PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

WAVE OPTICS

Mcq Level 1

1. If the intensity of unpolarized light after passing through a polarize (P) and an analyser

(A) reduces to one eighth of its original value, then the angle between the principal planes of P and A is :

A. 30°

B. 45°

C. 60°

D. 90°

Answer: B

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2. Light of wavelength 520 nm is falling normally on a plane diffraction grating having 5000 lines per cm. The maximum number of orders of diffracted images seen is :

A. 2

B. 3

C. 4

D. 5

Answer: B

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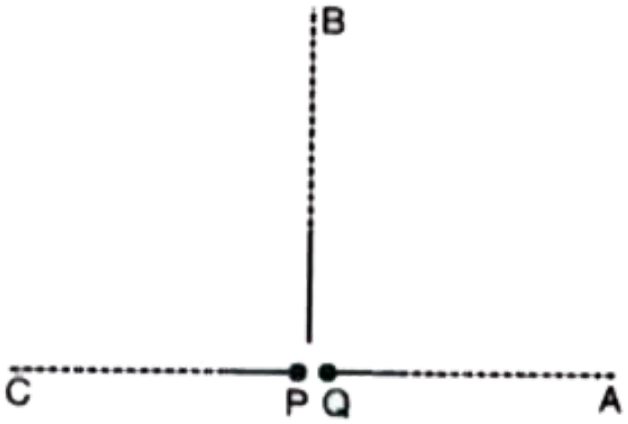
3. In the figure given below, P and Q are two equally intense coherent sources emitting radiations of wavelength 20 m. The separation between P and Q is 5.0 metre and phase of P is ahead of the phase of Q by 90°, A, B and C are three distant points of observation, equidistant from the mid point of PQ.The intensity of radiation at A, B, and C will bear

the ratio :



A. $0:1:4$

B. $4:1:0$

C. $0:1:2$

D. $2:1:0$

Answer: D

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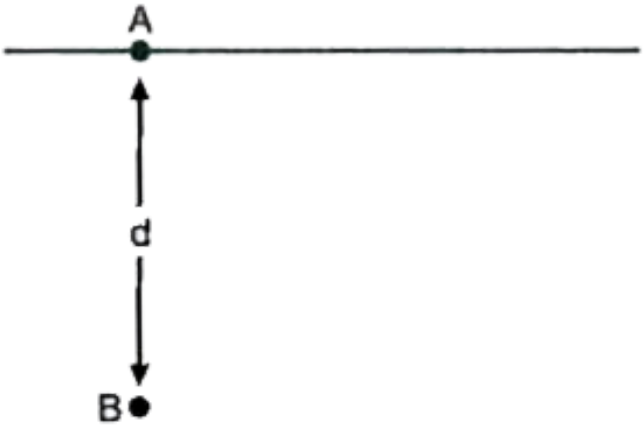
4. In Fig.A and B are identical radiators of waves that are in phase and of the same wavelength λ.The radiators are rotated by distance in λ, d = 3.00 λ.The greatest distance from A, along the x - axis, for which fully destructive interference occurs is :



A. 8.75λ

B. 2.5λ

C. 4.5λ

D. 11.25λ

Answer: A

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5. If one of the two slits of a Young's double slit experiment is covered by thin parallel

sided glass slab, so that it transmit only half the light intensity of the other then

A. the fringe system will get shifted towards the covered slit.

B. the fringe system will get shifted away from covered slit.

C. the bright fringes will be less bright and dark fringe will be less dark

D. the fringe width will change.

Answer: A

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6. In Young's double slit experiment the light emitted from source has $\lambda = 6.5 \times 10^{-7}$ m and the distance between the two slits is 1 mm. Distance between the screen and slit is 1 metre. Distance between the screen and slit is 1 metre. Distance between third dark and fifth bright fringes will be :

A. 3.2 mm

B. 1.63 mm

C. 0.585 mm

D. 2.31 mm

Answer: B

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7. Light is incident normally on a diffraction grating through which first order diffraction is seen at 32°.The second order diffraction will be seen at :

A. 84°

B. 48°

C. 64°

D. None of these.

Answer: D

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8. In Young's double slit experiment if the widths of the slits are in the ratio 4 : 9, rstio of

intensity of maxima to intensity of minima will be :

