3 mm$ from the centre of the screen. Calculate the width of the slit.

Watch Video Solution

320. Red light of wavelength 6500Å from a distant source falls on a slit $0.50 mm$ 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 $1.8 m$ from the slit.

Watch Video Solution

321. A plane wavefront $\left(\lambda = 6 \times 10^{-7} m\right)$ falls on a slit $0.4m$ wide. A convex lens of focal length $0.8m$ placed behind the slit focuses the light on a screen. What is the linear diameter of second maximum?

Watch Video Solution

322. A slit of width $'a'$ is illuminated by red light of wavelenght 6500Å. For what value of $'a'$ will the (i) first minimum fall at an angle of diffraction of 30° ? (ii) first maximum fall at an angle of diffraction of 30° ?

Watch Video Solution

323. A $0.02cm$ wide slit is illuminated at normal incidence by light having wavelength $6 \times 10^{-7}m$.

(i) Find the width of the central band maximum on the screen which is $1m$ away from slit.

(ii) What would be the width of central maximum, if the apparatus is immersed in water whose refractive index is $4/3$?

Watch Video Solution

324. A screen is placed $50cm$ from a single slit, which is illuminated with 6000Å light. If the distance between the first and third minima in the diffraction pattern is $3.00mm$, what is the width of the slit ?

Watch Video Solution

325. Determine the angular spread between central maximum and first order maximum of the diffraction pattern due to a single slit of width $0.25mm$, when light of wavelength 5890Å is incident on it normally ?

Watch Video Solution

326. Two wavelength of sodium light $590nm$ and $596nm$ are used, in turn, to study the diffraction taking placed at a single slit of aperture $2 \times 10^{-4}m$. The distance between the slit and screen is $1.5m$. Calculate the separation between the positions of first maxima of diffraction pattern obtained in the two cases.

Watch Video Solution

327. A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observe on screen 1 m away. It is observed that the first minimum is at a distance of $2.5mm$ from the centre of the screen. Find the width of the slit.

Watch Video Solution

328. Calculate the numarical aperture of a microscope required to just resolve two points separated by a distance of $10^{-4}cm$. Wavelength of light used is $5.8 \times 10^{-5}cm$.

Watch Video Solution

329. The smallest object detail that can be resolved with a microscope using light of wavelength $600nm$ is $3.5 \times 10^{-5}cm$. Find N.A of objective when used dry and when immersed in an oil of $\mu = 1.6$.

Watch Video Solution

330. Calculate the resolving power of a telescope when light of wavelength $540nm$ is used. Diameter of objective lens is $6cm$.

Watch Video Solution

331. The objective of a telescope has a diameter of $125cm$. Calculate the smallest angular separation of two stars that may be resolved by it. Wavelengthof light used is 6000Å.

Watch Video Solution

332. Assuming the mean wavelength of light as $555 nm$, estimate the smallest angular separation of two stars which can be just resolved by the telescope. Given the diameter of objective of astronomical telescope is $25 cm$.

Watch Video Solution

333. Calculate wavelength of light used when limit of resolution of the microscope is $5 \times 10^{-7} m$ and cone angle of light falling on the objective is equal to 90°. Given for air, $\mu = 1$.

Watch Video Solution

334. The objective of an astronomical telescope has a diameter of $100cm$. Calculate the smallest angualr separation of two stars that can just be resolved by the telescope, take $\lambda = 5000\text{Å}$.

Watch Video Solution

335. What is the minimum angualr separation between two stars, if a telescope is used to observe them with an objective of aperture $0.2m$. Wavelength of light used is 5900Å.

Watch Video Solution

336. A star is moving towards the earth with a speed of $9 \times 10^6 m/s$. If the wavelength of a particular spectral line emitted by star is $600nm$, find the apparent wavelength.

Watch Video Solution

337. Light from a galaxy, having wavelength 6000Å is found to be shifted towards red by 50Å. Calculate velocity of recession of the galaxy.

Watch Video Solution

338. The spectral line for a given element in light received from a distant star is shifted towards longer wavelength by 0.024%. Deduce the velocity of star in the line of sight.

Watch Video Solution

339. Certain characteristic wavelength in the light from a galaxy in the constellation virgo are observed to be increased in wavelength, as compared with terrestrial sources, by about 0.4%. What is the radial speed of this galaxy with respect to earth ? Is it approacing or receding ?

Watch Video Solution

340. A ray of light is incident on the surface of a glass plate of reflective index 1.536 such that the reflected and refracted rays are mutually perpendicular. What is the angle of reflection ?

Watch Video Solution

341. What is the vlaue of refractive index of a medium of polarising angle 60° ?

Watch Video Solution

342. Two polaroid A and B are set in crossed positions. A third polaroid C is placed between the two making $\angle\theta$

with the pass axis of first polaroid. Write the expression for intensity of light transmitted from second polaroid. In what orientations will be transmitted intensity be (i) minimum (ii) maximum ?

Watch Video Solution

343. At what angle should the axes of two polaroids be placed so as to reduce the intensity of incident unpolarized light to $1/3$.

Watch Video Solution

344. A ray of light falls on a transparent glass slab of refractive index 1.62. If the reflected ray and the refracted rays are mutually perpendicular, what is the angle of refraction ?

Watch Video Solution

345. Two nicols are so oriented that the maximum amount of light is transmitted. To what fraction of its maximum value is the intensity of transmitted light reduced when the analyser is rotated through (i) 45° (ii) 90° (iii) 180°. ?

Watch Video Solution

346. When sun light is incident at an angle of 53° on the surface of water, the reflected light is plane polarized.

Calculate the angle of refraction and refractive index of water.

Watch Video Solution

347. A beam of light travelling in water falls on a glass plate immersed in water. When the incidence angle is 51°, then the reflected beam of light is found polarized. Calculate μ of glass. Given μ of water is $4/3$.

Watch Video Solution

348. Two polaroid A and B are kept in crossed position. How should a third polaroid C be placed between them so that the intensity of polarized light transmitted by

polaroid B reduces to $\frac{1}{8}th$ of the intensity of unplarised light incident on A ?

Watch Video Solution

349. Two polaroids are placed at 90° to eachother and the transmitted intensity is zero. What happens when one more polaroid is placed between these two, bisecting the angle between them. How will the intensity of transmitted light vary on further rotating the third polaroid ?

Watch Video Solution

350. A parallel beam of monochromatic light of wavelength 450 m passes through a long slit of width 0.2 mm. find the angular divergence in which most of the light is diffracted.

Watch Video Solution

351. 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 ?

Watch Video Solution

352. 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.

Watch Video Solution

353. An astronaut approaching the moon sends a ratio signal of frequency $5 \times 10^3 MHz$ towards moon to find the speed of his rocket. The frequency of waves reflected back from the moon is $86 kHz$ more than the original frequency. Calculate the velocity of the rocket relative to the moon.

Watch Video Solution

354. Critical angle for a certain wavelength of light in glass is 40°. Calculate the polarizing angle and the angle of refraction in glass corresponding to it.

Watch Video Solution

355. Two Polaroids P_1 and P_2 are placed with their axis perpendicular to eachother. Unpolarised light I_0 is nicident on P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1. The intensity of transmitted light through P_2 is

Watch Video Solution

356. A ray of light incident at an angle θ on a refracting face of a prism emerges from the other face normally. If the angle of the prism is 5° and the prism is made of a material of refractive index 1.5, the angle of incidence is.

A. 7.5°

B. 5°

C. 15°

D. 2.5°

Answer: A

Watch Video Solution

357. A short pulse of white light is incident from air to a glass slab at normal incidence. After travelling through the slab, the first colour to emerge is.

A. blue

B. green

C. violet

D. rad

Answer: D

Watch Video Solution

358. An object approaches a convergent lens from the left of the lens with a uniform speed $5m/s$ and stops at the focus. The image.

A. moves away from the lens with uniform speed $5m/s$

B. moves away from the lens with uniform acceleration

C. moves away from the lens with a non-uniform acceleration

D. moves towards from the lens with a non-uniform acceleration

Answer: C

Watch Video Solution

359. A passenger in an Aeroplan shall

A. never see a rainbow

B. may see a primary and a secondary rainbow as concentric circles

C. may see a primary and a secondary rainbow as concentric arcs

D. shall never see a secondary rainbow

Answer: B

Watch Video Solution

360. You are given four sources of light each one providing a light of a single colour-red, blue,green and yellow. Suppose the angle of refraction for a beam of yellow light corresponding to a particular angle of incidence at the interface of two media is 90°. Which of the folowing statements is correct it the source of yellow light is replaced with that of other lights without changing the angle of incidence ?

A. The beam of red light would undergo total internal reflection

B. The beam of red light would bend towards normal white it gets refracted through the second medium

C. The beam of blue light would undergo total internal reflection

D. The beam of green light would bend away from the normal as it gets refracted through the second medium

Answer: C

Watch Video Solution

361. The radius of curvature of the curved surface of a plano-convex lens is $20cm$. If the refractive index of the material of the lens be 1.5, it will

A. act as a convex lens only for the object that lie on its curved side

B. act as a concave lens for the object that lie on its curved side

C. act as a convex lens irrespective of the side on which the object lies

D. act as a concave ens irrespective of side on which the object lies

Answer: C

Watch Video Solution

362. The phenomena involved in the reflected of radiowaves by ionosphere is similar to.

A. reflection of light by a plane mirror

B. total internal reflection of light in air during a mirage

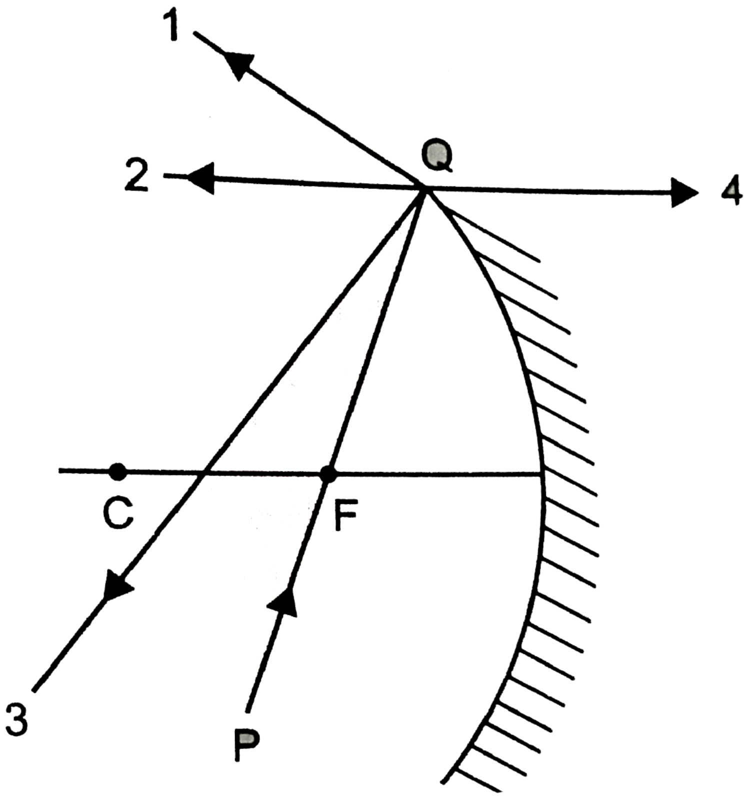
C. dispersion of light by water molecules during the formation of a rainbow

D. scattering of light by the particales of air

Answer: B

Watch Video Solution

363. The direction of ray of light incident on a concave mirror is shown by PQ while directions in which the ray would travel after reflection is shown by four rays marked $1, 2, 3$ and 4, Fig. Which of the four rays correctly shows the direction of reflected ray ?



A. 1

B. 2

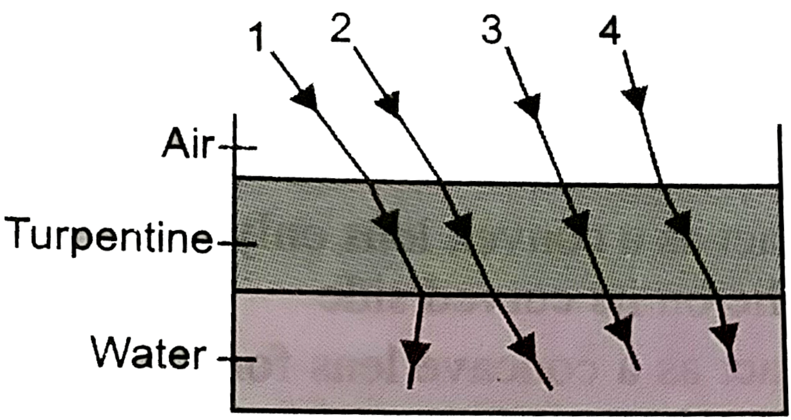
C. 3

D. 4

Answer: B

Watch Video Solution

364. The optical density of turpentine is higher than that of water, while its mass density is lower. Fig. shows a layer of turpentine floating over water in a container. For which one of the four rays incident on turpentine in Fig., the path shows is correct ?



A. 1

B. 2

C. 3

D. 4

Answer: B

Watch Video Solution

365. A car is moving with a constant speed of $60kmh^{-1}$ on a straight road. Looking at the rear view mirror, the driver finds that the car following him is at a distance of $100m$ and is approaching with a speed of $5kmh^{-1}$. In order to keep track of the car in the rear, the driver begins to glane alternatively at the rear and side mirror of his car after every $2s$ till the other car overtakes. If the two cars were maintaining their speeds, which of the following statement (s) is/are correct ?

A. The speed of the car in the rear is $65kmh^{-1}$

B. In the side mirror, the car in the rear would appear to approach with a speed of $5kmh^{-1}$ to the driver of the leading car

C. In the rear view mirror, the speed of the approaching car would appear to decrease as the distance between the cars decreases

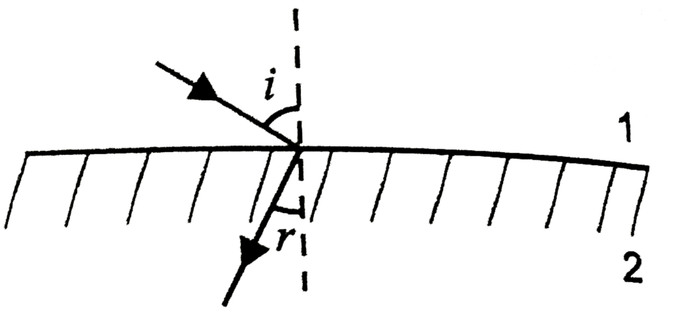
D. In the side mirror, the speed of the approaching car would appear to increase as the distance between the cars decreases

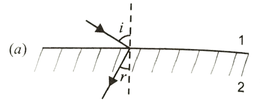
Answer: D

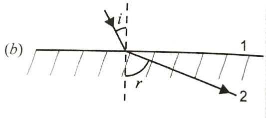
Watch Video Solution

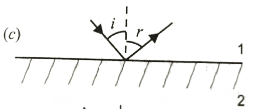
366. There are certain materials developed in laboratories which have a negative refractive index, Fig. A ray incident from air (medium 1) into such a medium (medium 2) shall follow a path given by

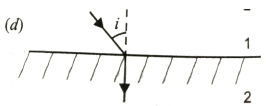
(a)



A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

367. Consider an extended object immersed in water contained in a plane through. When seen from close to the edge of the through, the object looks distorted because.

A. the apparent depth of the points close the egde are nearer the surface of the water compared to the points away from the edge.

B. the angle subtended by the image of the object at the eye is smaller than the actual angle subtended by the object in air.

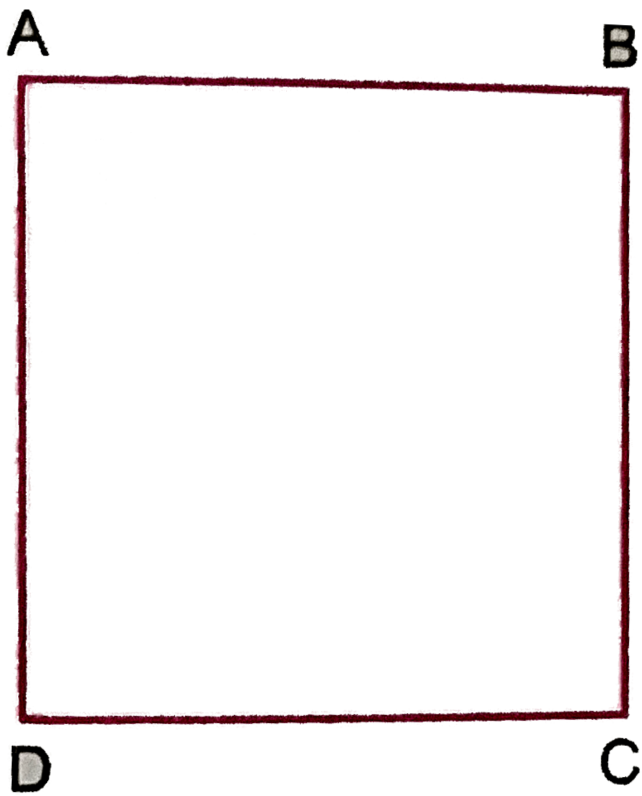
C. some of the points of the object far away from the edge may not be visible because of total internal reflection.

