PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

INTERFERENCE AND DIFFRACTION

Classical Thinking

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

A. of the same frequency.

B. of nearly the same frequency.

C. of the same wavelength.

D. of different wavelength

Answer: A

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2. Which of the following is conserved when light waves interfere

A. Amplitude

B. Energy

C. Phase

D. Intensity

Answer: B

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3. Two identical light sources S_1 and S_2 emit light of same wavelength λ. These light rays will exhibit interference if

A. phase differences remain constant.

B. phases are distributed randomly

C. ligh intensities remain constant.

D. light intensities change radomly.

Answer: A

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4. Intensity of light depends upon

A. velocity

B. wavelength

C. amplitude

D. frequency

Answer: C

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5. The coherent sources of light produce constructive interference when phase difference between them is

A. π

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

C. $\frac{3\pi}{2}$

D. 2π

Answer: D

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6. What is the path difference of destructive interference

A. $n\lambda$

B. $n(\lambda + 1)$

C. $\frac{(n+1)\lambda}{2}$

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

Answer: D

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7. The destructive interference at a certain point is produced when two coherent light

waves superpose at that point with a phase difference of

A. zero

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

C. π

D. 2π

Answer: C

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8. Two coherent sources produce a dark fringe, when the phase difference between the intefering beams is

A. zero

B. 2π

C. $n\pi$

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

Answer: D

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9. The centre of inteference pattern

A. is always bright

B. is always dark

C. may be bright or dark

D. is changed continously

Answer: A

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10. To produce destructive interference at a point, the path difference between two waves meeting at that point should be

A. $\Delta x = \lambda, 3\lambda, 5\lambda....$

B. $\Delta x = 0, \lambda, 2\lambda, 3\lambda.............n\lambda$

C. $\Delta = \frac{\lambda}{2}, \frac{3\lambda}{2}, \frac{5\lambda}{2}..$

D. $\Delta x = \frac{\lambda}{2}, \frac{3\lambda}{4}, \frac{5\lambda}{4}.......$

Answer: C

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11. What is the condition of phase difference for destructive interference?

A. $0, 2\pi, 4\pi, 6\pi$

B. $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \frac{7\pi}{2}$.....

C. $\pi, 3\pi, 5\pi, 7\pi$...

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

Answer: C

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12. In the Young's double slit experiment, if the phase difference between the two waves interfering at a point is ϕ, the intensity at that point can be expressed by the expression

A. $I=\sqrt{A^2+B^2\cos\phi}$

B. $I=\frac{A}{B}\cos\phi$

C. $I=A+B\cos\frac{\phi}{2}$

D. $I=A+B\cos\phi$

Answer: D

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13. If path difference between two interfering waves arriving at a point is zero, then the point will

A. be a dark point

B. be a bright point

C. remains as it is

D. be eigher a dary or a bright point.

Answer: B

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14. If the amplitude of two interfering light waves are not equal, then the intensity in the dark region formed in the interference pattern will be

A. more

B. less

C. same

D. zero

Answer: A

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

A. $(n+1)\pi$

B. $n\pi$

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

D. 0

Answer: C

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16. Which of the following pairs denotes coherent sources?

A. Two close points on a sodium lamp

B. Two sodium lamps operating at same voltage.

C. Two Argon ion lasers.

D. Argon ion and helium neon laser.

Answer: C

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17. Two inependent monochromatic sources of light are

A. coherent

B. incoherent

C. coherent of incoherent depeding upon the nature of source.

D. chromatic.

Answer: B

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18. To obtain steady or sustained interference pattern, two sources of light should be

A. away from each other.

B. coherent and monochromatic

C. emitting light waves of different wavelengths.

D. emitting light waves of different amplitudes.

Answer: B

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19. For steady interference of light, the two sources of light must be

A. narrow and away from each other.

B. broad and away from each other.

C. narrow and close to each other.

D. broad and close to each other.

Answer: C

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20. For interference experiment, the sources should lie quite close to each other, otherwise maxima and minima

A. will not be formed

B. will be formed too much apart.

C. will have very small intensity.

D. would be quite crowded.

Answer: D

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21. Which scientist performed the double slit experiment to observe the interference of light?

A. Frensel

B. Foucault

C. Becquerel

D. Thomas Young

Answer: D

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22. Young's experiment establishes that

A. light consists of particles

B. light consists of particles.

C. light is both particle and wave.

D. light is longitudinal wave.

Answer: B

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23. In Young's double slit experiment, if one of the slit is closed fully, then in the interference pattern

A. a bright slit will be observed, no interference pattern will exist.

B. the bright fringes will become more bright.

C. the bright fringes will become fainter.

D. bright fringes become dark.

Answer: A

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24. In double slits experiment, for light of which colour the fringe width will be minimum

A. Violet

B. Red

C. Green

D. Yellow

Answer: A

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25. The fringe width in Young's double slit experiment can be increased by decreasing

A. separationk between two slits.

B. width of the slit.

C. wavelength of light

D. distance between slit and the screen.

Answer: A

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26. If yellow light in the Young's double slit experiement is replaced by red light, the fringe width will

A. decrease

B. remain unaffected

C. increase

D. first increase and then decrease

Answer: C

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27. In Young's experiment one slit is covered with a blue filter and the other (slit) with a yellow filter then the interference pattern

A. will be blue

B. will be yellow

C. will be green

D. will not be formed.

Answer: D

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28. A thin transparent sheet is placed in front of a slit in Young's double slit experiment. The fringe width will

A. increase

B. decrease

C. remain same

D. becomes non-uniform

Answer: C

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29. In Young's experiment if the dark bands are to be perfectly dark, then

A. wavelength of the two waves must be exactly equal.

B. the amplitudes of the waves must be exactly equal.

C. frequencies of the waves must be exactly equal.

D. phases of the two waves must be equal.

Answer: B

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30. In Young's double slit experement if the two sources of light are very wide, then

A. the interference frinces are very wide

B. the interference fringes are very narrow.

C. Uniform illumination is obtained instead of alternate bright and dark fringes.

D. interference docs not occur.

Answer: C

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31. A double-slit interference experiment is set up in a chamber that can be completely evacuated. With monochromatic light, an interference pattern is observed when the container is open to air. As the container is evacuated, a careful observer will note that the interference fringes

A. moves slightly closer together.

B. do not change at all.

C. move slightly further apart.

D. none of these.

Answer: C

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32. In Young's double slit experiment, for which colour is the fringe width maximum?

A. Red

B. Green

C. Blue

D. Yellow

Answer: A

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33. If a torch is used in place of monochromatic light in Young's experiment what will happen?

A. No fringe will appear.

B. Only bright fringe wil appear.

C. Fringes will occur in the same way as from monochromatic source.

D. Fringe will appear for a moment and then it will disppear.

Answer: A

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34. In Young's double slit experiment, 62 fringes are seen in visible region for sodium light of wavelength 5893Å. If violet light of wavelength 4358Å, is used in place of sodium light, then number of fringes seen will be

A. 54

B. 64

C. 74

D. 84

Answer: D

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35. The path difference between two waves is

A. $\frac{xD}{d}$

B. $\frac{xd}{D}$

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

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

Answer: B

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36. Distance between two adjacent bright bands or dark bands is called

A. band length

B. band order

C. band gap

D. band width

Answer: D

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37. In interference of light, bright bands occur on the screen at

A. $X = 0, \frac{\lambda}{d}, \frac{2\lambda D}{d}$..............

B. $X = \frac{\lambda D}{2d}, \frac{\lambda D}{3d}, \frac{\lambda D}{4d}$...

C. $X = \frac{\lambda D}{2d}, \frac{3\lambda D}{2d}, \frac{5\lambda D}{2d}$.............

D. $X = \frac{\lambda D}{3d}, \frac{\lambda D}{6d}, \frac{\lambda D}{9d}$.................

Answer: A

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38. The distance of nth bright band from centre band is given by

A. $\frac{(2n-1)\lambda D}{d}$

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

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

D. $\frac{(2n)\lambda D}{d}$

Answer: B

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39. If a thin transparent plate is introduced, in the path of interfering waves, then entire fringe

A. shifts to left

B. shifts to right

C. remains same

D. shifts upwards.

Answer: D

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40. In biprism experiment, clear and sharp interference pattern is seen, when

A. biprism is close to slit.

B. refracting edge of the briprims is perpendicular to the slit.

C. biprism is close to eye piece.

D. refracting edge of biprism is exactly parallel slit.

Answer: D

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41. In Fresnel's biprism experiment, when the distance between the slit aperture and eye is increased, then distance between the fringes

A. increases

B. decreases

C. remains unchanged.

D. increases in the beginning but decreases when it reaches maximum.

Answer: A

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42. The vertex angle fo a biprism is of the order

A. 179°

B. 170°

C. 1°

D. zero

Answer: C

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43. In a biprism experiment, to determine the distance between coherent sources, the convex lens is introduced

A. between the slit and the screen

B. between the slit and the biprims

C. between eye piece and the biprism

D. behind the eye piece

Answer: C

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44. If the wavelength of light is kept constant and the biprism is moved towards the screen, then the fringe width

A. decreases

B. increases

C. remains unchanged.

D. cannot be determined.

Answer: A

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45. In Fresnel's bipriam, the shape of interference fringes formed will be

A. bright and dark linear fringes of equal width.

B. successive bright and dark linear fringes of different width.

C. successive bright and dark circular fringes of same width.

D. successive bright and dark circular fringes of different width.

Answer: A

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46. In Fresnel's biprism experiment, on increasing the prism angle, the fringe width will

A. increase

B. decrease

C. remain unchanged

D. depend on the position of the object.

Answer: B

47. In a double slit experiment to find the separation between slits by displacement method, the separations of images of slits were found to be 16mm and 9mm respectively. The actual separation between slits will be

A. $d = d_1 d_2$

B. $d = \dfrac{d_1}{d_2}$

C. $d = \sqrt{d_1 d_2}$

D. $d = \sqrt{\dfrac{d_1}{d_2}}$

Answer: C

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48. The phenomenon of diffraction of light was discovered by-

A. Huygens

B. Newton

C. Fresnel

D. Grimaldi

Answer: D

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49. If we observe the single slit Fraunhofer diffraction with wavelength λ and slit width d, the width of the central maxima is 2θ. On decreasing the slit width for the same λ

A. θ increases

B. θ remains unchanged

C. θ decreases

D. θ increases or decreases depending on the intensity of light.

Answer: A

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50. The diffraction fringes obtained by a single slit are of

A. unequal width

B. equal width

C. equal width and equal intensity.

D. unequal width and unequal intensity.

Answer: D

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51. The phenomenon of diffraction can be treated as interference phenomenon if the number of coherent sources is

A. one

B. two

C. zero

D. infinity

Answer: D

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52. What is necessary for eash occurrence of Fresnel's diffraction?