A. $25:1$

B. $9:4$

C. $3:2$

D. $81:16$

Answer: A

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9. White light is used to illuminate the two slits in Young's double slit experiment, separation between the slits is b and the screen is at a distance $d(>>b)$ from the slits.At a point on the screen, directly in front of the slits, certain wavelengths are missing.Some of these missing wave lengths are :

A. $\frac{(b^2)}{d}, \frac{(b^2)}{3d}$

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

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

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

Answer: A

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10. A radar operates at wavelength 50.0 cm. If the bbeat frequency between the transmitted signal and the signla reflected from aircraft (Δv) is 1 kHz, then velocity of the aircraft will be :

A. $800\frac{km}{h}$

B. $900\frac{km}{h}$

C. $1000\frac{km}{h}$

D. $1032\frac{km}{h}$

Answer: B

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11. Light with wavelength 0.50 mm falls on a slit of width 10 mm and at an angle $\theta_0 = 30^\circ$ to its normal.Then angular position of first

minima located on right side of the central Fraunhoffer's diffraction will be at :

A. 33.4°

B. 26.8°

C. 39.8°

D. None of these.

Answer: A

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12. Angular width of central maximum in the Fraunhoffer's diffraction pattern is measured.Slit is illuminated by the light of wavelength 6000 $\mathring{A}$. If slit illuminated by light of another wavelength, angular width decreased by 30%. Wavelength of light used is :

A. $3500\mathring{A}$

B. $4200\mathring{A}$

C. $4700\mathring{A}$

D. 6000Å

Answer: B

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13. A parallel beam of white light falls on a thin film whose refractive index is 1.33. IF angle of incedence is 52° then thickness of the film for the reflected light to be coloured yel,ow $(\lambda = 6000\text{Å})$ most intensively must be :

A. $14(2n+1)\mu m$

B. $1.4(2n+1)\mu m$

C. $0.14(2n+1)\mu m$

D. $142(2n+1)\mu m$

Answer: C

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14. A plane monochromic light falls normally on a diaphragm with two narrow slits separated by a distance d = 2.5mm. A fringe pattern is formed on the screen placed at D =

100 cm behind the diaphragm.If one of the slits is covered by a glass plate of thickness $10\mu m$, then distance by which these fringes will be shifted is :

A. 2 mm

B. 3 mm

C. 4 mm

D. 5 mm

Answer: A

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

A. $4000doA$

B. 6000Å

C. 5890Å

D. 8000Å

Answer: B

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16. White light is used to illuminate the two slits in Young's double slit experiment, separation between the slits is b and the screen is at a distance $d(>>b)$ from the

slits.At a point on the screen, directly in front of the slits, certain wavelength

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

B. $\frac{b^2}{d}, \frac{b^2}{4d}$

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

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

Answer: A

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17. A double slit experiment is immersed in a liquid of refractive index 1.33. Separation between the slits is 1.0 mm and the distance between slit and screen is 1.33 m. If slits are illumintated by a parallel beam of light whose wavelength is 6300Å, then fringe width will be :

A. $6.3mm$

B. $63mm$

C. $0.63mm$

D. None of these.

Answer: C

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18. In a Young's interference experimental arrangement incident yellow light is composed of two wavelengths 5890 $\mathring{A}$ and 5895 doA. Distance between the slits is 1 mm and the screen is placed 1 m away.Order upto

which fringes can be seen on the screen will be :

A. 384

B. 486

C. 512

D. 589

Answer: D

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19. A thin film of a material of refractive index 1.38 is coated on a glass surface of refractive index 1.5.Light of wavelength 550 nm gives no reflected light. The minimum thickness of the film is :

A. $500\dot{A}$

B. 750Å

C. 1000Å

D. 1500Å

Answer: C

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20. A light of wavelength 5500Å falls normally on a slit of width 22×10^{-5} cm. Calculate the angular position of the first two minima on either side of the central maxima :

A. $14^\circ 29', 30^\circ$

B. $6.14^\circ, 12.6^\circ$

C. $12.6^\circ, 24.2^\circ$

D. None of these.

Answer: A

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21. A diffraction grating 2.0 cm wide has 6000 rulings.At what angles will max. Intensity occur?