D. water in a trough acts as a lens and magnifies the object.

Answer: A::B::C

Watch Video Solution

368. A rectangular block of glass $ABCD$ has a refractive index 1.6. A pin is placed midway on the faceAB, Fig. When observed from the face AD, the pin shall.



A. appaer to be near A.

B. appear to be near D.

C. appear to be at the centre of AD.

D. not be seen at all.

Answer: A::D

Watch Video Solution

369. Between the primary and secondary rainbows, there is a dark band known as Alexander's dark band. This is because

A. light scattered into this region interferes destructively.

B. there is no light scattered into this region.

C. light is absorbed in this region.

D. angle made at the eye by the scattered rays with respect to the incident light of the sun lies between approximately 42° and 50°.

Answer: A::D

Watch Video Solution

370. A magnifying glass is used, as the object to be viewed can be brought closer to the eye than the normal near point. This results in.

A. a larger angle to be subtended by the object at the eye and hence viewed in greater detail.

B. the formation of a virtual erect image.

C. increase in the field of view.

D. infinite magnification at the near point.

Answer: A::B

Watch Video Solution

371. An astronomical refractive telescope has an objective of focal length $20m$ and an eyepiece of focal length $2cm$.

A. The length of the telescope tube is $20.02m$.

B. The magnification is 1000.

C. The image formed is inverted.

D. An objective of a larger aperture will increase the brightness and reduce chromatic aberration of the image.

Answer: A::B::C

Watch Video Solution

372. 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 an axis passing through the centre and perpendicular to the plane of the polaroid.

A. For a particular orientation there shall be darkenss as observed through the polaroid.

B. The intensity of light as seen through the polaroid shall be independent of the rotation.

C. The intensity of light as seen through the Polaroid shall go through a minimum but not zero for two orientations of the polaroid.

D. The intensity of light as seen through the polaroid shall go through a minimum for four orientations of the polaroid.

Answer: C

Watch Video Solution

373. Consider sunlight incident on a slit of width 10^4Å . The image seen through the slit shall

A. be a fine sharp slit white in colour at the centre

B. a bright slit white at the centre diffusing to zero intensities at the edges

C. a bright slit white at the centre diffusing to regions of different colours

D. only be a diffused slit white in colour

Answer: A

Watch Video Solution

374. Consider a ray of light incident from air onto a slab of glass (refractive index n) of width d, at an angle θ . The phase difference between the ray reflected by the top surface of the glass and the bottom surface is

A. $\frac{2\pi nd}{\lambda}\left(1 - \frac{1}{n^2}\sin^2\theta\right)^{\frac{1}{2}} + \pi$

B. $\frac{4\pi d}{\lambda}\left(1 - \frac{1}{n^2}\sin^2\theta\right)^{\frac{1}{2}}$

C. $\frac{4\pi d}{\lambda}\left(1 - \frac{1}{n^2}\sin^2\theta\right)^{\frac{1}{2}} + \frac{\pi}{2}$

D. $\frac{4\pi d}{\lambda}\left(1 - \frac{1}{n^2}\sin^2\theta\right)^{\frac{1}{2}} + 2\pi$

Answer: A

Watch Video Solution

375. In a Young's double slit experiment, the source is white light. One of the holes is covered by a red filter and another by a blue filter. In this case

A. there shall be alternate inference pattern of red and blue

B. there shall be interference pattern for red distinct from that for blue

C. there shall be no interference fringes

D. there shall be an interference pattern for red mixing with one for blue

Answer: C

Watch Video Solution

376. Figure shows a standard two slit arrangement with slits S_1, S_2. P_1, P_2 are the two minima points on either side of P (Figure). At P_2 on the screen, there is a hole and behind P_2 is a second 2-slit arrangement with slits S_3, S_4 and a second screen behind them.

A. There would be no interference pattern on the second screen but it would be lighted

B. The second screen would be totally dark

C. There would be a single bright point on the second screen

D. There would be a regular two slit pattern on the second screen

Answer: D

Watch Video Solution

377. Two source S_1 and S_2 of intensity I_1 and I_2 are placed in front of a screen [Figure a]. The pattern of intensity distribution see in the central portion is given by Figure b. In this case which of the following statement are true.

A. S_1 and S_2 have the same intensities

B. S_1 and S_2 have a constant phase difference

C. S_1 and S_2 have the same phase

D. S_1 and S_2 have the same wavelength

Answer: A::B::D

Watch Video Solution

378. Consider sunlight incident on a pinhole of width 10^3Å. The image of the pinhole seen on a screen shall be

A. a sharp white ring

B. different from a geomatrical image

C. a diffused central spot, white in colour

D. diffused coloured region around a sharp central white spot

Answer: B::D

Watch Video Solution

379. Consider the diffraction pattern for a small pinhole. As the size of the hole is increased

A. the size decreases

B. the intensity increases

C. the size increases

D. the intensity decreases

Answer: A::B

Watch Video Solution

380. For light diverging from a point source

A. the wavefront is spherical

B. the intensity decreases in proportion to the distance squared

C. the wavefront is parabolic

D. the intensity at the wavefront does not depend on the distance

Answer: A::B

381. A source of light lies on the angle bisector of two plane mirrors inclined at angle θ. The value of θ, so that the light reflected from one mirror does not reach the other mirror will be.

A. $\theta \geq 120^{\circ}$

B. $\theta \geq 90^{\circ}$

C. $\theta \leq 120^{\circ}$

D. none of the above

Answer: A

382. A ray of light travelling in the direction $\frac{1}{2}\left(\hat{i}+\sqrt{3}\hat{j}\right)$ is incident on a plane mirror. After reflection, it travels along the direction $\frac{1}{2}\left(\hat{i}-\sqrt{3}\hat{j}\right)$. The anglel of incidence is

A. 30°

B. 45°

C. 60°

D. 75°

Answer: A

Watch Video Solution

383. The ratio of the speed of an object to the speed of its real image of magnification m in the case of a convex mirror is.

A. $-\frac{1}{m^2}$

B. m^2

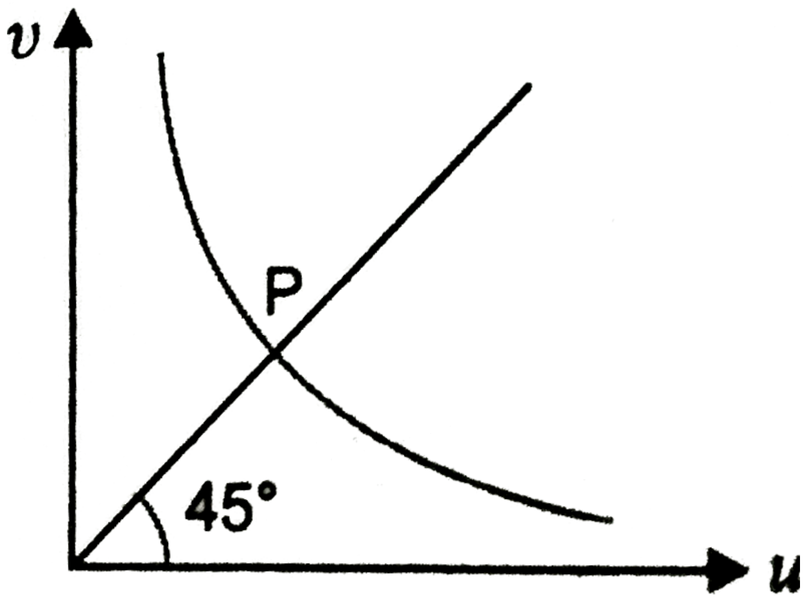
C. $-m$

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

Answer: A

Watch Video Solution

384. The graph in Fig. shows plot of variation of v with change in u for a concave mirror. Points plotted above the point P on the curve are for values of v :



A. smaller than f

B. smaller than $2f$

C. larger than $2f$

D. larger than f but less than $2f$

Answer: C

Watch Video Solution

385. A beam of light from a source L is incident normally on a plane mirrorr fixed at a certain distance x from the source. The beam is reflected back as a spot on a scale placed just above the source L. When the mirrorr is rotated through a small angle θ, the spot of the light is found to move through a distance y on the scale. The angle θ is given by :

A. $\frac{y}{2x}$

B. $\frac{y}{x}$

C. $\frac{x}{2y}$

D. $\frac{x}{y}$

Answer: A

Watch Video Solution

386. In a concave mirror, an object is placed at a distance d_1 from the focus and the real image is formed aat a distance d_2 from the focus. Then the focal length of the mirror is :

A. $\sqrt{d_1 d_2}$

B. $d_1 d_2$

C. $\left(d_1 + d_2\right)/2$

D. $\sqrt{d_1/d_2}$

Answer: A

Watch Video Solution

387. A short linear object of length b lies along the axis of a concave mirror of focal length f at a distanee u from the pole of the mirror. The size of the image is approximately equal to

A. $b\left(\frac{u-f}{f}\right)^{\frac{1}{2}}$

B. $b\left(\frac{f}{u-f}\right)^{\left(\frac{1}{2}\right)}$

C. $b\left(\frac{u-f}{f}\right)$

D. $b\left(\frac{f}{u-f}\right)$

Answer: D

Watch Video Solution

388. A car is fitted with a convex side-view mirror of focal length 20 cm. A second car 2.8m behind the first car is overtaking the first car at a relative speed of 15 $\frac{m}{s}$. The speed of the image of the second car as seen in the mrror of the first one is:

A. $-\frac{1}{15}m/s$

B. $10m/s$

C. $15m/s$

D. $\frac{1}{10}m/s$

Answer: A

Watch Video Solution

389. A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that the end closer to the pole is 20 cm away from it. Find the length of the image.

A. $10cm$

B. $15cm$

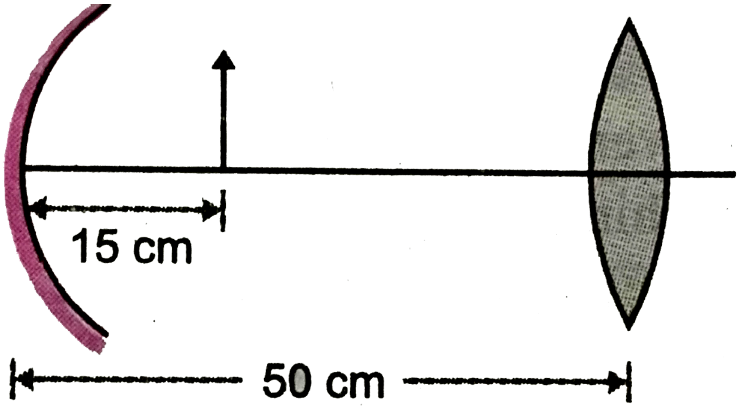
C. $2.5cm$

D. $5cm$

Answer: D

Watch Video Solution

390. Consider a concave mirror and a convex lens (refractive index 1.5) of focal length $10cm$ each separated by a distance of $50cm$ in air (refractive index = 1) as shown in the Fig. An object is placed at a distance of $15cm$ from the mirror. Its erect image formed by this combination has magnification M_1. When this set up is kept in a medium of refractive index $7/6$, the magnification becomes M_2. The magnitude $\left(\frac{M_2}{M_1}\right)$ is :



A. 5

B. 6

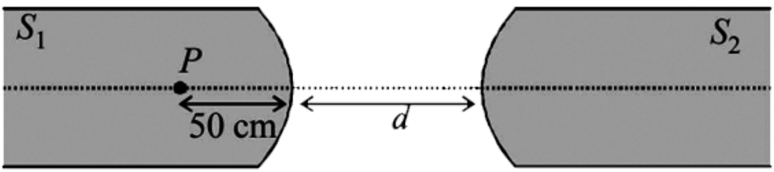
C. 7

D. 8

Answer: C

Watch Video Solution

391. Two identical glass rods S_1 and S_2 (refractive index=1.5) have one convex end of radius of curvature 10 cm. They are placed with the curved surfaces at a distance d as shown in the figure, with their axes (shown by the dashed line) aligned. When a point source of light P is placed inside rod S_1 on its axis at a distance of 50 cm from the curved face, the light rays emenating from it are found to be parallel to the axis inside S_2. The distance d is



A. $60cm$

B. $70cm$

C. $80cm$

D. $90cm$

Answer: B

Watch Video Solution

392. Two identical thin planoconvex glass lenses (refractive index 1.5) each having radius of curvature of $20cm$ are placed with their convex surfaces in contact at the centre. The intervening space is filled with oil of refractive index 1.7. The focal length of the combination is

A. $-25cm$

B. $-50cm$

C. (c) $50cm$

D. $-20cm$

Answer: B

Watch Video Solution

393. A diverging lens with magnitude of focal length $25cm$ is placed at a distance of $15cm$ from a converging lens of magnitude of focal length $20cm$. A beam of parallel light falls on the diverging lens. The final image formed is.

A. real and it distance of $40cm$ from the divergent lens

B. real and at a distance of $6cm$ from the convergent lens

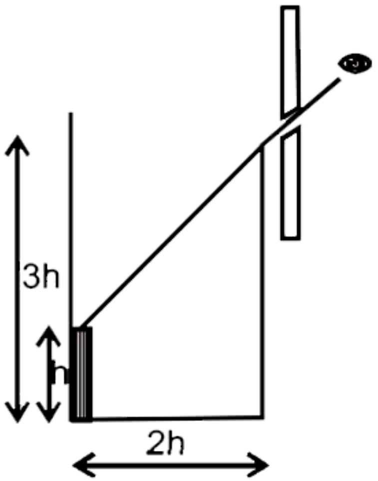
C. real and at a distance of $40cm$ from convergent lens

D. virtual and at a distance of $40cm$ from convergent lens

Answer: C

Watch Video Solution

394. An observer can see through a pin-hole the top end of a thin rod of height h, placed as shown in the figure. The beaker height is 3h and its radius h. When the beaker is filled with a liquid up to a height 2h, he can see the lower end of the rod. Then the refractive index of the liquid is



A. $\frac{5}{2}$

B. $\sqrt{\frac{5}{2}}$

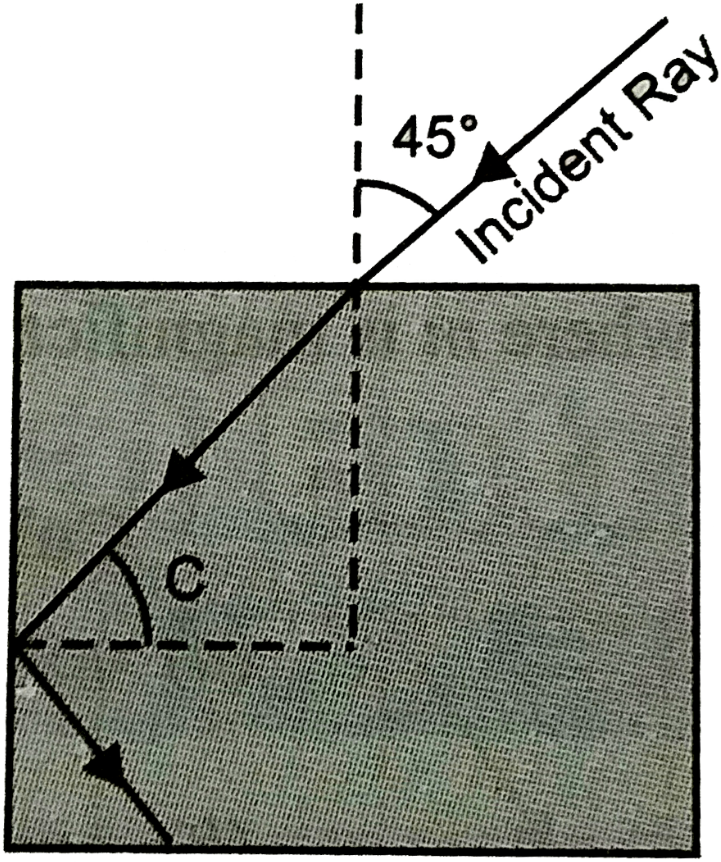
C. $\sqrt{\frac{3}{2}}$

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

Answer: B

Watch Video Solution

395. For a given incident ray as shown in Fig., the condition of total internal reflection of ray will be satisfied if the refractive index of the block will be.