A. Obstacle should be of the order of wavelength.

B. Narrow opening should be of the order of wavelength.

C. Source and screen shoud be at finite distance from the obstacle.

D. All of these.

Answer: D

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53. Diffraction pattern is obtained using red light. What will happen if it is replaced by violet light?

A. Bands will disappear.

B. Bands will become narrow

C. Bands will get spaced apart

D. Bands will remain unchanged.

Answer: B

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54. Select the CORRECT statement from the following.

A. Diffraction is not based on the principle of superposition.

B. Interference and diffraction both are based on the principle of superposition,

C. In diffraction all the fringes have equal width

D. Diffraction shows that light is a transverse wave.

Answer: B

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55. In a diffraction pattern, width of a fringe

A. does not depend on slit, width

B. varies directly as slit width

C. varies inversely as slit width

D. is directly proportional to the square of fringe width.

Answer: C

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56. When light is incident on a diffraction grating, the zero order principal maximum will be

A. one of the component colours

B. absent

C. spectrum of the colours

D. white

Answer: D

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57. The condition for observing Fraunhofer diffraction from a single slit is that the light wavefront incident on the slit should be

A. spherical

B. cylindrical

C. plane

D. elliptical

Answer: C

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58. The main difference in diffraction and interference is that

A. in diffraction, the fringe width of different fringes are not equal whereas in in interference the fringe widths are equal.

B. it cannot be observed with white light.

C. unlike diffraction, the interference fringes are of varying intensity.

D. none of these.

Answer: A

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59. To observe the diffraction phenomenon, the minimum sizer of the hole is needed for which of the following waves

A. Microwaves

B. Radio waves

C. Sound waves

D. Visible light

Answer: D

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60. In a single slit diffraction pattern, which of the following is incorrect for fringe pattern?

A. Width of the central maximum is twice the width of the secondary maxima or minima.

B. Intensities of the secondary maxima are much less than the intensity of the central maxima.

C. All secondary maxima and minima are of the same width.

D. For a given wavelength, the width of the diffraction pattern is directly proportional to the slit width.

Answer: D

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61. When separation between the central maxima of the two objects is less than the separation between central maximum of first object and the first minima of the second object, then the objects are said to be

A. just resolved

B. well resolved

C. not resolved

D. resolving

Answer: C

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62. Which colour will give maximum resolving power for a telescope?

A. red light

B. yellow light

C. green light

D. ultraviolet light

Answer: D

63. The resolving power of a telescope is given by

A. $R = \frac{a}{\lambda}$

B. $R = \frac{\lambda}{a}$

C. $R = \frac{2a}{\lambda}$

D. $R = \frac{\lambda}{2a}$

Answer: A

64. If the aperture of the objective of a telescope is decreased, then its resolving power

A. decreases

B. increases

C. does not change

D. becomes infinity

Answer: A

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65. The energy in the phenomenon of interference-

A. is conserved and gets redistributed.

B. is equal at every point.

C. is destroyed in regions of dard fringes.

D. is created at the place of bright fringes.

Answer: A

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66. If two independent waves are $y_1 = a_1 \sin \omega_1$ and $y_2 = a_2 \sin \omega_2 t$ then

A. they will not produce interference.

B. they will produce interference

C. they may or may not produce interference.

D. it is difficult to comment about the result.

Answer: C

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67. Select the correct statement

A. In a biprism experiment, fringe width of blue colour light is less than that of light of red colour.

B. In Fresnel's biprism experiment, using white light, blue fringes appear near the central fringe and red fringe appear later.

C. Phenomenon of interference establishes the wave nature of light.

D. In a soap film, colour appears due to the dispersion of light.

Answer: D

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68. Which of the following phenomena distinguishes diffraction ad interference?

A. In diffraction all the maxima are of decreaasing intensity whereas in interference, all the maxima are of equal intensity.

B. In diffraction, all the maxima are of equal intensity whereas in interference all the maxima are of decreasing intensity.

C. In diffraction, all the maxima sre of decreasing intensity whereas in interference all the maxima are of increasing intensity.

D. In diffraction, all the maxima are of inreasing intensity whereas in interference, all the maxima are of decreasing intensity.

Answer: A

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69. Assertion : Ultra-violet light is used to achieve high resolving power.

Reason: Resolving power of microscope increases with the decrease of wavelength of light used.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True Reason is False.

D. Assertion is False, Reason is True.

Answer: A

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70. Assertion: The colour of the oil film on the surface of water continuously changes.

Reason: The colour of the light reflected by the oil film depends upon its thickness.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True Reason is False.

D. Assertion is False, Reason is True.

Answer: B

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Critical Thinking

1. The two waves represented by $y_1 = a\sin(\omega t)$ and $y_2 = b\cos(\omega t)$ have a phase difference of

A. 0

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

C. π

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

Answer: B

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2. The light waves from two independent monochromatic light sources are given by, $y_1 = 2\sin\omega t$ and $y_2 = 3\cos\omega t$. Then the correct statement is

A. both the wave are coherent

B. both the waves are incoherent

C. both the waves are in the same phase.

D. both the waves have same time period.

Answer: B

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3. Select the INCORRECT statement. For stable interference to occur between two sets of waves

A. the two sets must have a constant phase difference

B. the two sets must have the same wavelength.

C. the waves must be transverse.

D. the waves must have similar amplitudes.

Answer: C

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4. Which of the following condition of path difference represent destructive interference?

A. 37λ

B. 12.5λ

C. 26λ

D. 19λ

Answer: B

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5. If the path difference between two waves at a point is 29λ, then the point will be

A. bright

B. dark

C. neigther bright nor dark

D. invisible

Answer: A

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6. The optical path difference between two light waves arriving at a point simultaneously is $260\frac{\lambda}{4}$. The point is

A. dark

B. bright

C. may be dark or bright

D. data insufficient

Answer: B

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7. The optical path difference between to light waves arriving at a point simultaneously is $130\frac{\lambda}{2}$, if the path difference is 650×10^{-5} cm, then the wavelength of light will be

A. 5000Å

B. 13000Å

C. 6500Å

D. 1000Å

Answer: D

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8. If two waves represented by $y_1 = 4\sin\omega t$ and $y_2 = 3\sin\left(\omega t + \frac{\pi}{3}\right)$ interfere at a point, the amplitude of the resulting wave will be about

A. 7

B. 6

C. 5

D. 3.5

Answer: B

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9. Two coherent waves of intensities I and $4I$ interfere at a point. If the resultant intensity is 3I, then the phase difference between te two waves at the point is

A. zero

B. 60°

C. 120°

D. 90°

Answer: C

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10. In a movie hall, the distance between the projector and the screen is increased by 1% illumination on the screen is

A. increased by 1%

B. decreased by 1%

C. increased by 2%

D. decreased by 2%

Answer: D

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11. In a double slit experiment, instead of taking slits of equal widths, one slit is made twice as wide as the other. Then, in the interference pattern

A. the intensities of both the maxima and the minima increase.

B. the intensity of maxima increases and the minima has zero intensity

C. the intensity of maxima decreases and that of the minima increases

D. the intensity of maxima decreases and the minima has zero intensity.

Answer: A

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12. To increse fringe width, by keeping distance between slit and screen constant, we need to ensure that

A. d increases and λ remain constant.

B. d increases and λ decreases

C. d decreses and λ decreases

D. d decreases and λ increases.

Answer: D

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13. In Young's double slit experiment, a third slit is made in between the double sits. Then

A. fringes of unequal width are formed.

B. constrast between bright and dark fringes is reduced.

C. intensity of fringes totally disappears.

D. only bright light is observed on the screen.

Answer: B

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14. Two coherent light sources S_1 and $S_2\left(\lambda = 6000\text{Å}\right)$ are $1mm$ apart from each other. The screen is placed at a distance of $25cm$ from the sources. The width of the fringes on the screen should be

A. 0.015 cm

B. 0.025 cm

C. 0.010 cm

D. 0.030 cm

Answer: A

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15. In a certain double slit experimental arrangement interference fringes of width $1.0 mm$ each are observed when light of wavelength 5000Å is used. Keeping the set up unaltered, if the source is replaced by another source of wavelength 6000Å, the fringe width will be

A. 0.5 mm

B. 1.0 mm

C. 1.2 mm

D. 1.5 mm

Answer: C

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16. In a Young's double slit experiment, the fringe width is found to be $0.4mm$. If the whole apparatus is immersed in water of refractive index $4/3$ without disturbing the geometrical arrangement, the new fringe width will be

A. 0.30 mm

B. 0.40 mm

C. 0.53 mm

D. 450 micron

Answer: A

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17. In Young's double slit experiement, if L is the distance between the slits and the screen upon which interference pattern is observed, x is the average distance between the adjacent fringes and d being the slit separation. The wavelength of light if given by

A. $\frac{Xd}{L}$

B. $\frac{XL}{d}$

C. $\frac{Ld}{X}$

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

Answer: A

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

A. 1.67 cm

B. 1.5 cm

C. 0.5 cm

D. 5.0 cm

Answer: B

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19. In a double slit experiment, with monochromatic light, finges are obtained on a screen placed at some distance from the slits.