A. $0^\circ, \pm 3^\circ, \pm 9^\circ, \pm 16^\circ$....

B. $0^\circ, \pm 10^\circ, \pm 32^\circ, \pm 45^\circ$....

C. $0^\circ, 6^\circ, 9^\circ, 19^\circ$....

D. $0^\circ, 4^\circ, 8^\circ, 12^\circ$....

Answer: B

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22. Interference is observed in a chamber with air present inside the chamber.The chamber is then evacuated and the same light is again used to produce interference. A careful observer will see

A. no change in the pattern

B. that the fringe width slightly increases

C. that the fringe width slightly decreases

D. no interference pattern.

Answer: B

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23. Two niclos are crossed to each other.Now one of them is rotated through 60°.What percentage of incident light will pass through the system?

A. $12\ \%$

B. $24\ \%$

C. $37.5\ \%$

D. $52\ \%$

Answer: C

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24. A beam of light of wavelength 600nm from a distant sorce falls on a single slit 1.00 mm wide and resulting diffraction pattern is

observed on a screen 2 m away. The diatnce between the first dark fringes on either side of the central bright fringe is :

A. $0.6mm$

B. $1.2mm$

C. $0.9mm$

D. $0.20mm$

Answer: B

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25. Find the distance between adjacent interference bands if the distance from the source to biprism is 1 m and from biprism to screen is 4 m.The angle of refraction of biprism is 2×10^{-3} rad. How many interference bands can be observed on the screen ?

(Given $\mu = 1.5$ & $\lambda = 6000\text{Å}$)

A. 5

B. 4

C. 3

D. 2

Answer: A

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26. A plane light wave falls on Fresnel mirrors at an inclination of $\alpha = 2$. Detrmine the wavelength of light if the width of fringe on the screen is $\beta = 0.55m$:

A. 220 nm

B. 330 nm

C. 640 nm

D. 750 nm

Answer: C

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27. In a double slit experiment, the separation between slits is d = 0.25 cm and the distance of screen D = 120 cm from the slits.If I_0 is intensity of central bright fringe, what is the

intensity at distance $x = 4.8 \times 10^{-5}$ m from central max ? Given $\lambda = 6000\text{Å}$:

A. I_0

B. $2I_0$

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

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

Answer: D

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28. A double slit experiment produces interference fringes for sodium light $(\lambda = 5890\text{Å})$ that are 0.20° apart What will be angular fringe separation if the entire arrangement is immersed in water $\left(\mu = \frac{4}{3}\right)$?

A. 1.25°

B. 0.30°

C. 0.15°

D. 0.45°

Answer: C

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29. In double slit pattern $(\lambda = 6000\text{Å})$, the zero order and tenth order maxima fall at 12.34 mm and 14.73 mm from a particular reference point. If λ is changed to 5000Å, find the position of zero order and tenth order fringes, other set up being same :

A. $6.2mm$

B. $14.53mm$

C. $7.2mm$

D. 94 mm

Answer: B

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30. I is the intensity due to a source of light at any point P on the screen.Now the light reaches at P via two different paths (i) direct (ii) after reflection from a plane mirror.If the path difference between two paths is $3\lambda/2$, the intensity at P is :

A. zero

B. I

C. 2I

D. 4I

Answer: D

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31. In the Young's double -slit experiment, the interference pattern is found to have intensity

ratio between bright and dark fringes as 9.This implies that

A. the intensities at the screen due to the two slits are 5 units and 4 units respectively

B. the intensities at the screen due to the two slits are 1 unit and 4 units respectively

C. the amplitude ratio is 3

D. the amplitude ratio is 2

Answer: D

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32. A light of 6000Å is used to produce interference pattern.The observed fringe widht is 0.12 mm. The angle between two interfering wave trains is :

A. 2×10^{-3} radian

B. 3×10^{-3} radian

C. 4×10^{-3} radian

D. 5×10^{-3} radian.

Answer: D

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33. The thickness of air column which will have one more wavelength of yellow light (6000Å) than in the same thickness of vaccum will be (refractive index of air is 1.0003) :

A. 2 mm

B. 2 cm

C. 2 m

D. 2 km

Answer: A

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34. A glass wedge of angle 0.01 radian is illuminated by monochromatic light of wavelength 6000Å falling normally on it. At what distance from the wedge will 10th dark

fringe be observed by reflected light ?