A. $\frac{\sqrt{3}+1}{2}$

B. $\frac{\sqrt{2}+1}{2}$

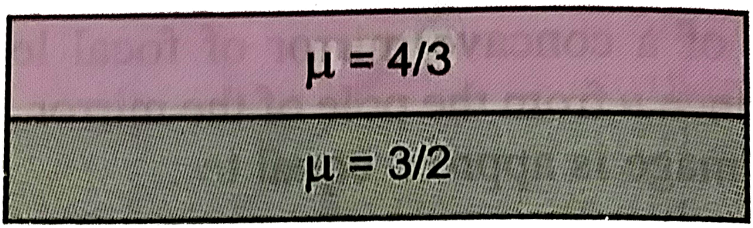
C. $\sqrt{\frac{3}{2}}$

D. $\sqrt{\frac{7}{6}}$

Answer: C

Watch Video Solution

396. Considering normal incidence of ray, the equivalent refractive index of combination of two slabs shown in Fig. is.



A. 1.8

B. 1.43

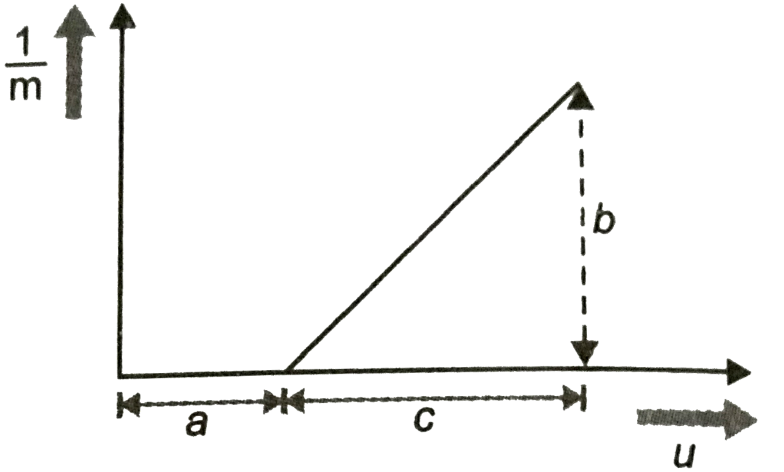
C. 2

D. none of the above

Answer: B

Watch Video Solution

397. The graph in Fig. shows how the inverse of magnification $1/m$ produced by a convex thin lens varies with object distance u. What was the focal length of the lens used ?



A. $\frac{b}{c}$

B. $/(ca)$

C. $\frac{bc}{a}$

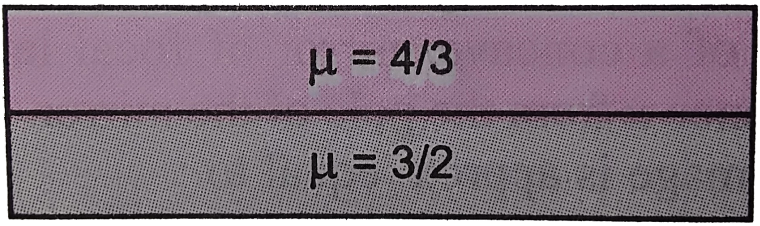
D. $\frac{c}{a}$

Answer: D

Watch Video Solution

398. Consider the ray diagram for the refraction given Fig.

The maximum value of angle θ for which the light suffers total internal reflection at the vertical surface, is



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

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

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

D. $\cot^{-1}\left(\frac{3}{4}\right)$

Answer: B

Watch Video Solution

399. A luminous object is placed at a distance of $30cm$ from the convex lens of focal length $20cm$. On the other side of the lens, at what distance from the lens a convex mirror of radius of curvature $10cm$ be placed in order to have an upright image of the object coincident with it ?

A. $12cm$

B. $30cm$

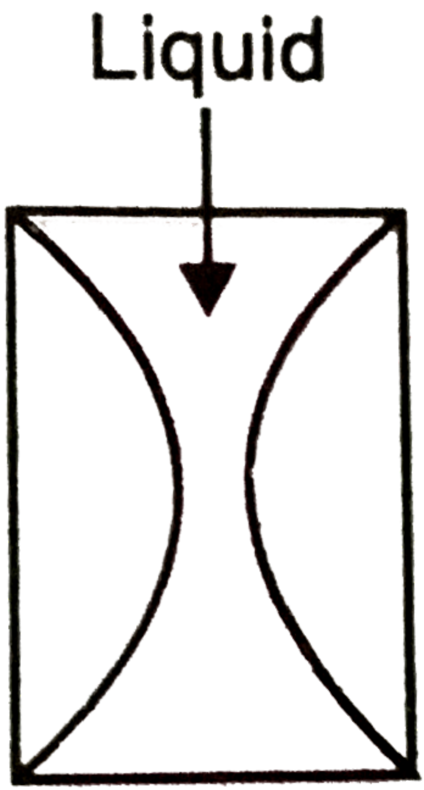
C. $50cm$

D. $60cm$

Answer: C

Watch Video Solution

400. The effective focal length of the lens combination shown in Fig. is -$60cm$. The radii of curvature of the curved surfaces of the plano-convex lenses are $12cm$ each and refractive index of the material of the lens is 1.5. The refractive index of the liquid is :



A. 1.33

B. 1.42

C. 1.53

D. 1.60

Answer: D

Watch Video Solution

401. A ray of light falls on the surface of a spherical glass paper weight making an angle α with the normal and is refracted in the medium at an angle β. The angle of deviation of the emergent ray from the direction of the incident ray is :

A. $(\alpha - \beta)$

B. $2(\alpha - \beta)$

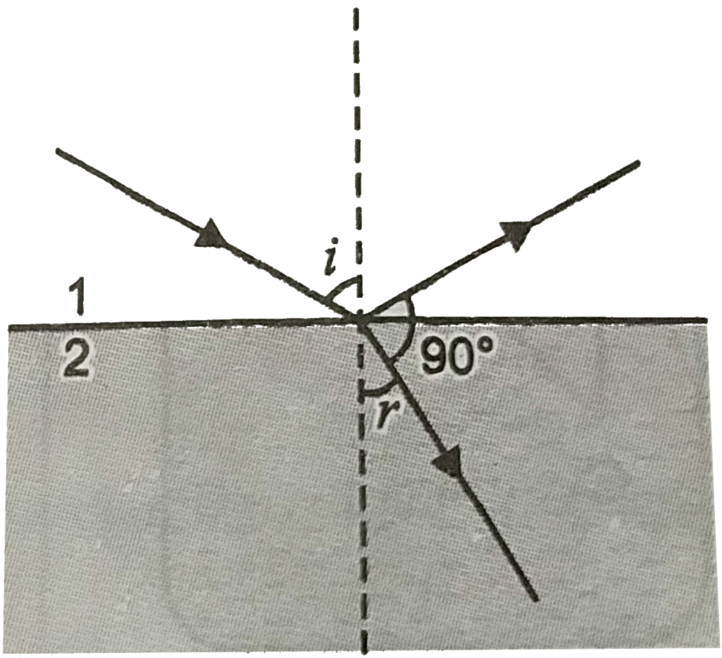
C. $(\alpha - \beta)/2$

D. $(\beta - \alpha)$

Answer: B

Watch Video Solution

402. Light incident on a surface separating two media is partly reflected and party refracted as shown in Fig. Then :



A. $\sin i = \frac{\mu_2}{\left(\mu_1^2 + \mu_2^2\right)^{1/2}}$

B. $\tan i = \frac{\mu_1}{\mu_2}$

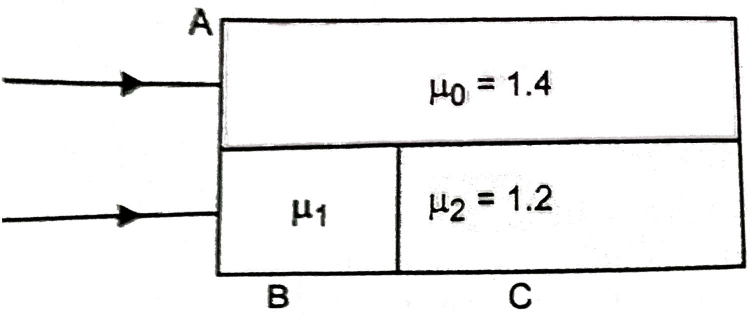
C. $\sin i = \mu_1\mu_2$

D. $\sin i = \frac{\mu_2}{\mu_1}$

Answer: A

Watch Video Solution

403. A slab of transparent material is made as shown in Fig. Monochromatic parallel beams of light are normally incident on the slab. The thickness of C is twice the thickness of B. If the number of waves in A = number of waves in combination of B and C, then the refractive index of B is :



A. 1.33

B. 1.8

C. 1.6

D. 1.4

Answer: B

Watch Video Solution

404. The focal length of a thin lens in vacuum is f. If the material of the lens has $\mu = 3/2$, its focal length when immersed in water of refractive index $4/3$ will be.

A. f

B. $4f/3$

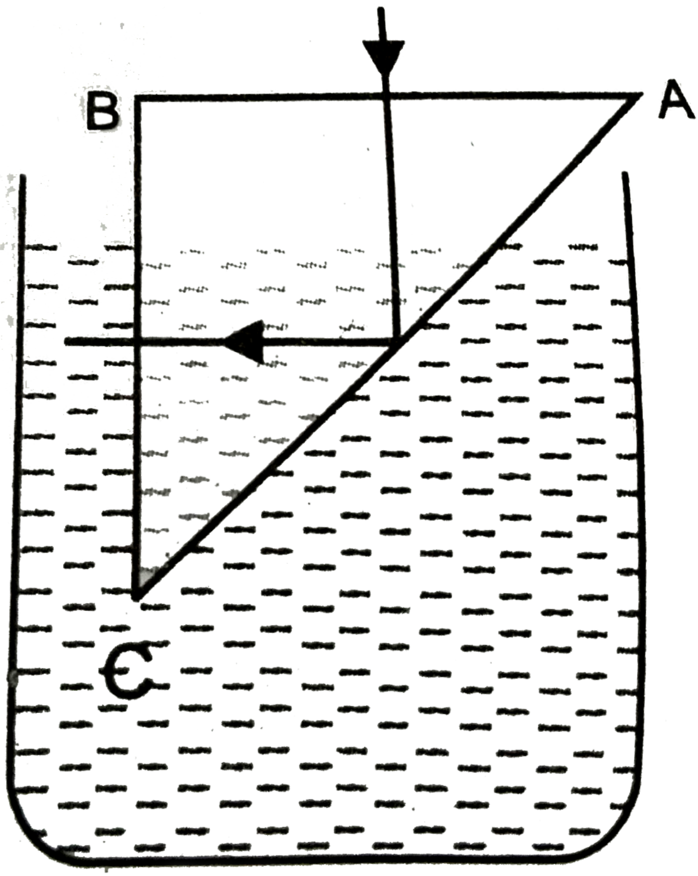
C. $2f$

D. $4f$

Answer: D

Watch Video Solution

405. A glass prism of refractive index 1.5 is immersed in water (refractive index 4/3). A light beam incident normally on the face AB is totally reflected to reach the face BC, Fig. if :



A. $\sin C = 8/9$

B. $\sin C = 9/8$

C. $\sin C = 2/3$

D. $\sin C = 3/2$

Answer: A

Watch Video Solution

406. The radius of curvature of curved surface of a thin plano-convex lens is $10 cm$ and the refractive index is 1.5. If the plano surface is silvered, then the focal length will be.

A. $15 cm$

B. $20cm$

C. $5cm$

D. $10cm$

Answer: D

Watch Video Solution

407. The refracting angle of a prism is A, the refractive index of the material of the prism is $\cot\left(\frac{A}{2}\right)$. The angle of minimum deviation is :

A. $180^{\circ} - 2A$

B. $90^{\circ} - A$

C. $180^{\circ} + 2A$

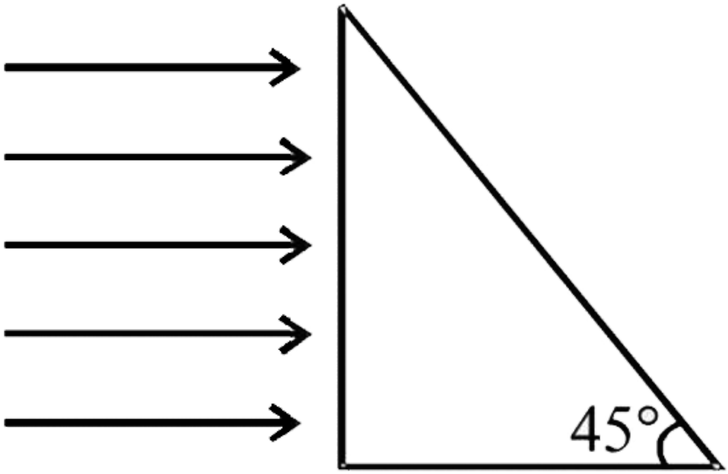
D. $180^{\circ} - 3A$

Answer: A

Watch Video Solution

408. A beam of light consisting of red, green and blue colours is incident on a right angled prism, fig. The refractive indices of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and

1.47 respectively. The prism will `



A. Separate the red colour part from green and blue colours

B. Separate the blue colour part from the red and green colours.

C. Separate all the three colours from one another.

D. Not separate the three colours at all

Answer: A

Watch Video Solution

409. A plano convex lens has focal length $f = 20cm$. If its plane surface is silvered, then new focal length will be

A. $20cm$

B. $5cm$

C. (c) $10cm$

D. $25cm$

Answer: C

Watch Video Solution

410. In an optics ecperiment, with the position of the object fixed, a student varies the position of a convex lens and for each position, the screen is adjusted to get a clear image of the object. A graph between the object distance u and image distance v from the lens, is plotted using the same scale for the two axes. A straight line passing through origin and making an angle of 45° with the x-axis meets the experiment curve at P. The coordinate of P will be

A. $\left(\frac{f}{2}, \frac{f}{2}\right)$

B. (f, f)

C. $(4f, 4f)$

D. $(-2f, 2f)$

Answer: D

Watch Video Solution

411. The focal length of thin biconvex lens is $20cm$. When an object is moved from a distance of $25cm$ in front of it to $50cm$, the magni- fication of its image changes from m_{25} to m_{50}. The ratio $\dfrac{m_{25}}{M_{50}}$ is

A. 4

B. 6

C. 1

D. 3

Answer: B

Watch Video Solution

412. A thin convex lens made from crown glass ($\mu = 3/2$) has focal length f. When it is measured in two different liquids having refractive indiced $4/3$ and $5/3$, it has the focal length f_1 and f_2 respectively. The correct ralation between the focal lengths is

A. $f_2 > f, f_1$ becomes negative

B. f_1 and f_2 both becomes negative

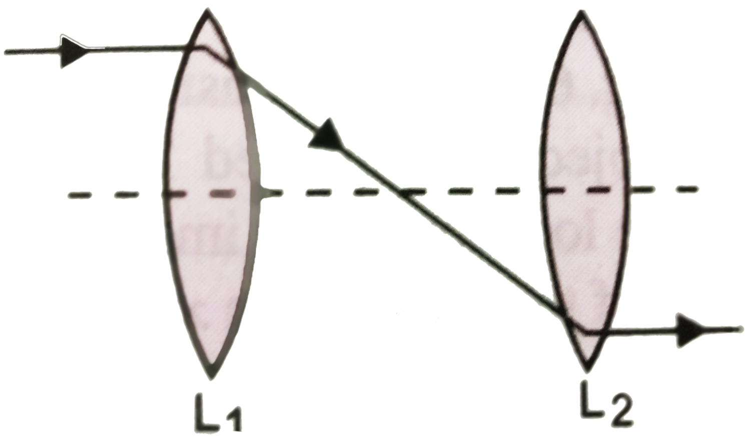
C. $f_1 = f_2 < f$

D. $f_1 > f$ and f_2 becomes negative.

Answer: D

Watch Video Solution

413. In Fig., there are two convex lenses L_1 and L_2 having focal lengths F_1 and F_2 respectively. The distance between L_1 and L_2 will be :



A. F_1

B. F_2

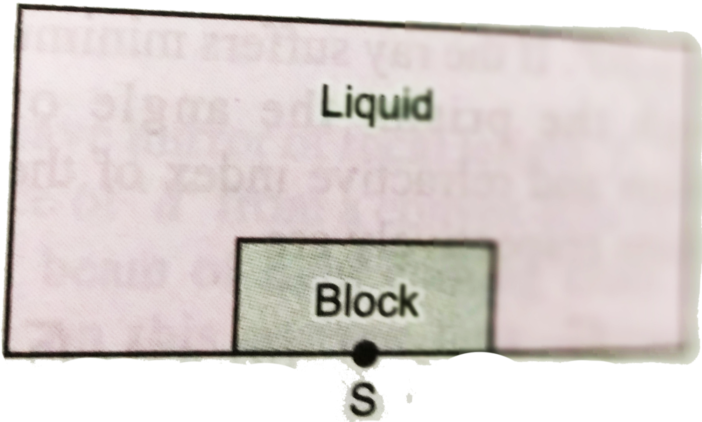
C. $F_1 + F_2$

D. F_1 - F_2

Answer: C

Watch Video Solution

414. A point source S is placed at the bottom of a transparent block of height $10mm$ and refractive index 2.72. It is immersed in a lower refractive index liquid as shwon in Fig. I tis found that the light emerging from the block to the liquid forms a circular bright spot of diameter $11.54 mm$ on the top of the block. The refractive index of the liquid is



A. 1.21

B. 1.30

C. 1.36

D. 1.42

Answer: C

Watch Video Solution

415. A ray of light travelling in a transparent medium f refractive index μ, falls on a surface separating the medium from air at an angle of incidence of 45°. For which of the following value of μ the ray can undergo total internal reflection ?