If the screen is moed by4×10^{-2} m towards the slits, the changes in fringe width is 2×10^{-5} m. If the separation between the slits is 10^{-3} m then wavelength of light used is

A. 3500Å

B. 5000Å

C. 4500Å

D. 3200Å

Answer: B

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20. In a double slit interference experiment, the distance between the slits is 0.05 cm and screen is 2m away from the slits. The wavelength of light is 8.0×10^{-5} cm. The distance between successive fringes is

A. 0.24 cm

B. 3.2 cm

C. 1.28 cm

D. 0.32 cm

Answer: D

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21. In a double-slit experiment, the slits are separated by a distance d and the screen is at a distance D from the slits. If a maximum is formed just opposite to each slit, then what is the order or the fringe so formed?

A. $\frac{d^2}{2\lambda D}$

B. $\frac{2d^2}{\lambda D}$

C. $\frac{d^2}{\lambda D}$

D. $\frac{d^2}{4\lambda}$

Answer: A

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

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

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

C. $S\lambda < dD$

D. $SD > \lambda d$

Answer: A

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23. In Young's double slit experiment, the 8th maximum with wavelength λ_1 is at a distance d_1 from the central maximum and the 6th maximum with a wavelength λ_2 is at a distance d_2. Then (d_1 / d_2) is equal to

A. $\frac{4}{3} \frac{\lambda_2}{\lambda_1}$

B. $\frac{4}{3} \frac{\lambda_1}{\lambda_2}$

C. $\frac{3}{4} \frac{\lambda_2}{\lambda_1}$

D. $\frac{3}{4} \frac{\lambda_1}{\lambda_2}$

Answer: B

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24. In Young's double slit experiment, the wavelength of the light used is doubled and distance between two slits is half of initial distance, the resultant fringe width becomes

A. 2 times

B. 3 times

C. 4 times

D. $1/2$ times

Answer: C

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25. Two sources of light of wavelengths 2500 Å and 3500 Å are used in Young's double slit expt. simultaneously. Which orders of fringes of two wavelength patterns coincide?

A. 3 rd orderof 1st source and 5th of 2nd source

B. 7 th order of 1st and 5th order of 2nd source

C. 5 th order of 1 st and 3rd order of 2nd source

D. 5th order of 1st and 7th order of 2nd source

Answer: B

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26. In the Young's double slit experiment with sodium light, the slits are $0.589m$ apart. The angular separation of the third maximum from the central maximum will be (given $\lambda = 589mm$)

A. $\sin^{-1}(0.33 \times 10^{8})$

B. $\sin^{-1}(0.33 \times 10^{-6})$

C. $\sin^{-1}(3 \times 10^{-8})$

D. $\sin^{-1}(3 \times 10^{-6})$

Answer: D

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27. 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?

A. 1mm

B. 0.05 mm

C. 0.03 mm

D. 0.01 mm

Answer: C

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28. Two wavelengths of light λ_1 and λ_2 are sent through Young's double-slit apparatus simultaneously. If the third-order bright fringe coincides with the fourth-order bright fringe, then

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

B. 7

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

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

Answer: D

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29. Two slits separated by a distance of 0.5 mm are illuminated by light of wavelength 5000 Å. The interference fringes are obtained on a screen at a distance of 1.m. what is the phase difference between two interfering waves at a point 3 mm from the central bbright fringe?

A. 6π radian

B. 3π radian

C. 5π radian

D. 4π radian

Answer: C

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30. In the double-slit experiment, the distance of the second dark fringe from the central line are $3mm$. The distance of the fourth bright fringe from the central line is

A. 6 mm

B. 8 mm

C. 12 mm

D. 4 mm

Answer: B

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31. Two slits separated by a distance of 1 mm are illuminated with red light of wavelength 6.5×10^{-7}m. The interference firnges are observed on a screen placed 1 m form the slits. The distance between third bright firnge and the fifth dark fringe on the same side is equal to

A. 9.75 mm

B. 0.975 mm

C. 9.75 μm

D. 19.5 mm

Answer: B

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32. In Young's double slit experiment, an interference pattern is obtained on a screen by a light of wavelength 6000Å, coming from the coherent sources S_1 and S_2. At certain point P on the screen third dark fringe is formed. Then the path difference $S_1P - S_2P$ in microns is

A. 0.75

B. 1.5

C. 3

D. 4.5

Answer: B

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33. The maximum intensity in Young's double slit experiment is I_0. Distance between the slits is $d = 2\lambda$, where λ is the wavelength of monochromatic light used in experiment. What will be the intensity of light in front of one of the slits on a screen at a distance $D = 6d$?

A. $\frac{I_0}{2}$

B. $\frac{3}{4} I_0$

C. I_0

D. $\frac{I_0}{4}$

Answer: B

Watch Video Solution

34. In a biprism experiment, when a convex lens was placed between the biprism and eyepiece at a distance of $30cm$ from the slit, the virtual images of the slits are found to be separated by $7mm$. If the distance between the slit and biprism is $10cm$ and between the biprism and eyepiece is $80cm$, find the linear magnification of the image.

A. 0.2 mm

B. 0.25 mm

C. 0.30 mm

D. 0.45 mm

Answer: A

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35. In the biprism experiment, if the images produced by the convex lens in the two positions between the biprism annd the eye piece are 4.5 mm and 2 mm apart, then the distance (d) between the two virtual sources is

A. 2.4 mm

B. 2.2 mm

C. 3.2 mm

D. 2.8 mm

Answer: A

Watch Video Solution

36. In a biprism experiment, eyepiece is placed at a distance $D = 1m$ from the source. The separation (D) between the images of the two coherent sources produced by the biprism is 1mm. A convex lens of focal length 20 cm is placed at a distance 40 cm from eye piece to obtain diminished images of the two coherent sources in the focal plane of the eye piece. The separation (d_1) between these two images will be

A. 0.57 mm

B. 1.5 mm

C. 0.67 mm

D. 0.4 mm

Answer: C

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37. In a biprism experiment, the wavelenght of monochromatic light is 6000Å. The distance between two virtual images is 6 mm . The number of fringes formed per mm on a screen placed at a distance of 1 m is

A. 5

B. 10

C. 15

D. 20

Answer: B

Watch Video Solution

38. In a biprism experimentn the distance between slite and epepiece is 1m. If the convex lens is interposed at a distance of 30 cm from the slit, then the size of the magnified image is 0.7 mm. The distance between the two virtual images of the slits will be

A. 1 mm

B. 2 mm

C. 3 mm

D. 4 mm

Answer: C

Watch Video Solution

39. In a biprism experiment, the distance between the sit and the eyepiece is 1m and distance between the two coherent sources is 0.5 mm. If the wavelength of light used I 6000Å, then distance of the 10th bright and from the central bright band is

A. 1.2 mm

B. 1.2 cm

C. 0.12 m

D. 0.6 cm

Answer: B

Watch Video Solution

40. In a biprism experiment, a slit is illuminated by a light of wavelength 4800. The distance between the slit and biprism is and the distance between the biprism is $15cm$ and the distance between the biprism and eyepiece is $85cm$. If the distance between virtual sources is $3mm$, determine the distance between $4th$ bright band on one side and $4th$ dark band on the other side of the central bright band.

A. $9424 \times 10^{-5}m$

B. $9424 \times 10^{-5}cm$

C. $9424 \times 10^{-5}m$

D. $9424 \times 10^{-5}km$

Answer: B

Watch Video Solution

41. In a biprism experiment, the distance of the 20th bright band from the centre of the interference pattern is 8 mm. The distance of the 30th bright band from the centre is

A. 12 mm

B. 10 mm

C. 11 mm

D. 15 mm

Answer: A

Watch Video Solution

42. In a biprism experiment, the slit is illuminated with light of wavelength 5000Å. The number of bright fringes passing on a screen, if the path difference is changed by 0.005cm will be

A. 60 fringes

B. 80 fringes

C. 100 fringes

D. 120 fringes

Answer: C

Watch Video Solution

43. The distance between the first and seventh bright fringes formed in a biprims experiment is $(\lambda = 6000\text{Å}, D = 1.0m, d = 1.2mm)$

A. $0.003m$

B. $0.03m$

C. $3 \times 10^{-4}m$

D. $0.3m$

Answer: A

Watch Video Solution

44. In a biprims experiment, the distance between the 3rd and 12th bright bands when light of wavelength 6000Å is used is the same as the distance between 4th and 14 th bright bands of light of wavelength λ. The value of λ is

A. 5800Å

B. 5600Å

C. 5400Å

D. 4800Å

Answer: C

Watch Video Solution

45. In a biprism experimentn is performed yellow light of wavelength $5600 \AA$. The yellow light was then replaced by red light of wavelengts $6400 \AA$. Find the value of n for which $(n+1)^{th}$ yellow bright band consider with the n^{th} red bright band for the same setting.