$(\mu = 1.5)$:

A. $0.1mm$

B. $0.2mm$

C. $0.3mm$

D. $0.4mm$

Answer: B

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35. An unpolarised beam of light is incident on a group of four polarising sheets which are arranged in such a way that the characteristic direction of each polarising sheet makes an angle of 30° with the preceding sheet. What fraction of light is transmitted?

A. $\frac{27}{54}$

B. $\frac{27}{81}$

C. $\frac{27}{128}$

D. $\frac{27}{112}$

Answer: C

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36. The spectral line emitted by a star, known to have a wavelength of 6500Å, when observed in the laboratory appears to have a wavelength 6525Å. What is the spped of the star in the line of light relative to the earth fro receding or approaching?

A. $1.154 \times 10^6 ms^{-1}$ receding

B. $1.154 \times 10^4 ms^{-1}$ approaching

C. $1.154 \times 10^3 ms^{-1}$ receding

D. $1.154 \times 10^2 ms^{-1}$ approaching

Answer: A

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37. 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 to the

incident beam. At the first minimum of the diffraction pattern, the phase difference between the rays coming from the two edges of slit is :

A. 0

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

C. π

D. 2π

Answer: D

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38. A parallel beam of light of wavelength $5000 fotA$ is incident normally on a single slit of width $0.001mm$. The light is focussed by a convex lens on a screen placed in focal plane.The first minimum is formed for the angle of diffraction equal to :

A. 0°

B. 15°

C. 30°

D. 60°

Answer: C

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39. In a Young' s experiment, two coherent sources are placed 0.90 mm apart and the fringes are observed one metre away. If it produces the second dark fringe at a distance of 1 mm from the central fringe, the wvaelength of monochormatic light used would be :

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

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

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

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

Answer: D

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40. A lens has focal length f. It gives diffraction pattern of Fraunhoffer type of a slit giving width of w. If the wavelenth of light used is λ,

then what is the distance of first dark band and next bright band from axis?

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

B. $a \lambda f$

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

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

Answer: C

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41. Two points separated by a distance of 0.1 mm can just be inspected in a microscope when light of wavelength 6000Å is used.If the light of wavelength 4800Å is used, this limit of resolution will become :

A. $0.8mm$

B. $0.12mm$

C. $0.1mm$

D. $0.08mm$

Answer: D

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42. Waves from two different sources overlap a particular point. The amplitude and frequency of the two waves are same.The ratio of the intensity when the two waves arrive in phase to that when they arrive 90° out of phase is :

A. $1:1$

B. $\sqrt{2}:1$

C. $2:1$

D. $4:1$

Answer: C

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43. A source emits electromagnetic waves of wavelength 3 m. One bema reaches the observer directly and other after reflection from a water surface, travelling 1.5 m extra distance and with intensity reduce to $\left(\frac{1}{4}\right)$ as

compared to intensity due to direct bema alone. The resultant intensity will be :

A. $\left(\frac{1}{4}\right)$ fold

B. $\left(\frac{3}{4}\right)$ fold

C. $\left(\frac{5}{4}\right)$ fold

D. $\left(\frac{9}{4}\right)$ fold

Answer: D

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44. In Young's experiment with sodium light the slits are 0.586 m aprt. What is the angular width of the fourth maximum ? Given that $\lambda = 589nm$:

A. $\sin^{-1}\left(3 \times 10^{-6}\right.$

B. $\sin^{-1}\left(3 \times 10^{-8}\right)$

C. $\sin^{-1}\left(0.33 \times 10^{-6}\right)$

D. $\sin^{-1}\left(0.33 \times 10^{-8}\right)$

Answer: A

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45. In a Young's experiment, let light of $\lambda = 5.48 \times 10^{-7}$ m and 6.85×10^{-8} m be used in turn keeping D and d constant. Compare the fringe widths in the two cases :