A. $\mu = 1.33$

B. $\mu = 1.40$

C. $\mu = 1.50$

D. $\mu = 1.25$

Answer: C

Watch Video Solution

416. A lens haivng focal length and aperture of diameter d forms an image of intensity I. Aperture of diameter $\frac{d}{2}$ in central region of lens is covered by a black paper. Focal length of lens and intensity of image now will be respectively.

A. f and $\frac{I}{4}$

B. $\frac{3f}{4}$ and $\frac{I}{2}$

C. f and $\frac{3I}{4}$

D. $\frac{f}{2}$ and $\frac{I}{2}$

Answer: C

Watch Video Solution

417. The speed of light in media M_1 and M_2 are $1.5 \times 10^8 m/s$ and $2.0 \times 10^8 m/s$ respectively. A ray of light enters from medium M_1 to M_2 at an incidence angle i. If the ray suffers total internal reflection, the value of i is.

A. Equal to $\sin^{-1}\left(\frac{2}{3}\right)$

B. Equal to or less than $\sin^{-1}\left(\frac{3}{5}\right)$

C. Equal to or greater than $\sin^{-1}\left(\frac{3}{4}\right)$

D. Less than $\sin^{-1}\left(\frac{2}{3}\right)$

Answer: C

Watch Video Solution

418. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are :

A. $30^{\circ}, \sqrt{2}$

B. $45^{\circ}, \sqrt{2}$

C. $30^{\circ}, \frac{1}{\sqrt{2}}$

D. (d) $45^{\circ}, \frac{1}{\sqrt{2}}$

Answer: A

Watch Video Solution

419. In an experiment for determination of refractive index of glass of a prism by i - δ, plot it was found thata ray incident at angle 35°, suffers a deviation of 40° and that it emerges at angle 79°. In that case which of the following is closest to the maximum possible value of the refractive index?

A. 1.5

B. 1.6

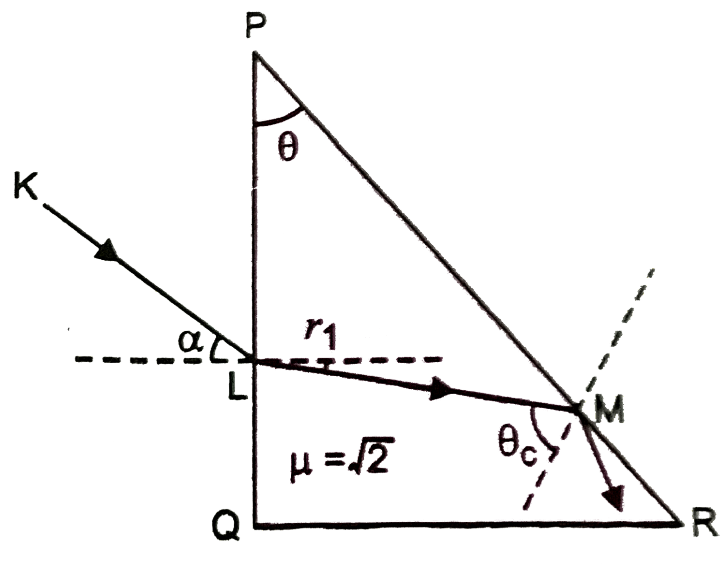
C. 1.7

D. 1.8

Answer: A

Watch Video Solution

420. A parallel beam of light is incident from air at an angle α on the side of right angled triangular prism of refractive index $\mu = \sqrt{2}$. Light undergoes total internal reflection in the prism at the face PR when α has a minimum value of 45°. The angle θ of the prism is.



A. 15°

B. 22.5°

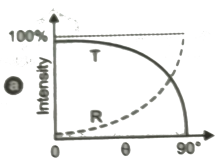
C. 30°

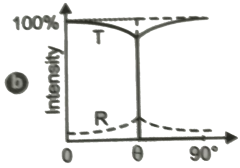
D. 45°

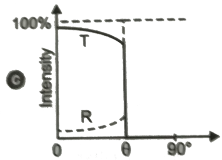
Answer: A

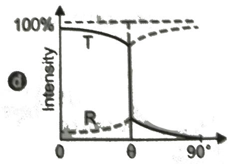
Watch Video Solution

421. A light ray travelling in glass medium is incident of glass- air interface at an angle of incidence θ. The reflected (R) and transmitted (T) intensities, both as function of θ, are plotted The correct sketch is

A. 

B. 

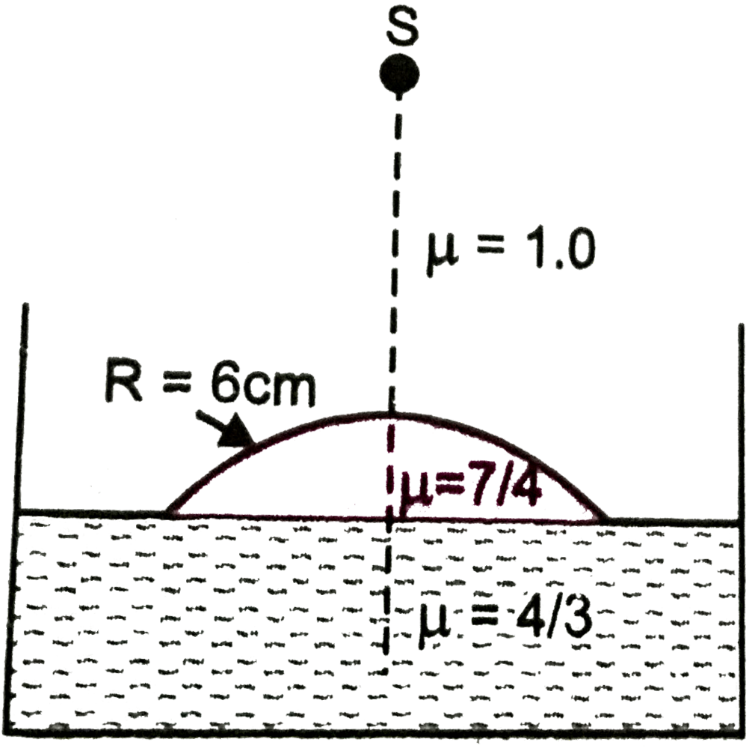
C. 

D. 

Answer: C

Watch Video Solution

422. Water (with refractive index = 4/3) in a tank is $18cm$ deep. Oil of refraction index $7/4$ lies on water making a convex surface of radius of curvature $R = 6cm$ as shown in Fig. Consider oil to act as a thin lens. An object S is placed $24 cm$ above water surface. The location of its image is at $x cm$ above the bottom of the tank. Then x is.



A. 1

B. 2

C. 3

D. 4

Answer: B

Watch Video Solution

423. A biconvex lens has a radius of curvature of magnitude $20cm$. Which one of the following options describes best the image formed of an object of height $2cm$ place $30cm$ from the lens ?

A. Virtual , upright, height $= 1cm$

B. Virtual , upright, height $= 0.5cm$

C. Real, inverted, height $= 4cm$

D. Real, inverted, height $= 1cm$

Answer: C

Watch Video Solution

424. A converging beam of rays in incident on a diverging lens. Having passed through the lens the rays intersect at a point $15cm$ from the lens. If the lens is removed, the point where the rays meet, move $5cm$ closer to the mounting that holds the lens. Find the focal length of the lens.

A. $-10cm$

B. $20cm$

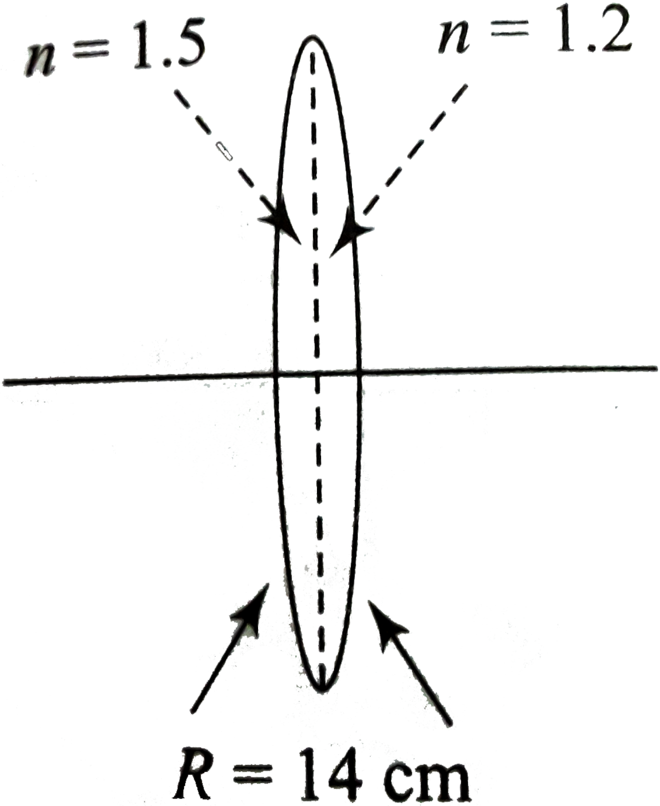
C. $-30cm$

D. $5cm$

Answer: C

Watch Video Solution

425. A bi-convex lens is formed with two thin plano-convex lenses as shown in the figure. Refractive index n of th efirst lens is 1.5 and that of the second lens if 1.2 Both the curved surfaces are of the same radius of curvature $R = 14cm$. For this bi-convex lens, for an object distance of 40cm, the image distance will be



A. -$280.0cm$

B. $40.0cm$

C. (c) $21.5cm$

D. $13.3cm$

Answer: B

Watch Video Solution

426. An object 2.4 m in front of a lens forms a sharp image on a film 12 cm behind the lens. A glass plate 1 cm thick, of refractive index 1.50 is interposed between lens and film with its plane faces parallel to film. At what distance (from lens) should object shifted to be in sharp focus of film?

A. $7.2m$

B. $2.4m$

C. $3.2m$

D. $5.6m$

Answer: D

Watch Video Solution

427. A concave mirrorr of focal length f_1 is placed at a distance of d from a convex lens of focal length f_2. A beam of light coming from infinity and falling on this convex lens-concave mirrorr combination returns to infinity. The distance d must equal.

A. $f_1 + f_2$

B. $-f_1 + f_2$

C. $2f_1 + f_2$

D. $-2f_1 + f_2$

Answer: C

Watch Video Solution

428. A plano-convex lens fits exactly into a plano-concave lens. Their plane surfaces are parallel to each other. If the lenses are made of different material of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then focal length of the combination is

A. $\dfrac{2R}{(\mu_2 - \mu_1)}$

B. $\dfrac{R}{2(\mu_2 - \mu_1)}$

C. $\dfrac{R}{2(\mu_1 - \mu_2)}$

D. $\dfrac{R}{(\mu_1 - \mu_2)}$

Answer: D

Watch Video Solution

429. The diameter of a plano convex lens is $6cm$ and thickness at the centre is $3mm$. If the speed of light in the material of the lens is $2 \times 10^8 m/s$, what is the focal length of the lens ?

A. $15cm$

B. $20cm$

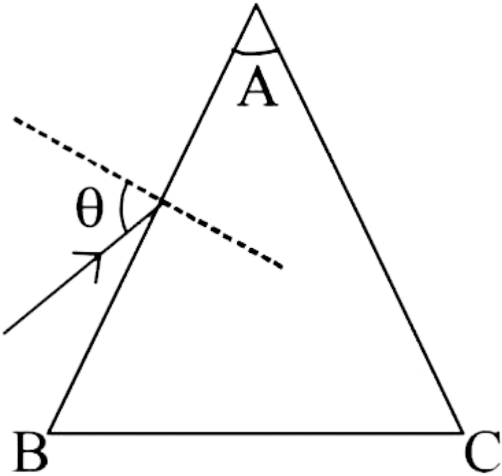
C. $30cm$

D. $10cm$

Answer: C

Watch Video Solution

430. Monochromatic light is incident on a glass prism of angle A. If the refractive index of the material of the prism is μ, a ray, incident at an angle θ, on the face AB would get transmitted through the face AC of the prism provided:



A. $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

B. $\theta < \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

C. $\theta > \cos^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

D. $\theta > \cos^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

Answer: A

Watch Video Solution

431. A monochromatic beam of light is incident at 60° on one face of an equilateral prism of refractive inder n and emerges from the opposite face making an angle θ with the normal. For $n = \sqrt{3}$, the value of θ is 60° and $\frac{d\theta}{dn} = m$. The value of m is.

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

432. The refracting angle of a prism is A, the refractive index of the material of the prism is $\cot\left(\frac{A}{2}\right)$. The angle of minimum deviation is :

A. $180^{\circ} - 2A$

B. $90^{\circ} - A$

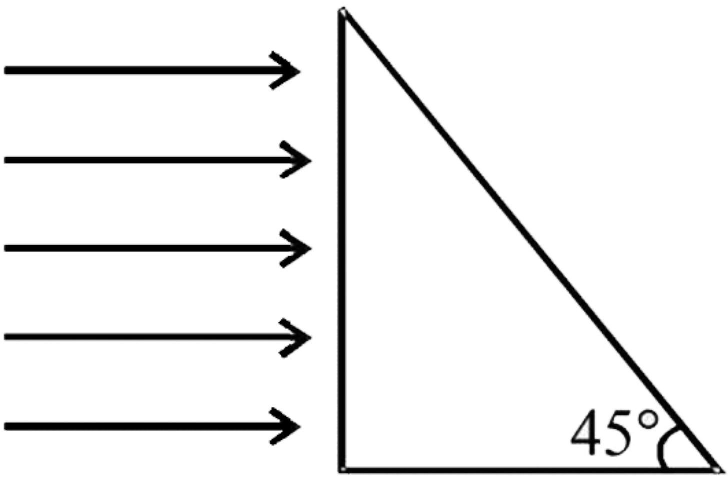
C. $180^{\circ} + 2A$

D. $180^{\circ} - 3A$

Answer: A

Watch Video Solution

433. A beam of light consisting of red, green and blue colours is incident on a right angled prism, fig. The refractive indices of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively. The prism will `



A. Separate the red colour part from green and blue colours

B. Separate the blue colour part from the red and green colours.

C. Separate all the three colours from one another.

D. Not separate the three colours at all

Answer: A

Watch Video Solution

434. Angle of prism is A and its one surface is silvered. Light rays falling at an angle of incidence $2A$ on first surface return back through the same path after suffering reflection at second silvered surface. Refraction index of the material of prism is

A. $2\sin A$

B. $2\cos A$

C. $\frac{1}{2}\cos A$

D. $\tan A$

Answer: B

Watch Video Solution

435. A green light is incident from the water to the air - water interface at the critical angle (θ). Select the correct statement.

A. The spectrum of visible light frequency is more than that of green light will come out of the air medium.

B. The entire spectrum of visible light will come out of water at various angles to the normal.

C. The entire spectrum od visible light will come out of water at an angle of 90° to the normal.

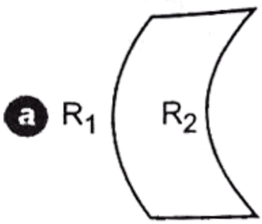
D. The spectrum of visible light whose frequency is less than that of green light will come out of the air medium.

Answer: D

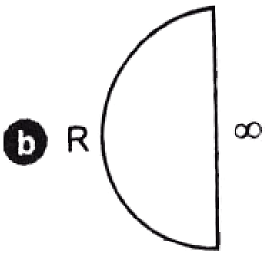
Watch Video Solution

436. Which one of the following spherical lenses does not exhibit dispersion? The radii of curvature of the surfaces of the lenses are as given in the diagrams. `

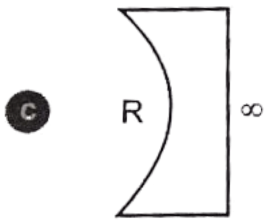
A.

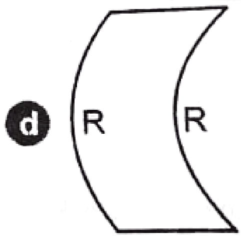


B.



C.



D. 