A. $n = 6$

B. $n = 4$

C. $n = 2$

D. $n = 5$

Answer: B

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46. The fringe width in a biprims experiment is 0.32 mm, when red light of waelength 6400Å is used. If source of blue light of wavelength 4000Å is used with the same setting, then the fringe width will

A. decrease by 64%

B. decrease by 40%

C. decrease by 75%

D. decrease by 37.5%

Answer: D

Watch Video Solution

47. A diffraction is obtained by using a bean of yellow light. What will happen if the yellow light is replaced by the red light?

A. Bands will become narrower and crowded together.

B. Bands become broader and further apart.

C. No change will take place.

D. Bands disappear.

Answer: B

Watch Video Solution

48. Assertion: Diffraction limits the resolving power of an optical instrument.

Reason: In diffraction, the fringes of minimum intensity are perfectly dark.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True Reason is False.

D. Assertion is False, Reason is True.

Answer: C

Watch Video Solution

49. Condition for diffraction is

A. $\frac{a}{\lambda} = 1$

B. $\frac{a}{\lambda} > > 1$

C. $\frac{a}{\lambda} < < 1$

D. $\frac{\lambda}{a} > 1$

Answer: A

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50. First secondary minima in case of diffraction due to single slit is obtained at a distance x from central maximum position, then

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

B. $\frac{x}{a} = \frac{D}{\lambda}$

C. $x = \lambda D a$

D. $x = \frac{\lambda D}{a}$

Answer: D

Watch Video Solution

51. What will be the angle of diffracting for the first minimum due to Fraunhofer diffraction with sources of light of wavelength $550nm$ and slit of width $0.55mm$?

A. 0.001 rad

B. 0.01 rad

C. 1 rad

D. 0.1 rad

Answer: A

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52. In the far field diffraction pattern of a single slit under polychromatic illumination, the first minimum with the wavelength λ_1 is found to be coincident with third maximum at λ_2. So

A. $3\lambda_1 = 0.3\lambda_2$

B. $3\lambda_1 = \lambda_2$

C. $\lambda_1 = 3.5\lambda_2$

D. $0.3\lambda_1 = 3\lambda_2$

Answer: C

Watch Video Solution

53. Light of wavelength $\lambda = 5000\text{Å}$ falls normally on a narrow slit. A screen is placed at a distance of $1m$ from the slit and perpendicular to the direction of light. The first minima of the diffraction pattern is situated at $5mm$ from the centre of central maximum. The width of the slit is

A. 0.1 mm

B. 1.0 mn

C. 0.5 mm

D. 0.2 mm

Answer: A

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54. Yellow light is used in single slit diffraction experiment with slit width $0.6mm$. If yellow light is replaced by X-rays then the pattern will reveal

A. that the central maxima is narrower.

B. no diffraction pattern.

C. more number of fringes

D. less number of fringes

Answer: B

Watch Video Solution

55. A plane wavefront $(\lambda = 6 \times 10^{-7} m)$ 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?

A. 5 mm

B. 6 mm

C. 9 mm

D. 12 mm

Answer: A

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56. Angular width of central maxima in the Fraunhofer 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%. The wavelength of this light will be

A. $6000 Å$

B. $4200 Å$

C. $3000 Å$

D. $1800 Å$

Answer: B

Watch Video Solution

57. In a single slit diffraction experiment, first minimum for red light (589nm) coincides with first maximum of some other wavelength λ'.

The value of λ' is

A. 4400Å

B. 6642Å

C. 3926Å

D. 3500Å

Answer: C

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58. ________________ microscope will have maximum resolving power.

A. simple

B. ultraviolet

C. electron

D. compound

Answer: C

Watch Video Solution

59. Assertion: Oil immersion objective microscope are used to achieve high resolving power.

Reason: Resolving power of microscope increases with the increase of refractive index.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True Reason is False.

D. Assertion is False, Reason is True.

Answer: A

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60. Two points separated by a distance of 0.1 mm can just be resolved in a microscope when a light of wavelength 6000 Å is used. If the light of wavelength 4800 Å is used this limit of resolution becomes :-

A. 0.08 mm

B. 0.10 mm

C. 0.12 mm

D. 0.06 mm

Answer: A

Watch Video Solution

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

A. 305m

B. $30.5 \times 10^{-7} m$

C. $30.5 m$

D. $305 mm$

Answer: B

Watch Video Solution

62. Two points sources distance 0.1 m are viewed by a telescope. The objective is covered by ascreen having a hole of 1 mm widht. If the wavelenghts of light used is 5000Å, the the maximum distance at which the two sources are seen just resolved, will be

A. 125.0 m

B. 141 m

C. 131 m

D. 163.9 m

Answer: D

Watch Video Solution

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

A. 3.5 cm

B. 3.5 mm

C. 3.5 m

D. 3.5 km

Answer: A

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64. The aperrture of the largest telescope in the world is about 5 m. if the separation between the moon and the earth is $4 \times 10^3 km$ and the wavelength of visible light is 5000 Å, then the minimum separation between the objects on the surface of the moon which can be just resolved is approximately equal to

A. 200 m

B. 100m

C. 50m

D. 25m

Answer: C

Watch Video Solution

65. Assertion: An excessively thin film appear black in reflected light.

Reason: The film absorbs all the radiations falling on it.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True Reason is False.

D. Assertion is False, Reason is True.

Answer: C

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66. Assertion: The fringe visibility will be maximum when amplitude of light waves from two coherent sources is exactly equal.

Reason: Fringe visibiltgiy $V = \frac{I_{\max}}{I_{\min}}$

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True Reason is False.

D. Assertion is False, Reason is True.

Answer: C

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67. In Young's experiment, the fringe width is 3 mm for a light of wavelength 6000Å. If the entire apparatus is dipped in water of R.I. $\frac{3}{2}$, then what is the change in fringe width?

A. 2mm

B. 1.5mm

C. 1mm

D. 3mm

Answer: C

Watch Video Solution

68. In double slit experiment fringes are obtained using light of wavelength 4800Å One slit is covered with a thin glass film of refractive index. 1.4 and another slit is covered by a film of same thickness but refractive index 1.7. By doing so, the central fringe is shifted to fifth bright fringe in the original pattern. The thickness of glass film is

A. 2×10^{-3} mm

B. 4×10^{-3} mm

C. 6×10^{-3}mm

D. 8×10^{-3}mm

Answer: D

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69. Monichromatic lightof wavelenght 600 nm is used ina Young's double slilt experient. One of the slits is covered by a transparent sheet of thicknes 1.8×10^{-5} m made of a material of refractive index 1.6. How many fringe will shift due to the introduction of the sheet?

A. 18

B. 10

C. 20

D. 8

Answer: A

Watch Video Solution

70. The distance between the first and the sixth minima in the diffraction pattern of a single slit is 0.5 mm. The screen is 0.5 m away from the slit. If the wavelength of light used is 5000 Å. Then the slit width will be

A. 5 mm

B. 2.5 mm

C. 1.25 mm

D. 1.0 mm

Answer: B

Watch Video Solution

71. In Young's double slit experiment, $5th$ dark fringe is obtained at a point. If a thin transparent film is placed in the path of one of waves, then 7th bright is obtained at the same point. The thickness of the film in terms of wavelength λ and refractive index μ will be

A. $\frac{1.5\lambda}{(\mu - 1)}$

B. $1.5(\mu - 1)\lambda$

C. $2.5(\mu - 1)\lambda$

D. $\frac{2.5\lambda}{(\mu - 1)}$

Answer: D

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72. In a double slit pattern $(\lambda = 6000 \mathring{A})$, the first order and tenth order maxima fall at 12.50 mm and 14.55mm from a particular reference point. If λ is changed to 5500Å, find the position of zero order and tenth order fringes, other arrangements remaining the same.

A. 1.25 mm and 2.55 mm

B. 1.25 mm and 2.65 mm

C. 2.50 mm and 3.10 mm

D. 0.50 mm and 1.89 mm

Answer: A

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Competitive Thinking

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

A. no interference

B. interference with brigh bands

C. interference with dark bands

D. interference in which width of the fringe will be slightly increased.

Answer: D

Watch Video Solution

2. On a rainy day a small oil film on water shows brilliant colours. This is due to

A. dispersion of light.

B. interference of light.

C. absorption of light

D. scattering of light

Answer: B

Watch Video Solution

3. For constructive interference to take place between two monochromatic light waves of wavelength λ , the path difference should be

A. $(2n-1)\frac{\lambda}{4}$

B. $(2n-1)\frac{\lambda}{2}$

C. $n\lambda$

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

Answer: C

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4. If the ratio of intensities of two waves is 1 : 25, then the ratio of their amplitudes will be

A. $1:25$

B. $5:1$

C. $26:24$

D. $1:5$

Answer: D

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5. Two coherent sources of light of intensity ratio n are employed in an interference experiment. The ratio of the intensities of the maxima and minima in the interference pattern is

A. $\left(\frac{n+1}{n-1}\right)$

B. $\left(\frac{n+1}{n-1}\right)^2$

C. $\left(\frac{\sqrt{n}+1}{\sqrt{n}-1}\right)$

D. $\left(\frac{\sqrt{n}+1}{\sqrt{n}-1}\right)^2$

Answer: D

Watch Video Solution

6. If the ratio of amplitude of two waves is $4:3$, then the ratio of maximum and minimum intensity is

A. $16:9$

B. $9:16$

C. $1:49$

D. $49:1$

Answer: D

Watch Video Solution

7. Intensity of two waves whicch produce interference are 100:1. The ratio of maximum and minimum intensities is

A. $121 : 81$

B. $100 : 1$

C. 101:99

D. 100:99

Answer: A

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8. In young double slit experiment the ratio of intentsities of bright and dark bands is 16 which means