Answer: D

Watch Video Solution

437. A thin prism having refracting angle 10° is made of glass of refracting index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be :

A. 4°

B. 6°

C. 8°

D. 10°

Answer: B

Watch Video Solution

438. A thin prism of angle 15° made of glass of refractive index $\mu_1 = 1.5$ is combined with another prism of glass of refractive index $\mu_2 = 1.75$. The combination of the prism produces dispersion without deviation. The angle of the second prism should be

A. 7°

B. 10°

C. 12°

D. 5°

Answer: B

Watch Video Solution

439. A ray of light is incident at small angle I on the surface of prism of small angle A and emerges normally from the oppsite surface. If the refractive index of the material of the prism is mu, the angle of incidence is nearly equal to

A. μA

B. $\frac{\mu A}{2}$

C. A/μ

D. $A/2\mu$

Answer: A

Watch Video Solution

440. For the angle of minimum deviation of a prism to be equal to its refracting angle, the prism must be made of a material whose refractive index

A. lies between $\sqrt{2}$ and 1

B. lies between 2 and $\sqrt{2}$

C. is less than 1

D. is greater than 2

Answer: B

Watch Video Solution

441. Magnification of a compound microscope is 30. Focal length of eye - piece is $5cm$ and the image is formed at a distance of distinct vision of $25cm$. The magnificatio of the objective lens is

A. 6

B. 5

C. 7.5

D. 10

Answer: B

Watch Video Solution

442. The ratio of resolving power of an optical microscope for two wavelength $\lambda_1 = 4000\text{Å}$ and $\lambda_2 = 6000\text{Å}$ is:

A. $8:27$

B. $9:4$

C. $3:2$

D. $16:81$

Answer: C

Watch Video Solution

443. An astronaut is looking down on earth's surface from a space shuttle at an altitude of $400km$. Assuming that the astronaut's pupil diameter is $5mm$ and the wavelength of visible light is $500nm$. The astronaut will be able to resolve linear object of the size of about .

A. $0.5m$

B. $5m$

C. $50m$

D. $500m$

Answer: C

Watch Video Solution

444. A telescope has an objective lens of $10cm$ diameter and is situated at a distance of one kilometre from two objects. The minimum distance between these two objects, which can be resolved by the telescope, when the mean wavelength of light is 5000Å, of the order of

A. $5mm$

B. $5cm$

C. $2.5m$

D. $5m$

Answer: A

Watch Video Solution

445. If the focal length of the objective lens is increased then

A. microscope will increase but that of telescope decrease

B. microscope and telescope, both will increase

C. microscope and telescope, both will decrease

D. microscope will decrease, but that of telescope will increase.

Answer: D

Watch Video Solution

446. A microscope is focused on a mark on a piece of paper and then a slab of glass of thickness $3cm$ and refractive index 1.5 is placed over the mark. How should the microscope be moved to get the mark in focus again ?

A. $2cm$ upward

B. $1cm$ upward

C. $4.5cm$ upward

D. 1 cm downward

Answer: B

Watch Video Solution

447. A boy is trying to start a fire by focusing sunlight on a piece of paper using an equiconvex lens of focal length $10cm$. The diameter of the sun is $1.39 \times 10^{9}m$ and its mean distance from the earth is $1.5 \times 10^{11}m$. What is the diameter of the sun's image on the paper ?

A. $89.2 \times 10^{-4}m$

B. $6.5 \times 10^{-4}m$

C. $6.5 \times 10^{-5}m$

D. $12.4 \times 10^{-4}m$

Answer: A

Watch Video Solution

448. The magnifying power of a telescope is 9. When it is adjusted for parallel rays the distance between the objective and eyepiece is $20cm$. The focal lengths of lenses are

A. $10cm, 10cm$

B. $15cm, 5cm$

C. $18cm, 2cm$

D. $11cm, 9cm$

Answer: C

Watch Video Solution

449. In an astronomical telescope in normal adjustment a straight black line of length L is drawn on inside part of objective lens. The eye piece forms a real image of this line. The length of this image is I. The magnification of the telescope is

A. $\frac{L}{I}$

B. $\frac{L}{I} + 1$

C. $\frac{L}{I} - 1$

D. $\frac{L + I}{L - I}$

Answer: A

Watch Video Solution

450. The near and far points of a person are at $40cm$ and $250cm$ respectively. Find the power of the lens he/she should use while reading at $25cm$. With this lens on the eye, what maximum distance is clearly visible?

A. $2.5D$

B. $5.0D$

C. $1.5D$

D. $3.5D$

Answer: C

Watch Video Solution

451. 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. $1\mu m$

B. $30\mu m$

C. $100\mu m$

D. $300\mu m$

Answer: B

Watch Video Solution

452. For a normal eye, the cornea of eye provides a converging power of $40D$ and the least converging power of the eye lens behind the cornea is $20D$. Using this information, the distance between the retina and the cornea eye lens can be estimated to be

A. $1.5cm$

B. $5cm$

C. $2.5cm$

D. $1.67cm$

Answer: D

Watch Video Solution

453. The focal length of the objective and eye piece of a telescope are respectively $100cm$ and $2cm$. The moon subtends and angle of 0.5°, the angle subtended by the moon's image will be.

A. 10°

B. 25°

C. 75°

D. 100°

Answer: B

Watch Video Solution

454. An astronomical telesope has objective and eyepiece of focal lengths $40cm$ and $4cm$ respectively. To view an object $200cm$ away from the objective, the lenses must be separated by a distance :

A. $46.0cm$

B. $50cm$

C. $54.0cm$

D. $37.3cm$

Answer: C

Watch Video Solution

455. An obsever looks at a distant tree of height 10m with a telescope of magnifying power of 20. to the observer the tree appears:

A. 10 times taller

B. 10 times nearer

C. 20 times taller

D. 20 times nearer

Answer: D

Watch Video Solution

Watch Video Solution

456. 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. $a = \lambda^2/L$ and $b_{\min} = \frac{2\lambda^2}{L}$

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

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

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

Answer: C

Watch Video Solution

457. On a hot summer night, the refractive index of air is smallest near the ground and increases with height from the ground. When a light beam is directed horizontally, the Huygens` principal leads us to conclude that as it travels, the light beam:

A. becomes narrower

B. goes horizontally without any deflection

C. bends downwards

D. bends upwards

Answer: D

Watch Video Solution

458. At the first minimum adjacent to the central maximum of a single-slit diffraction pattern the phase difference between the Huygens wavelet from the edge of the slit and the wavelet from the mid-point of the slit is

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

B. $\frac{\pi}{4} radian$

C. $\frac{\pi}{2} radian$

D. $\pi radian$

Answer: D

Watch Video Solution

459. In a double slit experiment, the two slits are $1mm$ apart and the screen is placed $1m$ away. A monochromatic light of wavelength $500nm$ 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. $0.1mm$

B. $0.5mm$

C. $0.02mm$

D. $0.2mm$

Answer: D

Watch Video Solution

460. A Young's double slit interference arrangement with slits S_1 and S_2 is immersed in water (refractive index $= 4/3$) as shown in the figure. The positions of maxima on the surface of water are given by $x^2 = p^2m^2\lambda^2 - d^2$, where λ is the wavelength of light in air (reflactive index = 1), 2d is the separation between the slits and m is an integer. The value of P is ....

A. 1

B. 2

C. 3

D. 4

Answer: C

Watch Video Solution

461. In Young's double-slit experiment, the y-coordinate of central maxima and 10th maxima are 2 cm and 5 cm, respectively, When the YDSE apparatus is immersed in a liquid of refreactive index 1.5, the corresponding y-coordinates will be

A. $2cm, 7.5cm$

B. $3cm, 6cm$

C. $2cm, 4cm$

D. $4/3cm, 10/3cm$

Answer: C

Watch Video Solution

462. In the Young's double-slit experiment, the intensity of light at a point on the screen where the path difference is λ is K, (λ being the wavelength of light used). The intensity at a point where the path difference is $\lambda/4$ will be

A. K

B. $K/4$

C. $K/2$

D. zero

Answer: C

Watch Video Solution

463. A light source, which emits two wavelength $\lambda_1 = 400nm$ and $\lambda_2 = 600nm$, is used in a Young's double slit experiment. If recorded fringe width for λ_1 and λ_2 are β_1 and β_2 and the number of fringes for them within a distance y on one side of the central maximum are m_1 and m_2 respectively, then

A. $\beta_2 > \beta_1$

B. $m_1 > m_2$

C. From the central maximum, 3rd maximum of λ_2 overlaps with 5th minimum of λ_1

D. The angular separation of fringes for λ_1 is greater than λ_2

Answer: D

Watch Video Solution

464. Two coherent sources of intensity ratio β interfere, then $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ is

A. $\frac{1+\beta}{\sqrt{\beta}}$

B. $\sqrt{\left(\frac{1+\beta}{\beta}\right)}$

C. $\frac{1+\beta}{2\sqrt{\beta}}$

D. $\frac{2\sqrt{\beta}}{1+\beta}$

Answer: D

Watch Video Solution

465. A transparent sheetof refractive index 1.5 is kept near one of the slits of the $YDSE$ apparentus. The intenisity at the centre of the screen (where the central maximum was located before the introduction of the sheet) is half of the previous value. The minimum thickness of the sheet should be (wavelength of the monochromatic light used in the experiment is 6000Å) :

A. $2 \times 10^{-7} m$

B. $7.5 \times 10^{-8} m$

C. (c) $3 \times 10^{-7} m$

D. $2 \times 10^{-7} m$

Answer: C

Watch Video Solution

466. A source emits electromagnetic waves of wavelength $3m$. One beam reaches the observer directly and other after reflection from a watersurface, travelling $1.5m$ extra distance and with intensity reduced to $1/4$ as compared to intensity due to the direct beam alone. The resultant intensity will be :

A. $(1/4)rad$

B. $(3/4)rad$

C. $(5/4)rad$

D. $(9/4)rad$

Answer: D

Watch Video Solution

467. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that

8^{th} bright fringe in the medium lies where 5^{th} dark fringe lies in air. The refractive index of the medium is nearly

A. 1.25

B. 1.59

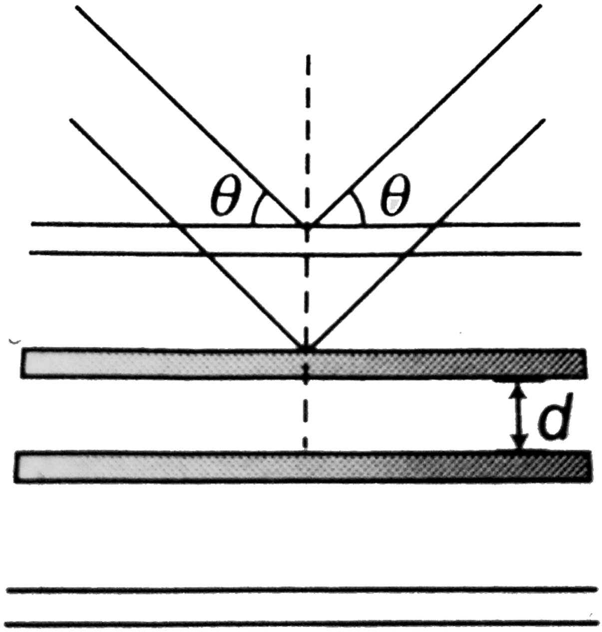
C. 1.69

D. 1.78

Answer: D

Watch Video Solution

468. A beam with wavelength λ falls on a stack of partially reflecting planes with separation d. The angle θ that the beam should make with planes so that the beams reflected from successive planes may interfere constructively is (where n=1, 2, ...)



A. $\sin^{-1}\left(\frac{n\lambda}{d}\right)$

B. $\tan^{-1}\left(\frac{n\lambda}{d}\right)$

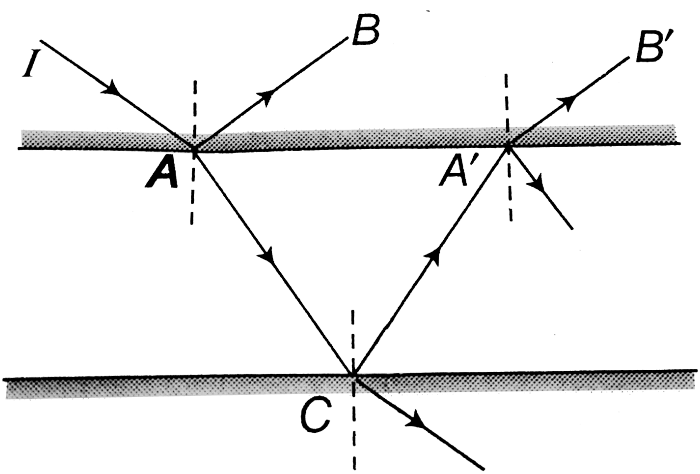
C. $\sin^{-1}\left(\frac{n\lambda}{2d}\right)$

D. $\cos^{-1}\left(\frac{n\lambda}{2d}\right)$

Answer: C

Watch Video Solution

469. A ray of light intensity I is incident on a parallel glass-slab at a point A as shown in figure. It undergoes partial reflection and refraction. At each reflection 25% of incident energy is reflected. The rays AB and $A'B'$ undergo interference. The ratio I_{max}/I_{min} is



A. $4:1$

B. $8:1$

C. $7:1$

D. $49:1$

Answer: D

Watch Video Solution

470. In a Young's double slit experiment, the slit separation is $1mm$ and the screen is $1m$ from the slit. For a monochromatic light of wavelength $500nm$, the distance of 3rd minima from the central maxima is

A. $0.1mm$

B. $0.5mm$

C. $0.02mm$

D. $0.2mm$

Answer: D

Watch Video Solution

471. 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 (wavelength 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. λ

C. $\lambda/3$

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

Answer: A

Watch Video Solution

472. A single slit located effectively at infinity in front of a lens of focal length $1m$, and it is illuminated normally with light of wavelength $600nm$. The first minimum on either side of central maximum are separated by $4mm$. Width of the slit is

A. $0.1mm$

B. $0.2mm$

C. $0.3mm$

D. $0.4mm$

Answer: C

Watch Video Solution

473. A beam of electron is used $YDSE$ experiment . The slit width is d when the velocity of electron is increased ,then

A. no interference is observed

B. fringe width increases

C. fringe width decreases

D. fringe width remains same

Answer: C

Watch Video Solution

474. 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. $9.75mm$

B. $15.6mm$

C. $1.56mm$

D. $7.8mm$

Answer: D

Watch Video Solution

475. n identical waves each of intensity I_0 interfere each other. The ratio of maximum inensities if interference is (i) coherent and (ii) incoherent is

A. n

B. n^2

C. n^3

D. $\frac{1}{n^2}$

Answer: A

Watch Video Solution

476. In a Young's double slit experiment the intensity at a point where tha path difference is $\frac{\lambda}{6}$ (λ being the wavelength of light used) is I. If I_0 denotes the maximum intensity, $\frac{I}{I_0}$ is equal to

A. $3/4$

B. $1/\sqrt{2}$

C. $\sqrt{3}/2$

D. $\frac{1}{2}$

Answer: A

Watch Video Solution

477. Two periodic waves of intensities I_1 and I_2 pass through a region at the same time in the same direction. The sum of the maximum and minimum intensities is:

A. $I_1 + I_2$

B. $\left(\sqrt{I_1} + \sqrt{I_2}\right)^2$

C. (c) $\left(\sqrt{I_1} - \sqrt{I_2}\right)^2$

D. $2\left(I_1 + I_2\right)$

Answer: D

Watch Video Solution

478. At two point P and Q on screen in Young's double slit experiment, waves from slits S_1 and S_2 have a path difference of 0 and $\frac{\lambda}{4}$ respectively. The ratio of intensities at P and Q will be:

A. $3:2$

B. $2:1$

C. $\sqrt{2}:1$

D. $4:1$

Answer: B

Watch Video Solution

479. In Young's double slit experiment, one of the slit is wider than other, so that amplitude of the light from one slit is double of that from other slit. If I_m be the maximum intensity, the resultant intensity I when they interfere at phase difference ϕ is given by:

A. $\frac{I_m}{9}(4+5\cos\phi)$

B. $\frac{I_m}{3}\left(1+2\frac{\cos^2(\phi)}{2}\right)$

C. $\frac{I_m}{5}\left(1+4\frac{\cos^2(\phi)}{2}\right)$

D. $\frac{I_m}{9}\left(1+8\frac{\cos^2(\phi)}{2}\right)$

Answer: D

Watch Video Solution

480. In Young's double-slit experiment, the slits are $2mm$ apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000\text{Å}$ and $\lambda_2 = 10000\text{Å}$. At what minimum distance from the common central bright fringe on the screen $2m$

from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other?

A. $3mm$

B. $8mm$

C. $6mm$

D. $4mm$

Answer: C

Watch Video Solution

481. Two slits in Young's experiment have width in the ratio $1:25$. The ratio of intensity at the maxima and minima in the interference pattern $\frac{I_{\max}}{I_{\min}}$ is :

A. $\frac{4}{9}$

B. $\frac{9}{4}$

C. $\frac{121}{49}$

D. $\frac{49}{121}$

Answer: B

Watch Video Solution

482. The maximum intensity in young's double-slit experiment is I_0. Distance between the slit is $d = 5\lambda$, where λ is the wavelength of monochromatic light used in the experiment. What will be the intensity of light in front of one of the slits on a screen at a distance $D = 10d$?

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

B. $\frac{3}{4}I_0$

C. $I_0/2$

D. I_0

Answer: C

Watch Video Solution

483. 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. $1\mu m$

B. $30\mu m$

C. $100\mu m$

D. $300\mu m$

Answer: B

Watch Video Solution

484. For a parallel beam of monochromatic light of wavelength $'\lambda'$ differaction is produced by a single slit whose width $'a'$ is of the order as wavelength of the light. If $'D'$ is the distance of the screen from the slit, the width of the central maxima will be

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

B. $\frac{Da}{\lambda}$

C. $\frac{2Da}{\lambda}$

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

Answer: D

Watch Video Solution

485. A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct?

A. The angular width of central maximum will be unaffected.

B. Diffraction pattern is not observed on the screen in the case of electrons.

C. Th angular width of the central maximum of the diffraction pattern will increase.

D. The angular width of the central maximum will decrease.

Answer: D

Watch Video Solution

486. A parallel beam of monochromatic light of wavelength 5000Å is incident normally on a single narrow slit of width $0.001mm$. The light is focused by a convex lens on a screen placed on the focal plane. The first minimum will be formed for the angle of diffraction equal to

A. 0°

B. 15°

C. 30°

D. 60°

Answer: C

Watch Video Solution

Watch Video Solution

487. Two Polaroids P_1 and P_2 are placed with their axis perpendicular to eachother. Unpolarised light I_0 is nicident on P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1. The intensity of transmitted light through P_2 is

A. $\frac{I_0}{2}$

B. $\frac{I_0}{4}$

C. $\frac{I_0}{8}$

D. $\frac{I_0}{16}$

Answer: C

488. At the first minimum adjacent to the central maximum of a single-slit diffraction pattern the phase difference between the Huygens wavelet from the edge of the slit and the wavelet from the mid-point of the slit is

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

B. $\frac{\pi}{4} radian$

C. $\frac{\pi}{2} radian$

D. $\pi radian$

Answer: D

489. In a diffraction pattern due to single slit of width $'a'$, the first minimum is observed at an angle 30° when light of wavelength 5000Å is inclined on the slit. The first secondary maximum is observed at an angle of:

A. $\sin^{-1}(2/3)$

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

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

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

Answer: C

Watch Video Solution

490. Two point white dots are 1mm apart on a black paper. They are viewed by eye of pupil diameter 3mm. Approximately, what is the maximum distance at which these dits can be resolved by the eye? [Take wavelelngth of light =500nm]

A. $1m$

B. $5m$

C. $3m$

D. $6m$

Answer: B

Watch Video Solution

491. 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

492. A beam of light of wavelength 600 nm from a distant source

falls on a single slit 1.0 mm wide and the resulting diffraction pattern is

observed on a screen 2m away. What is the distance between the first dark

fringe on either side of the central bright fringe?

A. $1.2cm$

B. $1.2mm$

C. $2.4cm$

D. $2.4mm$

Answer: D

Watch Video Solution

493. 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. 1

B. $1/3$

C. 3

D. $3/2$

Answer: B

Watch Video Solution

494. A ray of light travelling in a transparant medium falls on a surface separating the medium from air at an angle of incidence of $45 degree$. The ray undergoes total internal reflection. If n is the refractive in index of the medium with respect to air, select the possible value (s) of n from the following:

A. 1.3

B. 1.4

C. 1.5

D. 1.6

Answer: C::D

Watch Video Solution

495. A spherical surface of radius of curvature R separates air (refractive index 1.0) from glass (refractive index 1.5). The centre of curvature is in the glass. A point object P placed in air is found to have a real image Q in the glass. The line PQ cuts the surface at a point O, and $PO = OQ$. The distance PO

A. $5R$

B. $3R$

C. $2R$

D. $1.5R$

Answer: A

Watch Video Solution

496. A diminished image of an object is to be obtained on a screen 1.0 m from it. This can be achieved by appropriately placing

A. a convex lens of suitable focal length

B. a concave lens of suitable focal length

C. a convex mirror of suitable focal length

D. a concave mirror of suitable focal length

Answer: A::D

Watch Video Solution

497. A short linear object of length b lies along the axis of a concave mirror of focal length f at a distanee u from the pole of the mirror. The size of the image is approximately equal to

A. $b\left(\frac{u-f}{f}\right)^{\frac{1}{2}}$

B. $b\left(\frac{f}{u-f}\right)^{\left(\frac{1}{2}\right)}$

C. $b\left(\frac{u-f}{f}\right)$

D. (d) $b\left(\frac{f}{u - f}\right)^2$

Answer: D

Watch Video Solution

498. An astronomical telescope has an angular magnification of magnitude 5 for distant object. The separation between the objective and the eyepiece is 36 cm and the final image is formed at infinity. The focal length f_0 of the objective and the focal length f_0 of the eyepiece are

A. $f_0 = 45cm$ and $f_e = -9cm$

B. $f_0 = 50cm$ and $f_e = 10cm$

C. $f_0 = 7.2cm$ and $f_e = 5cm$

D. $f_0 = 30cm$ and $f_e = 6cm$

Answer: D

Watch Video Solution

499. A planet is observed by an astronomical refracting telescope having an objective of ofcal length 16m and an eyepiece of focal length 2 cm. Then,

A. The distance between the objective and eye piece is $16.02m$

B. The angular magnification of the planet is -800

C. The image of the planet is inverted

D. The objective is larger than his eye piece

Answer: A::B::C::D

Watch Video Solution

500. Four light waves are represented by

(i) $y = a_1 \sin\omega t$

(ii) $y = a_2 \sin(\omega t + \varphi)$

(iii) $y = a_1 \sin 2\Omega t$

(iv) $y = a_2 \sin 2(\omega t + \varphi)$

Interference fringes may be observed due to superposition of

A. (i) and (ii)

B. (i) and (iii)

C. (ii) and (iv)

D. (iii) and (iv)

Answer: A::D

Watch Video Solution

501. If the source of light used in a young's double slit experiment is changed from red to violet

A. the fringes will becomes brighter.

B. consecutive fringes will come closer.

C. the intensity of minima will increase.

D. the central bright fringe will become a dark fringe.

Answer: B

Watch Video Solution

502. A parallel monochromatic beam of light is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of incident deam. At the first maximum of the diffraction pattern the phase difference between the rays coming from the edges of the slit is

A. zero

B. $\pi/2$

C. π

D. 2π

Answer: C

Watch Video Solution

503. A student performed the experiment of determination of focal length of a concave mirror by u - v method using an optical bench of length 1.5 meter. The focal length of the mirror used is 24 cm. The maximum error in the location of the image can be 0.2 cm. The 5 sets of (u, v) values recorded by the student (in cm) are:

$(42, 56), (48, 48), (60, 40), (66, 33), (78, 39)$. The data set (s) that cannot come from experiment and is (are) incorrectly recorded, is (are)

A. $(42, 56)$

B. $(48, 48)$

C. $(66, 33)$

D. $(78, 39)$

Answer: C::D

Watch Video Solution

504. 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`(gtb) from the slits. At a point on the screen directly in front of one of the slits, certain wavelength are missing. Some of these missing wavelength are

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

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

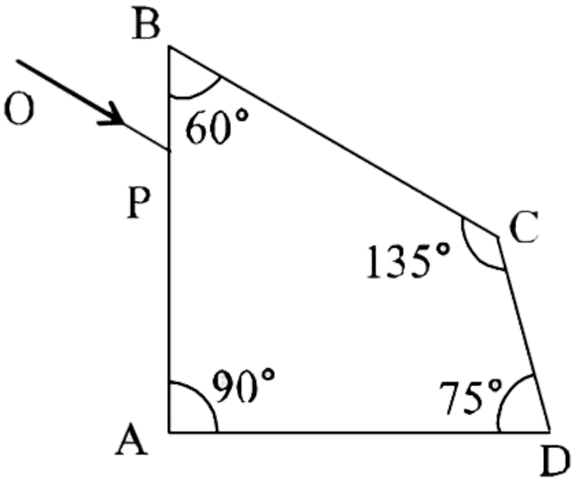
C. $\lambda = \frac{b^2}{3d}$

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

Answer: A::C

Watch Video Solution

505. A ray OP of monochromatic light is incident on the face AB of prism ABCD mear vertex B at an incident angle of $60 degree$ (see figure). If the refractive index of the material of the prism is $\sqrt{3}$, which of the following is (are) are correct? `



A. The ray gets totally internally reflected at face CD

B. The ray comes out through face AD

C. The angle between the incident ray and the emergent rays is 90°

D. The angle between the incident ray and the emergent ray is 120°

Answer: A::B::C

Watch Video Solution

506. When light propagates in vacuum there is an electric field and a magnetic field. These fields

A. constant in time

B. mutually perpendicular

C. having zero average values

D. both perpendicular to the direction of propagation of light

Answer: B::D

Watch Video Solution

507. Four light waves are represented by

(i) $y = a_1 \sin \omega t$

(ii) $y = a_2 \sin(\omega t + \varphi)$

(iii) $y = a_1 \sin 2\Omega t$

(iv) $y = a_2 \sin 2(\omega t + \varphi)$

Interference fringes may be observed due to superposition of

A. (i) and (iii)

B. (ii) and (iv)

C. (i) and (ii)

D. (iii) and (iv)

Answer: A::B

Watch Video Solution

508. A plano-covex lens is made of a material of refractive index n. When a small object is placed 30cm away in front of the curved surface of the lens, an image of double the size of the object is produced. Due to reflection from the convex surface of the lens, another faint image is observed at a distance of 10 cm away from the lens. Which of the following statement (s) is (are) true?

A. refractive index of lens is 2.5

B. radius of curvature of convex surface is $45cm$

C. faint image is erect and real

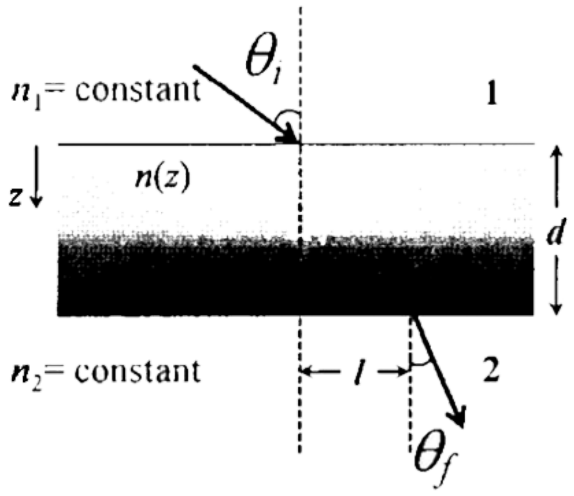
D. focal length of the lens is $20cm$

Answer: A::D

Watch Video Solution

509. A transparent slab of thickness d has a refractive index n(z) that increases with z. Here z is the vertical distance inside the slab, measured from the top. The slab is placed between two media with uniform refractive indices n_1 and $n_2\left(>n_1\right)$, θ_0, from medium 1 and emerges in medium 2 with refraction angle $\theta_t$with a lateral displacement l.

Which of the following statement(s) is (are) true?



A. l is independence of $n(Z)$

B. $n_1 \sin\theta_i = (n_2 - n_1)\sin\theta_f$

C. $n_1 \sin\theta_i = n_2 \sin\theta_i = n_2 \sin\theta_f$

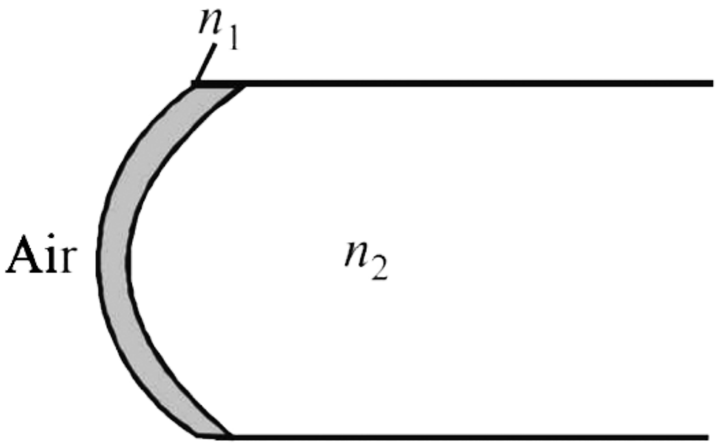
D. l is independence of n_2

Answer: C::D

Watch Video Solution

510. A transparent thin film of uniform thickness and refractive index $n_1 = 1.4$ is coated on the convex spherical surface of radius R at one end of a long solid glass cylinder of refractive index $n_2 = 1.5$, as shown in the figure. Rays of light parallel to the axis of the cylinder traversing through the film from air to glass get focused at distance f_1 from the film, while rays of light traversing from glass to air get focused at distance f_2 from the film,

Then `



A. $|f_1| = 3R$

B. $|f_1| = 2.8R$

C. $|f_2| = 2R$

D. $|f_2| = 1.4R$

Answer: A::C

Watch Video Solution

511. A Young's double slit experiment is performed with white light.

A. The central fringe will be white

B. There will be no completely dark fringe

C. The fringe next to central fringe will be violet

D. The fringe next to central fringe will be red.

Answer: A::C::D

Watch Video Solution

512. Three observers A, B and C measure the speed of light coming from a source to be v_A, v_B and v_C. The observer A moves towards the source and C moves away from the soure at the same speed. The observer B stays stationary. The surrounding space is vacuum everywhere.

A. $v_{<}v_B < v_C$

B. () $v_A > v_{>}v_C$

C. $v_C = \dfrac{v_B + v_A}{2}$

D. $v_A = v_B = v_C$

Answer: C::D

Watch Video Solution

513. An astronomical telescope of ten-fold angular magnification has a length of $44cm$. The focal length of the objective is

A. $440cm$

B. $44cm$

C. $40cm$

D. $4cm$

Answer: C

Watch Video Solution

514. Mark the correct options :

A. If the far point is $1m$ away from the eye, diverging lens should be used,

B. If the near point is $1m$ away from the eye, divergent lens should be used,

C. If the far point goes ahead, the power of the divergent lens should be reduced,

D. If the near point goes ahead, the power of the convergent lens should be reduced.

Answer: A::C

Watch Video Solution

515. A narrow beam of white light slab having parallel faces.

A. The light inside the slab is white,

B. The light inside the slab is spit into different colours,

C. The emergent beam is white,

D. The light never splits in different colours.

Answer: B::C

Watch Video Solution

516. Which of the following (referred to a sphericla mirror) do (does) not depend on whether the rays are paraxial or not?

A. Radius of curvature

B. Focus

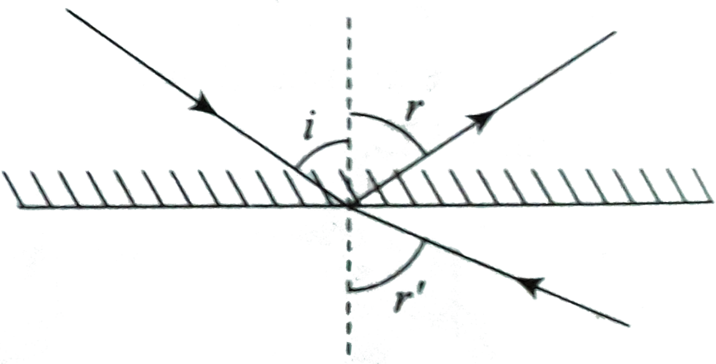
C. Pole

D. Principal axis.

Answer: A::C::D

Watch Video Solution

517. A ray of light from a denser medium strikes a rarer medium at an angle of incidence I (see figure). The reflected and refracted rays make an angle of $90°$ with each other. The angles of reflection and refraction are r and r'. The critical angle is



A. $\sin^{-1}(\tan r)$

B. $\sin^{-1}(\tan i)$

C. $\sin^{-1}(\tan r')$

D. $\tan^{-1}(\sin i)$

Answer: A::B

Watch Video Solution

518. Photograph of the ground are taken form an air-craft ,flying at an altitude of 2000 m by a camera with a lens of focal length $50cm$. The size of the film in the camera is $18 \times 18cm$.What area of the ground can be photography by this camera at any one time.