A. the ratio of their amplitudes is 5

B. intensities of idnividual sources are 25 and 9 units respectively

C. the ratio of their amplitudes is 4

D. antensities of individual sources are 4 and 3 units respectively

Answer: B

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9. Two coherent sources of intensities I_1 and I_2 produce an interference pattern. The maximum intensity in the interference pattern will be

A. $I_1 + I_2$

B. $I_1^2 + I_2^2$

C. $(I_1 + I_2)^2$

D. $\left(\sqrt{I_1}+\sqrt{I_2}\right)^2$

Answer: D

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10. In Young's double slit experiment, if the widths of the slits are in the ratio $4:9$, the ratio of the intensity at maxima to the intensity at minima will be

A. $169:25$

B. $81 : 16$

C. $25 : 1$

D. $9 : 4$

Answer: C

Watch Video Solution

11. 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

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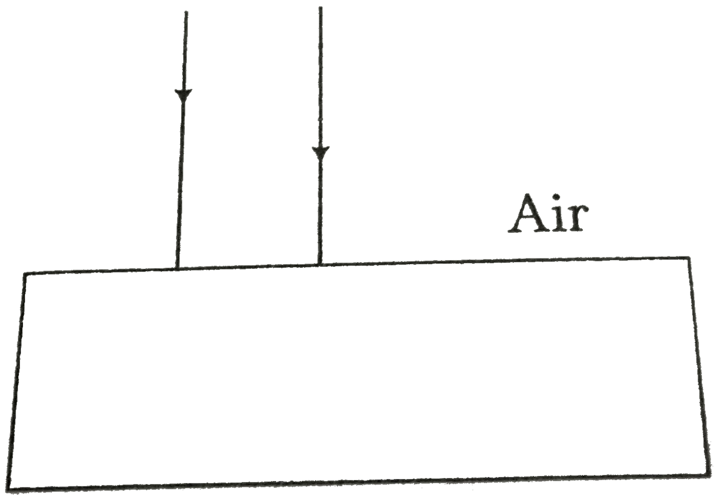
12. A parallel beam of light of intensity I is incident on a glass plate. 25% of light is reflected in any reflection by upper surface and 50 % of light is reflected by any reflection from lower surface. Rest is refracted The ratio of maximum to minimum intensity in interference region of reflected rays is



A. $\left(\dfrac{\frac{1}{2}+\sqrt{\frac{3}{8}}}{\frac{1}{2}-\sqrt{\frac{3}{8}}}\right)^2$

B. $\left(\dfrac{\frac{1}{4}+\sqrt{\frac{3}{8}}}{\frac{1}{2}-\sqrt{\frac{3}{8}}}\right)^2$

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

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

Answer: A

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13. In Young's double-sit experiment, if the superimposing waves have amplitude a_0 and intensity I_0, then the average intensity of the light in te fringe pattern formed on a screen will be

A. $6I_0$

B. $4I_0$

C. $2I_0$

D. $I_0 / 2$

Answer: C

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14. 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. $2(I_1 + I_2)$

C. $\left(\sqrt{I_1} + \sqrt{I_2}\right)$

D. $\left(\sqrt{I_1} - \sqrt{I_2}\right)$

Answer: B

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15. Interference fringes are produced on a screen by using two light sources of intensities I and $9I$. The phase difference between the beams $\frac{\pi}{2}$ is at point P and π at point Q on the screen. The difference between the resultant intensities at point P and Q is

A. 2I

B. 4I

C. 6I

D. 8I

Answer: C

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16. Two coherent monochromatic light beams of intensities 4/ and 9/ are superimosed the maxmum and minimum possible intenties in the resulting beam are

A. 3I and 2I

B. 9I and 5I

C. 16I and 3I

D. 25I and I

Answer: D

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

A. 5I and I

B. 5I and 3I

C. 9I and I

D. 9I and 3I

Answer: C

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

A. $10:8$

B. $9:1$

C. $4:1$

D. $2:1$

Answer: C

Watch Video Solution

19. If the amplitude ratio of two sources producing interference is 3 : 5, the ratio of intensities at maxima and minima is

A. $25 : 16$

B. $5 : 3$

C. $16 : 1$

D. $25 : 9$

Answer: C

Watch Video Solution

20. Monichromatic lightof wavelenght 600 nm is used ina Young's double slilt experient. One of the slits is covered by a transparent sheet of thicknes 1.8×10^{-5} m made of a material of refractive index 1.6. How many fringe will shift due to the introduction of the sheet?

A. $\cos^2 \phi$

B. $\cos^2 \frac{\phi}{2}$

C. $\cos^2 \frac{\phi}{2}$

D. $\cos^2 \frac{\phi}{4}$

Answer: B

Watch Video Solution

21. The interference pattern is obtained with two coherent light sources of intensity ration n. In the interference pattern, the ratio

$$\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$$ will be

A. $\frac{\sqrt{n}}{(n+1)^2}$

B. $\frac{\sqrt{n}}{n+1}$

C. $\frac{2\sqrt{n}}{n+1}$

D. $\frac{\sqrt{n}}{(n+1)^2}$

Answer: C

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22. Two sources of waves are called coherent if

A. both have the same amplitude of vibrations

B. both produce waves of the same wavelength.

C. both produce waves of the same wavelength having constnat phase different

D. both produce waves having the same velocity

Answer: C

Watch Video Solution

23. The necessary condition for phenomenon of interference NOT to occur is

A. there should be two coherent sources

B. the frequency and amplitude of both the waves should be same

C. the propagation of waves should be simultaneously and in same direction.

D. sources should be wide.

Answer: D

Watch Video Solution

24. If two sources are not coherent, then we obtain

A. steady interference

B. no interference

C. diffused interference

D. diminished interference

Answer: B

Watch Video Solution

25. If Young's double slit experiment is done with light, which of the following statements will be true?

A. All the bright fringes will be coloured.

B. All the bright fringes will be white.

C. The central fringe will be white.

D. No stable inerference pattern will be visible

Answer: C

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26. In Young's double slit experiment the source is white light. One slit is covered with red filter and the other with blhe filter. There shal be

A. Alternate red and blue fringes

B. Alternae dark and pink fringes

C. Alternate dark and yellow fringes

D. No interference

Answer: D

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27. Young's experiment is performed in air and then performed in water, the fringe width:

A. will remain same

B. will decrease

C. will increase

D. will be infinite

Answer: B

Watch Video Solution

28. Yong's double-slit experiment is carried out by using green, red and blue light, one color at a time. The fringe widths recorded are β_G, β_R and β_B, respectively. Then

A. $\beta_G > \beta_B > \beta_R$

B. $\beta_B > \beta_G > \beta_R$

C. $\beta_R > \beta_B > \beta_G$

D. $\beta_R > \beta_G > \beta_B$

Answer: D

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29. In Young's double slit experiment if wavelength of light is doubled without changing other conditions, the fringe width will

A. be doubled

B. be halved

C. be quadrupled

D. remain unchanged

Answer: A

Watch Video Solution

30. In young's double slit experiment with a source of light of wavelength 6320Å, the first maxima will occur when

A. paht difference is 9480Å

B. phase difference is 2π radian

C. path difference is 6320Å

D. phase difference is π radian

Answer: C

Watch Video Solution

31. Band with for red light of wavelength 6400Å us 0.32 mm. If red lilght is replaced by blue light of wavelength 4800Å, then the change in bandwidth will be

A. $8 \times 10^{-6} m$

B. $8 \times 10^{-5} m$

C. $4 \times 10^{-6} m$

D. $4 \times 10^{-5} m$

Answer: B

Watch Video Solution

32. In Young's double slit experiement when wavelength used is 6000Å and the screen is

$40cm$ from the slits, the fringes are $0.012cm$ wide. What is the distance between the slits?

A. 0.024m

B. 2.4 cm

C. 0.24 cm

D. 0.2 cm

Answer: D

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33. In a double experiment, the distance between the slit is 1 mm and screen is 25 cm away from the slits. The wavelength of light is 6000Å. The width of the fringe on the screen is

A. 0.15 mm

B. 0.24 mm

C. 0.30 mm

D. 0.12 mm

Answer: A

Watch Video Solution

34. A monochromatic light beam of wavelength $5896 Å$ is used in double slit experiment to get interference patter on a screen. 9th bright fringe is seen at a particular position on the screen. At the same point on the screen. If 11th bright fringe is to be seen, the wave length of the light that is needed is (nearly)

A. $3525 Å$

B. $7014 Å$

C. $4824 Å$

D. $6780 Å$

Answer: C

Watch Video Solution

35. The path difference at a point on the screen in Young's experiment is 5λ. If the distance of that point from the central bright hand is 0.5 mm, then the band width is

A. 2.5 mm

B. 1 mm

C. 0.1 mm

D. 10 mm

Answer: C

Watch Video Solution

36. In Young's double slit experiment, the sepcaration between the slits is halved and the distance between the slits and the screen is doubled. The fringe width is

A. will not change

B. will become half

C. will be doubled

D. will become four times

Answer: D

Watch Video Solution

37. The Young's experiment is performed with the lights of blue $(\lambda = 4360\text{Å})$ and green colour $(\lambda = 5460\text{Å})$. If the distance of the 4th fringe from the centre is x, then