A. $720m \times 720m$

B. $240m \times 240m$

C. $1080m \times 1080m$

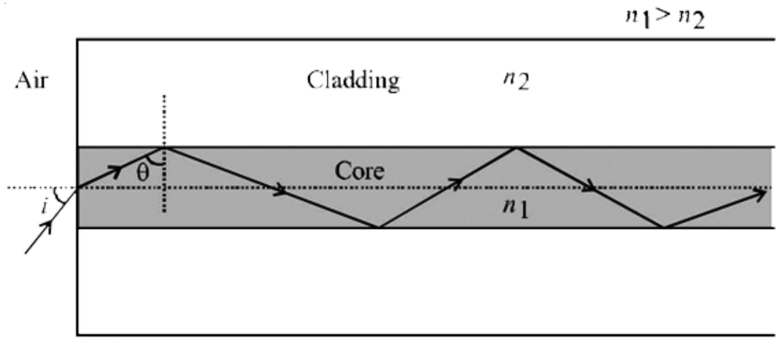
D. $100m \times 100m$

Answer: C

Watch Video Solution

519. Light guidance in an optical fibre can be understood by considering a structure comprising of thin solid glass cylinder of refractive index n_1 surrounded by a medium of lower refractive index n_2. The light guidance in the structure takes place due to successive total internal reflectrions at the interface of the media n_1 and n_2 as shown in the fugure. All rays with the angle of incidence i less than a particular value i_m are confined in the medium of refractive index n_1. The numerical aprture (NA) of the structure is defined as $\sin i_m$

If two structure of same cross-sectional area, but different numerical apertures $NA_1$and $NA_2\left(NA_2 < NA_1\right)$ are joined longitudinally, the numerical aperture of the combined structure is `



A. $\dfrac{NA_1 NA_2}{NA_1 + NA_2}$

B. $NA_1 + NA_2$

C. NA_1

D. NA_2

Answer: D

Watch Video Solution

520. When waves from two herent sources, having amplitudes a and b superimpose, the amplitude R of the resultant wave is given by $R = \sqrt{a^2 + b^2 + 2ab\cos\phi}$ where ϕ is the constant phase angle between the two waves. The resultant intensity I is directly proportional to the square of the amplitude of the resultant wave, i.e., $I \propto R^2$,

i.e., $I \propto \left(a^2 + b^2 + 2ab\cos\phi\right)$

For constructive interference, $\phi = 2n\pi$,

$I_{\max} = (a + b)^2$

For destructive interference, $\phi = (2n - 1)\pi$

$I_{\min} = (a - b)^2$

If I_1, I_2 are intensities of light from two slits of widths ω_1

and ω_2, then $\frac{I_1}{I_2} = \frac{\omega_1}{\omega_2} = \frac{a^2}{b^2}$

Light waves from two coherent sources of intensity ratio $81:1$ produce interference. With the help of the passsage given above, choose the most appropriate alternative for each of the following questions :

The ratio of amplitude of two sources is

A. $9:1$

B. $81:1$

C. $1:9$

D. $1:81$

Answer: A

Watch Video Solution

521. When waves from two herent sources, having amplitudes a and b superimpose, the amplitude R of the resultant wave is given by $R = \sqrt{a^2 + b^2 + 2ab\cos\phi}$ where ϕ is the constant phase angle between the two waves. The resultant intensity I is directly proportional to the square of the amplitude of the resultant wave, i.e., $I \propto R^2$,

i.e., $I \propto \left(a^2 + b^2 + 2ab\cos\phi\right)$

For constructive interference, $\phi = 2n\pi$,

$I_{\text{max}} = (a + b)^2$

For destructive interference, $\phi = (2n - 1)\pi$

$I_{\text{min}} = (a - b)^2$

If I_1, I_2 are intensities of light from two slits of widths ω_1 and ω_2, then $\frac{I_1}{I_2} = \frac{\omega_1}{\omega_2} = \frac{a^2}{b^2}$

Light waves from two coherent sources of intensity ratio

$81:1$ produce interference. With the help of the passsage given above, choose the most appropriate alternative for each of the following questions :

The ratio of slit widths of the two sources is

A. $9:1$

B. $81:1$

C. $1:9$

D. $1:81$

Answer: B

Watch Video Solution

522. When waves from two herent sources, having amplitudes a and b superimpose, the amplitude R of the resultant wave is given by $R = \sqrt{a^2 + b^2 + 2ab\cos\phi}$ where ϕ is the constant phase angle between the two waves. The resultant intensity I is directly proportional to the square of the amplitude of the resultant wave, i.e., $I \propto R^2$,

i.e., $I \propto \left(a^2 + b^2 + 2ab\cos\phi\right)$

For constructive interference, $\phi = 2n\pi$,

$I_{\max} = (a + b)^2$

For destructive interference, $\phi = (2n - 1)\pi$

$I_{\min} = (a - b)^2$

If I_1, I_2 are intensities of light from two slits of widths ω_1 and ω_2, then $\frac{I_1}{I_2} = \frac{\omega_1}{\omega_2} = \frac{a^2}{b^2}$

Light waves from two coherent sources of intensity ratio

$81:1$ produce interference. With the help of the passsage given above, choose the most appropriate alternative for each of the following questions :

The ratio of maxima and minima in the interference pattern is

A. $9:1$

B. $81:1$

C. $25:16$

D. $16:25$

Answer: C

Watch Video Solution

523. When waves from two herent sources, having amplitudes a and b superimpose, the amplitude R of the resultant wave is given by $R = \sqrt{a^2 + b^2 + 2ab\cos\phi}$ where ϕ is the constant phase angle between the two waves. The resultant intensity I is directly proportional to the square of the amplitude of the resultant wave, i.e., $I \propto R^2$,

i.e., $I \propto \left(a^2 + b^2 + 2ab\cos\phi\right)$

For constructive interference, $\phi = 2n\pi$,

$I_{max} = (a + b)^2$

For destructive interference, $\phi = (2n - 1)\pi$

$I_{min} = (a - b)^2$

If I_1, I_2 are intensities of light from two slits of widths ω_1 and ω_2, then $\frac{I_1}{I_2} = \frac{\omega_1}{\omega_2} = \frac{a^2}{b^2}$

Light waves from two coherent sources of intensity ratio

$81:1$ produce interference. With the help of the passsage given above, choose the most appropriate alternative for each of the following questions :

The ratio of slit widths of the two sources is

A. $1:4$

B. $1:16$

C. $9:1$

D. $9:16$

Answer: C

Watch Video Solution

524. Power (P) of a lens is given by reciprocal of focal length (f) of the lens. i.e. $P = 1/f$. When f is in metre, P is in dioptre. For a convex lens, power is positive and for a concave lens, power is negative. When a number of thin lenses of powers $p_1, p_2, p_3 ....$ are held in contact with one another, the power of the combination is given by algebraic sum of the powers of all the lenses

i.e., $P = p_1 + p_2 + p_3 + ...$

Answer the following questions :

Two thin lenses are in contact and the focal length of the combination is $80 cm$. If the focal length of one lens is $20 cm$, the focal length of the other would be

A. $-26.7 cm$

B. $60 cm$

C. $80 cm$

D. $20 cm$

Answer: A

Watch Video Solution

525. Power (P) of a lens is given by reciprocal of focal length (f) of the lens. i.e. $P = 1/f$. When f is in metre, P is in dioptre. For a convex lens, power is positive and for a concave lens, power is negative. When a number of thin lenses of powers $p_1, p_2, p_3 ....$ are held in contact with one another, the power of the combination is given by algebraic sum of the powers of all the lenses

i.e., $P = p_1 + p_2 + p_3 + ...$.

Answer the following questions :

Power of second lens is

A. $-3.75D$

B. $0.5D$

C. $-5D$

D. $1.25D$

Answer: A

Watch Video Solution

526. Power (P) of a lens is given by reciprocal of focal length (f) of the lens. i.e. $P = 1/f$. When f is in metre, P is in dioptre. For a convex lens, power is positive and for a concave lens, power is negative. When a number of thin lenses of powers $p_1, p_2, p_3 ....$ are held in contact with one another, the power of the combination is given by algebraic sum of the powers of all the lenses

i.e., $P = p_1 + p_2 + p_3 + ...$

Answer the following questions :

When a third lens of focal length $-20 cm$ is placed in contact with the two lenses, power of the three would be

A. $-3.75 D$

B. $3.75 D$

C. $5.0 D$

D. (d) $-5.0 D$

Answer: A

Watch Video Solution

527. Power (P) of a lens is given by reciprocal of focal length (f) of the lens. i.e. $P = 1/f$. When f is in metre, P is in dioptre. For a convex lens, power is positive and for a concave lens, power is negative. When a number of thin lenses of powers $p_1, p_2, p_3....$ are held in contact with one another, the power of the combination is given by algebraic sum of the powers of all the lenses

i.e., $P = p_1 + p_2 + p_3 + ...$

Answer the following questions :

Focal length of the combined three lenses would be

A. $80 cm$

B. $60 cm$

C. $\pm 20cm$

D. $-26.7cm$

Answer: D

Watch Video Solution

528. An intially parallel cyclindrical beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I$, where μ_0 and μ_2 are positive constants and I is intensity of light beam. The intensity of the beam is decreasing with increasing radius.

Answer the following questions :

As the beam enters the medium, it will

A. converge

B. diverge near the axis and converge near the periphery

C. travel as a cyclindrical beam

D. diverge

Answer: A

Watch Video Solution

529. An intially parallel cyclindrical beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I$, where μ_0 and μ_2 are positive constants and I is intensity of light beam. The intensity of the beam is decreasing with increasing radius.

Answer the following questions :

The speed of light in the medium is

A. the same everywhere in the beam

B. directly proportional to the intensity I

C. maximum on the axis of the beam

D. (d) minimum on the axis of the beam

Answer: D

Watch Video Solution

530. An intially parallel cyclindrical beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I$, where μ_0 and

μ_2 are positive constants and I is intensity of light beam. The intensity of the beam is decreasing with increasing radius.

Answer the following questions :

The initial shape of the wavefront of the beam is

A. concave

B. convex near the axis and concave near the periphery

C. planar

D. convex

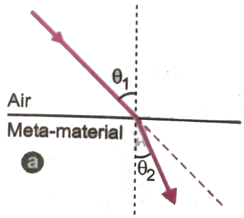
Answer: C

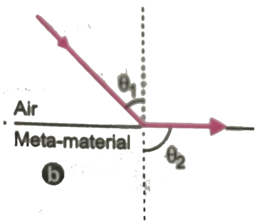
Watch Video Solution

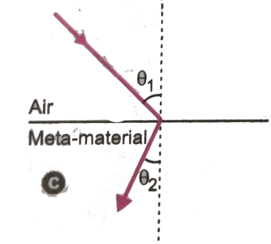
531. Most materials have the refractive index, $n > 1$. So, when a light ray from air enters a naturally occuring material, then by Snell's law, $\frac{\sin\theta_1}{\sin\theta_2} = \frac{n_1}{n_2}$, it is understood that the refracted ray bends towards the normal. But it never emerges on the same side of the normal as the incident ray. According to electromagnetism, the refractive index of the medium is given by the relation, $n = (c/v) = \pm\sqrt{\varepsilon_r, \mu_r}$, where c is the speed of the electromagnetic waves in vacuum, v its speed in the medium, ε_r and μ_r are negative, one must choose the negative root of n. Such negative refractive index materials can now be artifically prepared and are called meta-materials. They exhibit significantly different optical behaviour, without violating any physical laws. Since n is negative, it results in a change in the direction of propagation of the refracted light. However, similar to normal materials, the frequency of light remains unchanged upon refraction even in meta-materials.

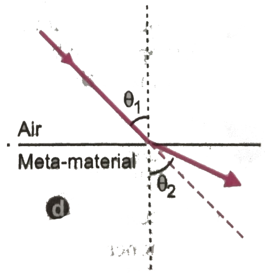
Answer the following questions :

For light incident from air on a meta-material, the appropriate ray diagram is

A. 

B. 

C. 

D. 

Answer: C

Watch Video Solution

532. Most materials have the refractive index, $n > 1$. So, when a light ray from air enters a naturally occuring material, then by Snell's law, $\frac{\sin\theta_1}{\sin\theta_2} = \frac{n_1}{n_2}$, it is understood that the refracted ray bends towards the normal. But it never emerges on the same side of the normal as the incident ray. According to electromagnetism, the refractive index of the medium is given by the relation, $n = (c/v) = \pm\sqrt{\varepsilon_r, \mu_r}$, where c is the speed of the electromagnetic waves in vacuum, v its speed in the medium, ε_r and μ_r are negative, one must choose the negative root of n. Such negative refractive index materials can now be artifically prepared and are called meta-materials. They exhibit significantly different optical behaviour, without violating any physical laws. Since n is negative, it results in a change in the direction of propagation of the refracted light. However, similar to normal materials, the frequency of light remains unchanged upon refraction even in meta-materials.

Answer the following questions :

Choose the correct statement.

A. The speed of light in the meta-material is $v = c|n|$

B. The speed of light in the meta-material is $v = \frac{c}{|n|}$

C. The speed of light in the meta-material is v = c

D. The wavelength of the light in the meta-material (λ_m) is given by $\lambda_m = \lambda_{air}|n|$, where λ_{air} is the wavelength of the light in air

Answer: B

Watch Video Solution

533. A man wants to distinguish between two pillars located at a distance of $11km$. What should be the minimum distance between the pillars ?

Watch Video Solution

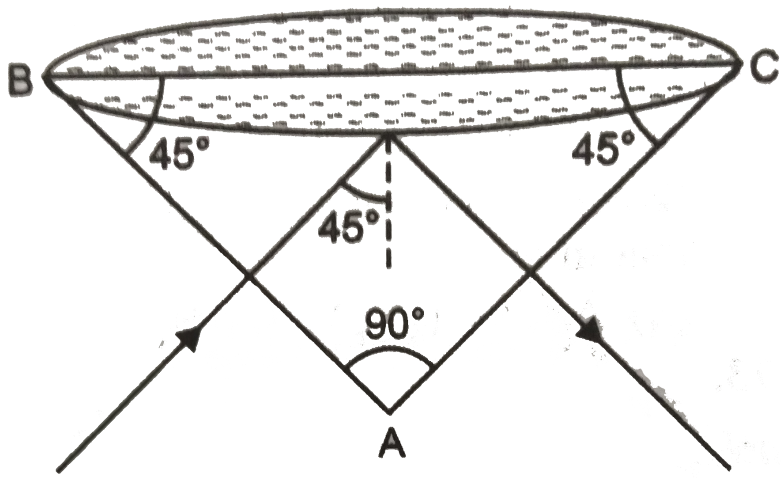
534. A beautiful person with two normal eyes wants to see full width of her face by a plane mirror. The eye and ear to ear distances of her face are $10cm$ and $14cm$ respectively. The minimum width of required mirror is :

Watch Video Solution

535. In a tank filled with a liquid of refractive index $5/3$, a point source of light is placed $2m$ below the surface of water. To cut off all light coming out of water from the source, what should be the minimum diameter of a disc, which should be placed over the source on the surface of water ?

Watch Video Solution

536. A drop of liquid is spread over the hypotenuse of a right angled isosceles prism as shown in Fig. and a ray of light is incident normally on face AB of the prism. If refractive index of liquid is $\sqrt{2}$, then for total internal reflection to occur, refractive index of material prism should be :



Watch Video Solution

537. The radii of curavture of surfaces of a convex lens of glass are $20cm$ each. If μ is glass is $3/2$, power of lens in diopter is.

Watch Video Solution

538. A simple microscope consists of a concave lens of power of $-10D$ and a convex lens of power $+30D$ in contact. If the image formed is at infinity, what is the magnifying power of microscope ? Take distance of distinct vision $= 25cm$.

Watch Video Solution

539. In Young's double slit experiment, the widths of two slits are n the ratio $4:1$. The ratio of maximum and minimum intensity in the interference pattern will be :

Watch Video Solution

540. Assertion : The resolving power of a telescope is more if the diameter of the objective lens is more.

Reason : Objective lens of large diameter collectd more light.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: A

Watch Video Solution

541. 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. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: C

Watch Video Solution

542. Assertion : In optical fibre, the diameter of the core is kept small.

Reason : The small diameter of the core ensures that the fibre should have inside it an angle greater than critical angle needed for total internal reflection.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: A

Watch Video Solution

543. Assertion : A ray of light entering from glass to air suffers change in frequency.

Reason : Velocity of light in glass is more than that ni air.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: D

Watch Video Solution

544. Assertion : A priam is the source of colours of light.

Reason : A prism has same refractive index for different colours of light.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: D

Watch Video Solution

545. Assertion: Radio waves can be polarised.

Reason: Sound waves in air are longitudinal in nature.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: B

Watch Video Solution

546. Assertion : Newton's rings are formed in the reflected system. When the space between the lens and the glass plate is filled with a liquid of refractive index greater than that of glass, the central spot of the pattern is bright.