A. x (Blue) $= x$(Green)

B. x (Blue) $>$ x(Green)

C. x (Blue) $<$ x (Green)

D. $\dfrac{x(\text{Blue})}{x(\text{Green})} = \dfrac{5460}{4360}$

Answer: C

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

A. 5

B. 31

C. 75

D. 25

Answer: D

Watch Video Solution

39. In Young's double slit interference experiment, the slit separation is made 3 fold. The fringe width becomes

A. $\frac{1}{3}$ times

B. $\frac{1}{9}$ times

C. 3 times

D. 9 times

Answer: A

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40. In Young's double experiment , in air interference pattern second minimum is observed exactly in front of one slit. The distance beween the two coherent source is 'd' and the distance between source and screen 'D'. The wavelength of light source used is

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

B. $\frac{d^2}{2D}$

C. $\frac{d^2}{3D}$

D. $\dfrac{d^2}{4D}$

Answer: C

Watch Video Solution

41. In Young's double slit experiment, if the width of 4th bright firnge is 2×10^{-2} cm then the width of 6 th bright fringe will be cm

A. 10^{-2}

B. 3×10^{-2}

C. 2×10^{-2}

D. 1.5×10^{-2}

Answer: C

Watch Video Solution

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

A. 6000Å

B. 5000Å

C. 3000Å

D. 45000Å

Answer: A

Watch Video Solution

43. In Young's double slit experiment using sodium light ($\lambda = 5898 \AA$) 92 fringes are seen if given colour $\left(\lambda = 5461 \AA\right)$ is used how many fringes will be seen

A. 62

B. 67

C. 85

D. 99

Answer: D

Watch Video Solution

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44. A wavelength of light 5600Å produces 60 fringes. What will be the number of fringes produced at same distance if wavelength of light used is 4800Å?

A. 51

B. 70

C. 60

D. 45

Answer: B

Watch Video Solution

45. Then nth bright band of red light of wavelength 6750Å is coincide with $(n+1)^{th}$ bright band of green light of wavelength 5400Å. Find the value of n.

A. 5

B. 4

C. 3

D. 6

Answer: B

Watch Video Solution

46. In Young's double slit experiment, red light of wavelength of 6000Å is used and the n^{th} bright fringe is obtained at a ponit P on the screen. Keeping the same setting, the source of light is replaced by green light of wavelength 5000Å and now $(n+1)^{th}$ bright fringe is obtained at the point P on the screen.

The value of n is

A. 4

B. 5

C. 6

D. 3

Answer: B

Watch Video Solution

47. In Young's double slit experiment, if the distance between two slits is equal to the wavelength of used light. Then the maximum number of bright firnges obtained on the screen will be

A. Infinite

B. 3

C. 4

D. 5

Answer: B

Watch Video Solution

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

A. 393.4 nm

B. 885.0 nm

C. 442.5 nm

D. 776.8 nm

Answer: C

Watch Video Solution

49. Monochromatic green light of wavelength $5 \times 10^{-7} m$ illuminates a pair of slits 1 mm apart. The separation of bright lines on the interference pattern formed on a screen 2 m away is

A. 0.25 mm

B. 0.1 mm

C. 1.0 mm

D. 0.01 mm

Answer: C

Watch Video Solution

50. Two coherent sources P and Q produce interference at point A on the screen where there is a dark band which is formed between 4th bright band and 5th bright band. Wavelength of light used is 6000 Å. The path difference between PA and QA is

A. $1.4 \times 10^{-4} cm$

B. $2.7 \times 10^{-4} cm$

C. $4.5 \times 10^{-4} cm$

D. $6.2 \times 10^{-4} cm$

Answer: B

Watch Video Solution

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

A. 1.2 cm

B. 1.2 mm

C. 2.4 cm

D. 2.4 mm

Answer: D

Watch Video Solution

52. A fringe width of a certain interference pattern is $\beta = 0.002$ cm What is the distance of 5th dark fringe centre?

A. $1 \times 10^{-2} cm$

B. $11 \times 10^{-2} cm$

C. $1.1 \times 10^{-2} cm$

D. $9 \times 10^{-3} cm$

Answer: D

Watch Video Solution

53. Two slits at a distance of $1mm$ are illuminated by a light of wavelength $6.5 \times 10^{-7} m$. The interference fringes are observed on a screen placed at a distance of $1m$. The distance between third dark fringe and fifth bright fringe will be

A. 0.6 mm

B. 1 mm

C. 2 mm

D. 0.4 mm

Answer: B

Watch Video Solution

54. In Young's double slit experiment slits are separated by 2 mm and the screen is placed at a distance of1.2 m from the slits. Light consisting of two wavelengths 6500Å and 5200Å are used to obtain interference fringes. The the separation between the fourth bright fringes the two wavelength is

A. 0.312 mm

B. 0.123 mm

C. 0.213mm

D. 0.412 mm

Answer: A

Watch Video Solution

55. 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. $\frac{1}{\sqrt{2}}$

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

C. $\frac{1}{2}$

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

Answer: D

Watch Video Solution

56. If a transparent medium of refractive index $\mu = 1.5$ and thickness $t = 2.5 \times 10^{-5} m$ is inserted in front of one of the slits of Young's Double Slit experiment, how much will be the shift in the interference patten? The distance between the slits is $0.5mm$ and that between slits and screen is $100cm$

A. 5 cm

B. 2.5 cm

C. 0.25 cm

D. 0.1 cm

Answer: B

Watch Video Solution

57. Young's double slit experiment is first performed in air and then in a medium other than air. It is found than 8th bright fringe in the medium lies where 5th 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

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

A. $60 \times 10^{-4} cm$

B. 10×10^{-4} cm

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

D. $6 \times 10^{-5} cm$

Answer: D

Watch Video Solution

59. In double slit experiment, the angular width of the fringes is 0.20° for the sodium light $(\lambda = 5890\text{Å})$. In order to increase the angular width of the fringes by 10%, the necessary change in the wavelength is

A. increase of 589Å

B. decrease of 589Å

C. increase of 6479Å

D. zero

Answer: A

Watch Video Solution

60. The two slits are 1 mm apart from each other and illuminated with a light of wavelength 5×10^{-7} m. If the distance of the screen is 1 m from the slits, then the distance between third dark fringe and fifth bright fringe is

A. 1.5 mm

B. 0.75 mm

C. 1.25 mm

D. 0.625 mm

Answer: C

Watch Video Solution

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

A. 9.75 mm

B. 15.6 mm

C. 1.56 mm

D. 7.8 mm

Answer: D

Watch Video Solution

62. 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. 8 mm

B. 6 mm

C. 4mm

D. 3 mmm

Answer: B

Watch Video Solution

63. In Young's double slit experiment, two wavelength $\lambda_1 = 780 nm$ and $\lambda_2 = 520$ nm are used to obtain interference fringes. If the nth bright band due to λ_1 coincides with $(n+1)^{th}$ bright band due to λ_2 then the value of n is

A. 4

B. 3

C. 2

D. 6

Answer: C

Watch Video Solution

64. The optical path difference between the two identical waves arriving at a point is 0.05 cm. If wavelength of light uses is 5000Å, then the number of dark fringes passing through that point will be

A. 10

B. 1000

C. 100

D. 10000

Answer: B

Watch Video Solution

65. Two interfering waves are arriving at a point on a screen with a path difference of 120λ. The path difference is $72\mu m$. The wavelength of light is ________. Is the point dark or bright?

A. 6000Å, bright

B. 8640Å, bright

C. 8640Å, dark

D. 6000Å, dark

Answer: A

Watch Video Solution

66. A thin mica sheet of thickness $2 \times 10^{-6} m$ and refractive index $(\mu = 1.5)$ is introduced in the path of the first wave. The wavelength of the wave used is 5000Å. The central bright maximum will shift

A. 2 fringes upward

B. 2 fringes downward

C. 10 fringes upward

D. none of these.

Answer: A

Watch Video Solution

67. A thin plastic of refractive index 1.6 is used to cover one of the slits of a double slit arrangement. The central point omn the screen is now occupied by what would have been the 7th bright fringe before the plastic was used. If the wavelength of light is 600 nm, what is the thickness (in μm) of the plastic?

A. 7

B. 4

C. 8

D. 6

Answer: A

Watch Video Solution

68. In Fresnel's experiment, the width of the fringe depends upon the distance

A. between the prism and the slit aperture

B. of the prism from the screen.

C. of screen from the imaginary light sources

D. of the screen from the prism and the distance from the imaginary sources

Answer: D

Watch Video Solution

69. Fringes are produced with monochromatic light of wave-length 5.45×10^{-5} cm. A thin glass plate of refractive index 1.5 is then placed normally in the path of one of the interference beams and the central bright band of the fringe system is found to move into the position previously occupied by the third bright band from the system. Find the thickness of the glass plate.

A. $32.7 \times 10^{-4} cm$

B. $32.7 \times 10^{-5} cm$

C. $16.7 \times 10^{-5} cm$

D. $12.5 \times 10^{-5} cm$

Answer: B

Watch Video Solution

70. Biprism experiment is conducted with a wavelength of 5000Å. The distance between the virtual sources is 0.2 mm and the micrometer eyepiece is at a distance of 100 cm from the slits. The distance between the consecutive bright and dark between the consecutive bright and dark band is

A. 1.25 mm

B. 2.5 mm

C. 3.5 mm

D. 0.25 mm

Answer: A

Watch Video Solution

71. The distances of a point on the screen from two slits in biprism experiment is 1.8×10^{-5} m and 1.23×10^{-5} m if wavelength of light used is 6000 Å then fringe formed at that point is

A. 10 th bright

B. 10 th dark

C. 9 th bright

D. 9 dark

Answer: B

Watch Video Solution

72. To observe diffraction, the size of the obstacle

A. should be much larger than the wavelength

B. has no relation to wavelength

C. should be of the order of wavelength

D. should be $\lambda/2$, where λ is the wavelength.

Answer: C

Watch Video Solution

73. The X-ray cannot be diffracted by means of an ordinary grating due to

A. high speed

B. short wavelenth

C. large wavelength

D. none of these.

Answer: B

Watch Video Solution

74. In a Fraunhofer diffraction at a single slit, if yellow light illuminating the slit is replaced by blue light, then diffraction bands

A. remain unchanged

B. become wider

C. disappear

D. become narrower

Answer: D

Watch Video Solution

75. For Fraunhofer diffraction to occur

A. light source should be at infinity.

B. both source and screen should be at infinity.

C. only the source should be at finite distance

D. both source and screen should be at finite distance

Answer: B

Watch Video Solution

76. A plane wave front of wavelength λ is incident on a single slite of width b. What is the angular width for secondary maximum ?

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

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

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

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

Answer: B

Watch Video Solution

77. For a parallel beam of monochromatic. Light of wavelength $'\lambda'$ diffraction is produced by a single slit whose width 'a' is of the order of the wavelength of the lightl. If 'D' is the distance of the screen from the slit, the width of the central maxima will be

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

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

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

D. $\frac{2Da}{\lambda}$

Answer: A

Watch Video Solution

78. In a single slit diffraction experiment the first minimum for red light of wavelength 6600Å coincides with the first maximum for other light of wavelength λ. The value of λ is

A. 2200Å

B. 3300Å

C. 4400Å

D. 5000Å

Answer: C

Watch Video Solution

79. In a diffraction pattern due to a single slit of width a, the first minimum is observed at an angle 30° when light of wavelength 5000 Å is incident on the slit. The first secondary minimum is observed at an angle of

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

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

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

D. $\sin^{-1}\left(\frac{2}{3}\right)$

Answer: B

Watch Video Solution

80. A slit of width a is illuminated by white light. For red light $(\lambda = 6500\text{Å})$, the first minima is obtained at $\theta = 30^\circ$. Then the value of a will be

A. 3250Å

B. $6.5 \times 10^{-4} mm$

C. 1.24 micro

D. $2.6 \times 10^{-4} cm$

Answer: C

Watch Video Solution

81. The light of wavelength 6328Å is incident on a slit of width $0.2mm$ perpendicularly, the angular width of central maxima will be

A. 0.36°

B. 0.18°

C. 0.72°

D. 0.09°

Answer: A

Watch Video Solution

82. Light of wavelength 600 nm is incident normally on a slit of width 0.2 mm. The angular width of central maxima in the diffraction pattern is

A. 6×10^{-3} rad

B. 4×10^{-3} rad

C. 2.4×10^{-3} rad

D. 4.5×10^{-3} rad

Answer: A

Watch Video Solution

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

A. 1.2 mm

B. 1.2 cm

C. 2.4 cm

D. 2.4 cm%

Answer: D

Watch Video Solution

84. A linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60cm. The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is

A. 0.15 cm

B. 0.10 cm

C. 0.25 cm

D. 0.20 cm

Answer: A

Watch Video Solution

85. In Fraunhofer diffraction pattern, slit width is $0.2mm$ and screen is at 2 m away from the lens. If wavelength of light used is 5000Å, then the distance between the first minimum on either side of the central maximum is (θ is small and measured in radian)

A. $10^{-1}m$

B. 10^{-2}m

C. $2 \times 10^{-2}m$

D. $2 \times 10^{-1}m$

Answer: B

Watch Video Solution

86. A plane wavefront $(\lambda = 6 \times 10^{-7} m)$ falls on a slit $0.4 m$ wide. A convex lens of focal length $0.8 m$ placed behind the slit focuses the light on a screen. What is the linear diameter of second maximum?

A. 6 mm

B. 12 min

C. 3 mm

D. 9 mm

Answer: A

Watch Video Solution

87. The first minimum of a single slit diffraction pattern is observed at angle 2° with a light of wavelength 698 nm. The width of this slit is

A. 2 mm

B. 0.2 mm

C. 0.02 mm

D. 0.002 mm

Answer: C

Watch Video Solution

88. Light of wavelength $589.3nm$ is incident normally on the slit of width $0.1mm$. What will be the angular width of the central diffraction maximum at a distance of $1m$ from the slit?

A. 0.68°

B. 1.02°

C. 0.34°

D. none of these.

Answer: A

Watch Video Solution

89. Light of wavelength λ is incident on a slit of width d. the resulting diffraction pattern is observed on a screen at a distance D. the linear width of the principal maximum is equal to the width of the slit if D equals

A. $\dfrac{d^2}{2\lambda}$

B. $\dfrac{2\lambda^2}{d}$

C. $\dfrac{d}{\lambda}$

D. $\dfrac{2\lambda}{d}$

Answer: A

Watch Video Solution

90. Red light of wavelength 625 nm is incident normally on a optical diffraction grating with 2×10^5 lines/m. Including central principal maxima, how many maxima may be observed on a screen which is far from the grating?

A. 15

B. 17

C. 8

D. 16

Answer: B

Watch Video Solution

91. 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. 5 mm

B. 0.5 m

C. 5 cm

D. 0.5 cm

Answer: D

Watch Video Solution

92. If numerical aperture of a microscope is increased, then its

A. resolving power remains constant.

B. resolving power becomes zero

C. limit of resolution is decreased

D. limit of resolution in increased

Answer: C

Watch Video Solution

93. In an astronomical telescope, the final image for normal vision is formed at

A. the focus of the eye piece

B. the least distance of the distinct vision

C. the focus of the objective lens

D. infinity

Answer: D

Watch Video Solution

94. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

A. small focal length and large diameter

B. laerge focal length and small diameter

C. large focal length and large diameter

D. smal focal length and small diameter

Answer: C

Watch Video Solution

95. Resolving power of telescope increases when

A. wavelength of light decreases

B. wavelength of light increases

C. focal length of eye-piece increases

D. focal length of eye- piece decreases

Answer: A

Watch Video Solution

96. 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. $9:4$

B. $3:2$

C. $16 : 81$

D. $8 : 27$

Answer: B

Watch Video Solution

97. 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)

A. 7.52×10^{-6}

B. 6.10×10^{-6}

C. 6.55×10^{-6}

D. 7.32×10^{-6}

Answer: D

Watch Video Solution

98. Diameter of the objective of a telescope is 200cm. What is the resolving power of a telescope? Take wavelength of light =5000Å.

A. 6.56×10^6

B. 3.28×10^5

C. 1×10^6

D. 3.28×10^6

Answer: D

Watch Video Solution

99. The resolving power of a telescope whose lens has a diameter of 1.22 m for a wavelength of 5000Å is

A. 2×10^5

B. 2×10^6

C. 2

D. 2×10^2

Answer: B

Watch Video Solution

100. When a beam of light is used to determine the position of an object, the maximum accuracy is achieved if the light is

A. polarised

B. of longer wavelength

C. of shorter wavelength

D. of high intensity

Answer: C

Watch Video Solution

101. Two slits at a distance of $1mm$ are illuminated by a light of wavelength $6.5 \times 10^{-7}m$. The interference fringes are observed on a screen placed at a distance of $1m$. The distance between third dark fringe and fifth bright fringe will be

A. 0.65 mm

B. 1.63 mm

C. 3.25 mm

D. 4.88 mm

Answer: B

Watch Video Solution

102. In the Young's double slit experiment using a monochromatic light of wavelength λ, the path difference (in terms of an integer n) corresponding to any point having half the peak

A. $(2n+1)\frac{\lambda}{2}$

B. $(2n+1)\frac{\lambda}{4}$

C. $(2n+1)\frac{\lambda}{8}$

D. $(2n+1)\frac{\lambda}{16}$

Answer: B

Watch Video Solution

103. In Young's double slit experiment, the fringe width obtained by a monochromatic light of wavelength 6000Å is 2 mm. I fthe apparatus is dipped into water of R.I. 1:33, then change in fringe width will be

A. 0.5 mm

B. 1 mm

C. 1.2 mm

D. 1.5 mm

Answer: A

Watch Video Solution

104. If initial fringe width is X, the distance between screen and slits is increased by 25% and distance between two slits is halved, then how many times does fringe width increase?

A. X

B. 1.5X

C. 2.5X

D. 2X

Answer: C

Watch Video Solution

105. 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. $\frac{I_m}{3}\left(1 + 2\cos^2\frac{\phi}{2}\right)$

C. $\frac{I_m}{5}\left(1 + 4\cos^2\frac{\phi}{2}\right)$

D. $\frac{I_m}{9}\left(1 + 8\cos^2\frac{\phi}{2}\right)$

Answer: D

Watch Video Solution

106. In Young's double slit experiment, the intensity on the screen at a point where path difference is λ is K. What will be the intensity at the point where path difference is $\lambda/4$?

A. $\frac{K}{4}$

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

C. K

D. Zero

Answer: B

Watch Video Solution

107. 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. $\frac{\sqrt{3}}{2}$

B. $1/2$

C. $3/4$

D. $1/\sqrt{3}$

Answer: C

Watch Video Solution

108. In Young's double slit experiment, the two slits acts as coherent sources of equal amplitude A and wavelength λ. In another experiment with the same set up the two slits are of equal amplitude A and wavelength λ but are incoherent. The ratio of the intensity of light at the mid-point of the screen in the first case to that in the second case is

A. $1:2$

B. $2:1$

C. $4:1$

D. $1:1$

Answer: B

Watch Video Solution

109. The intensity at the maximum in a Young's double slit experiment is I_0. Distance between two slits is $d = 5\lambda$, where λ is the wavelength of light used in the experiement. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10d$?