Reason : This is because the reflections in these cases will be from a denser to a rarer medium and the two interfering rays are reflected under similar conditions.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: A

Watch Video Solution

547. Assertion : Corpuscular theory fails to explain the velocities of light in air and water.

Reason : According to corpuscular theory, light should travel faster in denser media than in rarer media.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: A

Watch Video Solution

548. Assertion : Colours can be seen in thin layers of oil on the surface of water.

Reason : White light is composed of several colours.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: B

Watch Video Solution

549. Assertion : No diffraction is produced in sound waves near a very small opening.

Reason : For diffraction to take place, the aperture of opening should be of same order as wavelength of waves.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: A

Watch Video Solution

550. Assertion : A lens having larg aperture will produce image of a point source not as a point but as a diffused bright spot. This error of optical system is called spherical aberration.

Reason : The paraxial rays of light from the image at a longer distance from the lens than marginal rays.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: A

Watch Video Solution

551. Assertion : Light shows the phenomena of interference, diffrection and polarisation.

Reason : Because light behaves as corpuscles.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: C

Watch Video Solution

552. Assertion : Universe is expanding.

Reason : The result is based on red shift in the spectra of galaxies.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: A

Watch Video Solution

553. Assertion : All bright interference bands have same intensity.

Reason : Because all bands do not receive same light from two sources.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: C

Watch Video Solution

554. Assertion : The frequencies of incident, reflected and refracted beam of monochromatic light are same.

Reason : The incident, reflected and refracted rays are coplanar.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: B

Watch Video Solution

555. Assertion : A normal human eye can clearly see all the objects beyond a certain minimum distance.

Reason : The human eye has the capacity to suitable adjust the focal length of its lens to a certain extent.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: A

Watch Video Solution

556. Assertion : The sun lookes bigger in size at sunrise and sunset than during day.

Reason : The phenomenon of diffraction bends light rays.

A. If both, Assertion and Reason are true and the Reason is the correct explaination of the Assertion.

B. If both, Assertion and Reason are true but Reason is not a correct explaination of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both, Assertion and Reason are false.

Answer: B

Watch Video Solution

Watch Video Solution

557. Statement-1 : The rainbow is seen sometimes in the sky when it is raining. When one sees a rainbow, one's back is towards the sun.

Statement-2 : Internal reflection from water droplet causes dispersion. The final rays is in the backward direction.

A. Statement-1 is true, Statement-2 is true. Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: A

Watch Video Solution

558. Statement-1 : A single lens produces a coloured image of an object illuminated by white light.

Statement-2 : The refractive index of material of lens is different for different wavelengths of light.

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: A

Watch Video Solution

559. Statement-1 : Raman spectrum of a liquid contains lines, whose wavelengths are equal to the incident radiation.

Statement-2 : If a photon strikes an atom or a molecule in a liquid, the photon may lose some energy.

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: B

Watch Video Solution

560. Statement-1 : it is impossible to photograph a virtual image.

Statement-2 : The rays which appear diverging from a virtual image fall on the camera and a real image is captured.

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but

Statement-2 is not a correct explanation of

Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: D

Watch Video Solution

561. Statement-1 : If a convex lens is kept in water, its convergent power increases.

Statement-2 : Focal length of lens depends on its refractive index w.r.t. surrounding medium.

A. Statement-1 is true, Statement-2 is true. Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: D

Watch Video Solution

562. Statement-1 : A dentist uses a concave mirror to examine a small cavity.

Statement-2 : A dentist uses a concave mirror so as to form a magnified, virtual image of an object.

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: A

Watch Video Solution

563. Statement-1 : The refractive index of a prism depends only on the kind of glass of which this is made and the colour of light.

Statement-2 : The refractive index of a prism depens upon refracting angle of prism and angle of minimum deviation.

A. Statement-1 is true, Statement-2 is true. Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: C

Watch Video Solution

564. Statement-1 : A ray of light incident normally on a refracting surface does not suffer any refraction.

Statement-2 : The critical angle for total internal refraction is smaller when a ray of light travels from glass to water than when it travels from glass to air.

A. Statement-1 is true, Statement-2 is true.

   Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but

   Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: C

Watch Video Solution

565. Statement-1 : Light travels faster in glass than in air.

Statement-2 : Because air is rarer than glass.

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: D

Watch Video Solution

566. Statement-1 : Energy is created during constructive interference and it is destroyed during destructive intference.

Statement-2 : Because in constructive interference, the fringes are bright and in destructive interference, the fringes are dark.

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: D

Watch Video Solution

567. Statement-1 : When a prism of $\mu = 3/2$ is immersed in water $(\mu = 4/3)$, deviation through the prism becomes $1/4th$ of the deviation, when the prism is in air.

Statement-2 : It follows from $\delta = (\mu - 1)A$

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: A

Watch Video Solution

568. Statement-1 : Focal length of an equiconvex lens of $\mu = 3/2$ is equal to radius of curvature of each surface.

Statement-2 : it follows from

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but

Statement-2 is not a correct explanation of

Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: A

Watch Video Solution

569. Statement-1 : Two prism joined in opposite alone can produce dispersion without deviation or deviation without dispersion.

Statement-2 : Dispersion is due to different deviation only.

A. Statement-1 is true, Statement-2 is true.

   Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but

   Statement-2 is not a correct explanation of

Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: B

Watch Video Solution

570. Statement-1 : The dispersive power of a lens of focal length $10cm$ is 0.08. Longitudinal chromatic aberration of the lens would be $0.8cm$.

Statement-2 : It follows from $f_r - f_v = \omega . f$

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: A

Watch Video Solution

571. This question has a paragraph followed by two statements, Statement - 1 and Statement - 2. Of the given four alternatives after the statements, choose the one that describes the statements. A thin air film is formed by putting the convex surface of a plane-convex lens over a plane glass plate. With monochromatic light, this film gives an interference pattern due to light reflected from the top (convex) surface and the bottom (glass plate) surface of the film.

Statement - 1: When light reflects from the air-glass plate interface, the reflected wave suffers a phase change of π.

Statement - 2 : The centre of the interference pattern is dark.

A. Statement-1 is true, Statement-2 is true.

   Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but

   Statement-2 is not a correct explanation of

   Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: A

Watch Video Solution

572. Statement-1 : On viewing the clear blue portion of the sky through a Calcite Crystal, the intensity of transmitted light varies as the crystal is rotated.

Statement-2 : The light coming from the sky is polarized due to scattering of sun light by particles in the atmoshphere. The scattering is largest for blue light.

A. Statement-1 is true, Statement-2 is true.

Statement-2 is correct explanation of Statement-1.

B. Statement-1 is true, Statement-2 is true, but Statement-2 is not a correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is false.

D. Statement-1 is fasle, Statement-2 is true.

Answer: A

Watch Video Solution

573. An experment is performed to find the refractive index of glass using a travelling mircroscope. In this experiment distances are measured by

A. a vernier scale provided on the microscope

B. a standered laboratory scale

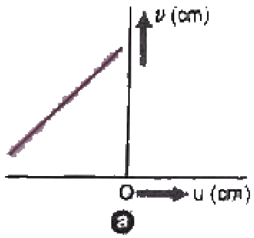
C. a meter scale provided on the microscope

D. a screw gauge provided on the microscope

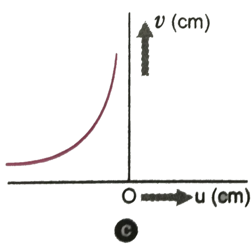
Answer: A

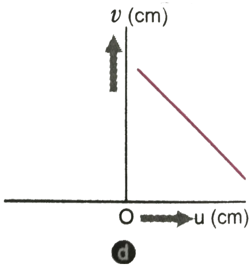
Watch Video Solution

574. A student measures the focal length of a convex lens by putting an object pin at a distance u from the lens and measuring the distance v of the image pin. The graph between u and v plotted by the student should look like

A. 

B. 

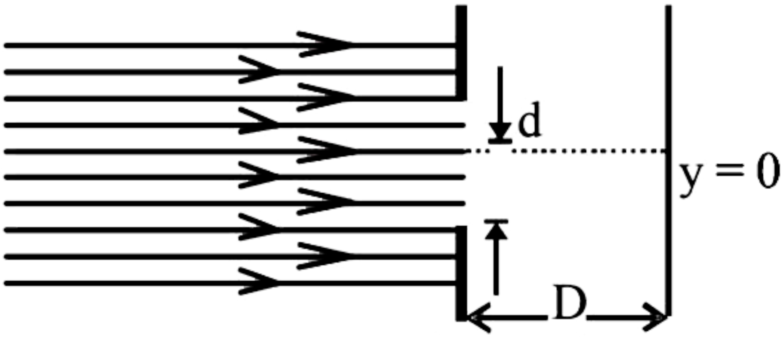
C. 

D. 

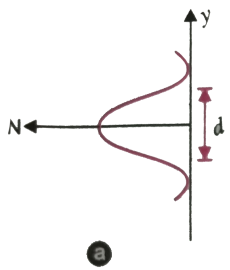
Answer: C

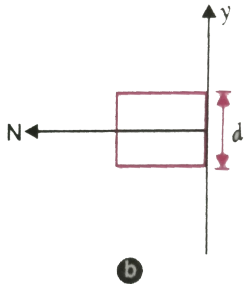
Watch Video Solution

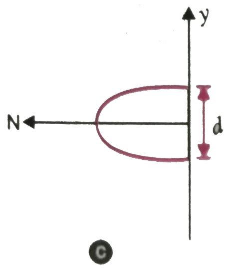
575. In an experiment, electrons are made to pass through a narrow slit of width d comparable to their de Broglie wavelength. They are detected on a screen at a distance D from the slit (see figure).

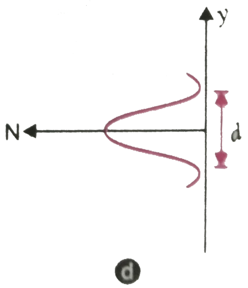


Which of the following graphs can be expected to represent the number of electrons N detected as a function of the detector position y (y=0 corresponds to the middle of the slit).

A. 

B. 

C. 

D. 

Answer: D

Watch Video Solution

576. We cannot find rough focal length of

A. convex mirror only

B. concave mirror only

C. both convex and concave mirror

D. none of the above

Answer: A

Watch Video Solution

577. The lens formula is

A. $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

B. $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

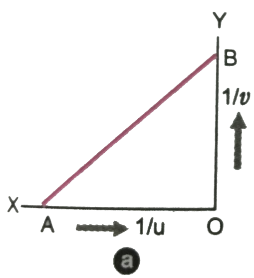
C. $\frac{1}{f} - \frac{1}{v} = \frac{1}{u}$

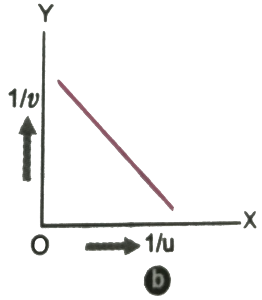
D. (d) $\frac{1}{f} - \frac{1}{u} = \frac{1}{v}$

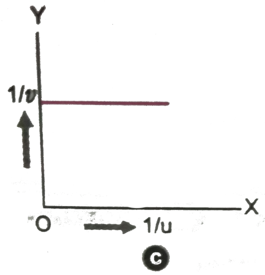
Answer: B

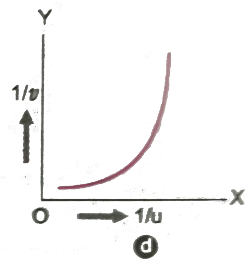
Watch Video Solution

578. The shape of graph between $1/u$ and $1/v$ in case of a convex lens is Fig.

A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

579. If c is velocity of light in vacuum and v is the velocity of light in a medium of refractive index μ, then

A. $\mu = c/v$

B. $\mu = v/c$

C. $\mu = \frac{c+v}{c-v}$

D. $\mu = \frac{c-v}{c+v}$

Answer: A

Watch Video Solution

580. An equilateral prism produces a minimum deviation of 30°. The angle of incidence is

A. 30°

B. 60°

C. 45°

D. 90°

Answer: C

Watch Video Solution

581. In Finding experimentally, the μ of a liquid using a convex lens and a plane mirror, parallax is removed when

A. object needle is at the slit focus of the lens

B. object needle is at $2F$

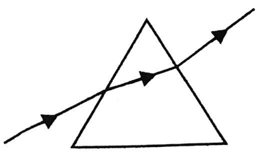
C. object needle lies between F and $2F$

D. none of the above

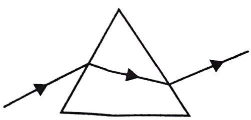
Answer: A

Watch Video Solution

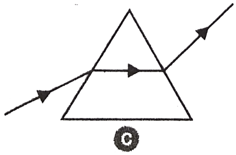
582. A student has drawn the following courses of rays through a glass prism, Fig. Which one represents the position of minimum deviation ?

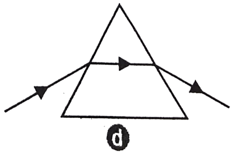
A. 

(a)

B. 

(b)

C. 

D. 

Answer: D

Watch Video Solution

Problems for practice

1. The dispersive powers of crown and flint glasses are 0.03 and 0.05 respectively. The difference in refractive indices for blue and red colour is 0.015 for crown glass and 0.022 for flint glass. Calculate the angles of the two prisms for a deviation of 2° without dispersion.

Watch Video Solution

2. In a Young's double slit experiment , the interference fringes are obtained on screen 0.75 m apart . The third dark band is at a distance of 5.5 mm from the central fringes (i) Determine the wavelength of light used if the two slits are 0.15 mm apart , (ii) What will be the wavelength of light used if the entire apparatus is immersed in a liquid of refractive index 4/3 ?

Watch Video Solution

3. The red shift of radiation froma distance nebula consits of light known to hace a wavelength of 434 nm. In the laboratory, this wavelength appears to be 6562 Å. What is the speed of the nebulal in the line of sight relative to the earth ? Is it approching or receding ?

Watch Video Solution

4. The polaroids P_1 and P_2 are placed in crossed position. A third polaroid P_3 is kept between P_1 and P_2 such that pass axis of P_3 is parallel to that of P_1. How would the intensity of light (I_2) transmitted through P_2 vary as P_3 is rotated ? Draw plot of intensity I_2 versus angle θ

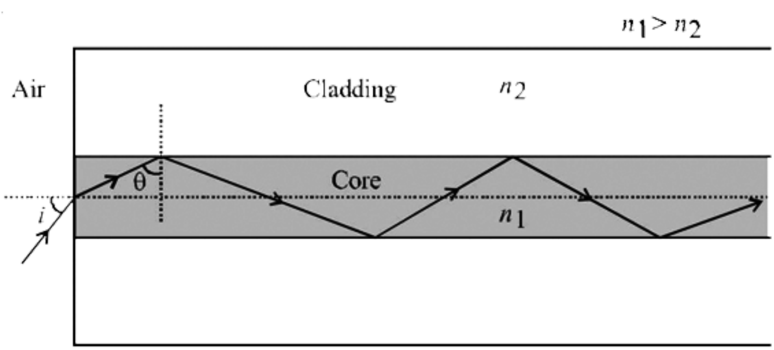
between pass axis of P_1 and P_3. In which orientation will the transmitted intensity be minimum and maximum ?

View Text Solution

Comprehension 1

1. Light guidance in an optical fibre can be understood by considering a structure comprising of thin solid glass cylinder of refractive index n_1 surrounded by a medium of lower refractive index n_2. The light guidance in the structure takes place due to successive total internal reflectrions at the interface of the media n_1 and n_2 as shown in the fugure. All rays with the angle of incidence i less than a particular value i_m are confined in the medium of refractive index n_1. The numerical aprture (NA) of the structure is defined as $\sin i_m$

If two structure of same cross-sectional area, but different numerical apertures $NA_1$and $NA_2\left(NA_2 < NA_1\right)$ are joined longitudinally, the numerical aperture of the combined structure is `



A. NA of S_1 immersed in water is same as that of S_2 immersed in a liquid of refractive index $\frac{16}{3\sqrt{15}}$,

B. NA of S_1 immersed in liquid of refractive index $\frac{6}{\sqrt{15}}$ is the same as that of S_2 immersed in water.

C. NA of S_1 placed in air same as that of S_2 immersed in liquid of refracitve index $\frac{4}{\sqrt{15}}$

D. NA of S_1 placed in air is the same as that of S_2 placed in water.

Answer: A::C

Watch Video Solution

Multiple choice questions

1. In the above question, the correct value of focal length f of lens as calculated from the graph is :

A. $f = \frac{1}{OA}$

B. $f = \frac{1}{OA + OB}$

C. $f = \frac{1}{OA - OB}$

D. $f = \frac{1}{OB}$

Answer: D

View Text Solution