A. $\frac{3}{4}I_0$

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

C. (I_0)

D. $\frac{I_0}{4}$

Answer: B

Watch Video Solution

110. In a Young's double slit experiment, bi-chromatic light of wavelengths 400 nm and 560 nm are used. The distance between the slits is 0.1 mm and the distance between the plane of the slits and the screen is 1m. The minimum distance between two successive regions of complete darkness is

A. 4 mm

B. 5.6 mm

C. 14 mm

D. 28 mm

Answer: D

Watch Video Solution

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

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

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

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

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

Answer: C

Watch Video Solution

112. 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. 0.2 mm

B. 0.1 mm

C. 0.5 mm

D. 0.02 mm

Answer: A

Watch Video Solution

113. In young's double slit experiment the separation d between the slits is $2mm$, the wavelength λ of the light used is $5896Å$ and distance D between the screen and slits is $100cm$. It is found that the angular width of the fringes is 0.20°. To increases the fringe angular width to 0.21°(with same λ and D) the separtion between the slits needs to be changed to

A. 1.8 mm

B. 1.9 mm

C. 2.1 mm

D. 1.7 mm

Answer: B

Watch Video Solution

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

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

A. $75\mu m$

B. $100\mu m$

C. $25\mu m$

D. $50\mu m$

Answer: C

Watch Video Solution

115. The diameter of the pupil of human eye is 2.5 mm. Assuming the wavelength of light used is 5000Å. What must be the minimum distance between two point like objects to the seen clearly if they are a distance of 5 m from the eye?

A. $1.34 \times 10^{-3} m$

B. $1.22 \times 10^{-3} m$

C. $1.5 \times 10^{-3} m$

D. $1.6 \times 10^{-3} m$

Answer: B

Watch Video Solution

116. 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. Wave length is

B. $1\mu m$

C. $30\mu m$

D. $100\mu m$

Answer: C

Watch Video Solution

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

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

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

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

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

Answer: B

Watch Video Solution

Evaluation Test

1. In a Young's doule slit experiment, the slits are 2 mm apart and are illuminated with a mixture of two wavelengths $\lambda = 750nm$ and $\lambda' = 900nm$. At what distance from the common central bright fringe on a screen 1.5 m from the slits will a bright fringe from one interference pattern coincide with a bright fringe from the other?

A. 0.8 mm

B. 1.6 mm

C. 2.4 mm

D. 3.4 mm

Answer: D

Watch Video Solution

2. In a Young's double slit experiment, the separation between the slits is 2×10^{-3} m and the distance of screen from the plane of slits of 2m. Light of wavelengths in the range

$3500Å$ to $7000Å$ is allowed to fall on the slits.

The wavelength that will have a maxima on the screen at 10^{-3} m from the central maxima is

A. $4000Å$

B. $500Å$

C. $5500Å$

D. $6000Å$

Answer: B

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3. A double slit apparatus is immersed in liquid of refractive index μ_m. The distance between the slits is d and distasnce between plane of slits and screen as $D(D > > d)$. The slits are illuminated by parallel beem of wavelegth λ'. The smallest thickness of a sheet of refractive index μ_p to bring adjacent minima on the axis is

A. $\frac{\lambda'}{2(\mu_p - \mu_m)}$

B. $\frac{(\mu_p - \mu_m)\lambda'}{2}$

C. $\frac{\lambda'}{(\mu_p - \mu_m)}$

D. $(\mu_p - \mu_m)\lambda'$

Answer: A

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4. In a double slit experiment, the separation between the slits is d and distance of the screen from slits is D. If the wavelength of light used is λ and I is the intensity of central bright fringe, then intensity at distance from central maximum is

A. $I\cos^2\left(\frac{\pi^2 xd}{\lambda D}\right)$

B. $I^2\sin^2\left(\frac{\pi xd}{2\lambda' D}\right)$

C. $I\cos^2\left(\frac{\pi xd}{\lambda D}\right.$

D. $I\sin^2\left(\frac{\pi xd}{\lambda D}\right)$

Answer: C

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5. 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. $\frac{I_0}{2}\left[1-8\cos^2\frac{\pi}{\lambda}d\sin\alpha\right]$

B. $\frac{I_0}{6}\left[1-4\cos^2\frac{2\pi}{\lambda}2d\sin\alpha\right]$

C. $\frac{I_0}{9}\left[1+8\cos^2\frac{\pi}{\lambda}d\sin\alpha\right]$

D. $\frac{I_0}{9}\left[1+4\cos\frac{\pi}{\lambda}d\sin\alpha\right]$

Answer: C

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6. In a single slit diffraction experiment, first minimum for a light of wavelength 540 nm coincides with the first maximum of another wavelength λ'. Then λ' is

A. 3600Å

B. 2700Å

C. 4800Å

D. 5200Å

Answer: A

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7. A beam of 8mW power and wavelength 6000Å has aperture 2 mm. If it is focused by a lens of focal length 6 cm the intensity of the image $\left(\times 10^3\right)$ is

A. $0.52\frac{kW}{m^2}$

B. $1.32\frac{kW}{m^2}$

C. $2.63\frac{kW}{m^2}$

D. $5.20\frac{kW}{m^2}$

Answer: D

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8. Human eye is most sensitive to 5550Å and diameter of pupil is 1.8 mm. The greates distance at which a person can see clearly the milimetre marks on a scale is approximately

A. 1.7m

B. 2.7m

C. 3.7m

D. 4.7m

Answer: B

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9. Two towers on the top of two hills are 40 km apart. The line joining them presses 50 m above a hill half way between the towers. What is the longest wavelength of radiowaves which can be send between the towers without appreciable fiffraction effects?

A. 12.5 cm

B. 24.4 cm

C. 33.3 cm

D. 42.2 cm

Answer: C

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10. If the monochromatic source in Young's double slit experiment is white light, then

A. fringe pattern is not observed.

B. central fringe is white and the fringe closest on either side of the central white fringe is red.

C. central fringe is white and the fringe closest on either side of the white fringe is blue.

D. central fringe is white and the fringe closest on either side of the white fringe is dark.

Answer: B

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11. White light is used to illuminate the two slits in Young's double slit experiment. The separation between the slits is b and the screen is at a distance $D > > b$ from slits. At a point on the screen directly in front of one of the slits, the missing wavelengths are

A. $\frac{b^2}{D}, \frac{b^2}{3D}$

B. $\frac{b}{D^2}, \frac{b}{3D^2}$

C. $\frac{b^2}{2D}, \frac{b^2}{4D}$

D. $\frac{D^2}{b}, \frac{D^2}{3b}$

Answer: A

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12. In a Young's double slit experiment, the slits separated by 1 mm are illuminated by a mixture of two wavelengths $\lambda = 600 nm$ and $\lambda' = 750 nm$. The distance of screen from slits is 1m. The minimum distance from the common central bright fringe where the bright frigne of one interference pattern will coincide with the bright fringe of second inteference pattern will be:

A. 0.8 mm

B. 3 mm

C. 0.3 m

D. 30 mm

Answer: B

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13. From a TV tower waves are sent normally to a plane reflector. A detector moves along this normal and covers a distance S between positions of first and nth successive maxima. Velocity of light in air is c, then probable frequency of TV waves is

A. $\frac{(n-1)}{2}\frac{c}{S}$

B. $\left(\frac{n+1}{2}\right)\frac{c}{S}$

C. $n\frac{c}{S}$

D. $\frac{(n+1)}{3}\frac{c}{S}$

Answer: A

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14. For a normal eye, distance of near point from the eye is.

A. 8.3 m

B. 7.8 m

C. 6.3 m

D. 3.3 m

Answer: D

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15. A parallel beam of x-rays 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. Diffraction pattern is not observed on the screen in the case of electrons.

B. The angular width of the central maximum of the diffraction pattern will increase.

C. The angular width of the central maximum will decrease

D. The angular width of the central maximum will be unaffected.

Answer: C

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16. The aperture of the larges telescope in the world is about 5m. If the separation between the moon and the earth is $4 \times 10^5 km$ and the wavelength of visible light is 6000Å, then minimum separation between the objects on the surface of the moon which can be just resolved is approximately equal to

A. $29.5m$

B. 59 m

C. 88.5 m

D. 1167 m

Answer: B

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17. A slit whose width is 5.0 cm is irradiated with microwaves of wavelength 3 cm. What is the angular spread of the central maximum? Assume normal incidence.

A. $\pm 18^{\circ}, 24'$

B. $\pm 36^{\circ} 52'$

C. $+43^{\circ} 23'$

D. $-33^\circ 35'$

Answer: B

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18. In a single slit diffraction experiment first minima for $\lambda_1 = 660 nm$ coincides with first maxima for wavelength λ_2. Calculate the value of λ_2.

A. 240 nm

B. 300 nm

C. 345 nm

D. 400 nm

Answer: D

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19. By passing sodium light $(\lambda = 5896 \times 10^{-10} m)$ through two slits 0.4 mm apart, an interfernece pattern is formed on a screen kept parallel to the plane of the slits and 60 cm from them. Find the distance along the screen between the third dark band and the tenth dark band on the opposite side of the central bright band.

A. 0.11 cm

B. 1.1 cm

C. 0.22 cm

D. 2.2 cm

Answer: B

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20. Assertion: An excessively thin film appear black in reflected light.

Reason: The film absorbs all the radiations falling on it.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True Reason is False.

D. Assertion is False, Reason is True.

Answer: C

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