A. $1:8$

B. $8:1$

C. $4:1$

D. $1:6$

Answer: A

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

A. electron gun voltage be increased

B. electron gun voltage be decreased

C. the slits be moved away

D. the screen be moved closer to interfering slits.

Answer: B

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47. Two coherent point sources S_1 and S_2 vibrating in phase emit light of wavelength λ .The separation between the sources is 2λ.The smallest distance from S_2 on a line passing

through S_2 and perpendicular to S_1S_2 where a minimum intensity occurs is :

A. $\frac{7\lambda}{12}$

B. $\frac{15\lambda}{4}$

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

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

Answer: A

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48. In Young's double slit experiment, how many maximas can be obtained on a screen (including the central maximum) on both sides of the central fringe if $\lambda = 2000\text{Å}$ and d = 7000Å?

A. 12

B. 7

C. 18

D. 4

Answer: B

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49. In Young's double slit experiment $\frac{d}{D} = 10^{-4}$ (d = distance between slits, D = distance of screen from the slits) At a point P on the screen the resulting intensity is equal to the intensity due to individual slit I_0.Then the distance of point P from the central maximum is $(\lambda = 6000\text{Å})$:

A. 2 mm

B. 1 mm

C. $0.5mm$

D. 4 mm

Answer: A

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50. 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 then equal to the width of the slit if D equals :

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

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

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

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

Answer: C

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51. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1.00 mm wide and the resulting diffraction pattern is

observed on a scfeen 2 m away.The distance between the first dark fringes on either side of the central bright fringe is :

A. $1.2cm$

B. $1.2mm$

C. $2.4cm$

D. $2.4mm$

Answer: B

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Mcq Level 1 Assertions

1. Statement I : In a young's double slit experiment two slits are at distance d part.Interference pattern is observed on a screen at distance D from the slits. At a point on screen directly opposite to one of the slits, a dark fringe is observed.The wave length of wave is $\frac{d^2}{D}$.

Statement II : If the entire double slit experiment is dipped in water, the fringe size gets reduced.

A. Statement I is true, statement II is false.

B. Statement I is false, statement II is true

C. Statement I is true, statement II is true. Statement II is not correct explanation of statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation of statement II.

Answer: C

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2. Statement I : Sound waves show diffraction more prominently than the light waves.

Statement II : The diffraction of light at a slit is more clearly visible when the slit width is increased.

A. Statement I is true, statement II is false.

B. Statement I is false, statement II is true

C. Statement I is true, statement II is true.

Statement II is not correct explanation

of statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation of statement II.

Answer: A

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3. Statement I : In propagation of light waves, the angle between plane of vibration and plane of polarisation is $\frac{\pi}{2}$ radians.

Statement II : Plane polarised light is incident on an analyser.The intensity becomes $\frac{3}{4}th$.The angle of axis of analyser with beam is then 30°.

A. Statement I is true, statement II is false.

B. Statement I is false, statement II is true

C. Statement I is true, statement II is true. Statement I is correct explanation of statement II.

D. Statement I is true, statement II is true and statement II is not correct

explanation of statement I.

Answer: D

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Mcq Level 1 Paragraph Questions

1. Questions 55 and 56 are based on following paragraph : In Young's double slit experiment, the distance between two slits is 1 mm. And distance between slits and screen is 1.0 meter.

The wavelength of light used is 6000Å. Two waves are equal.

55. The fringe width is

A. $0.3mm$

B. $0.6mm$

C. $0.8mm$

D. $2mm$

Answer: B

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2. The minimum distance from centre of zero order maxima to where the intensity in half that at the centre is

A. $0.15mm$

B. $0.20mm$

C. $0.30mm$

D. $0.40mm$

Answer: A

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3. Questions 57 and 58 are based on following paragraph : A glass plate 12×10^{-4} mm. Thick is placed in the path of one of the interfering beams in a biprism experiment using wavelength 600Å

57. The central band shifts a distance equal to width of the band, then refractive index of glass plate is

A. 1.5

B. 1.48

C. 1.45

D. 1.54

Answer: A

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4. If a diamond plate of refractive index 2.5 is introduced in path of second beam to bring the central band to original position then its thickness is

A. $1 \times 10^{-5} cm$

B. $2 \times 10^{-5} cm$

C. $3 \times 10^{-5} cm$

D. $1 \times 10^{-5} cm$

Answer: D

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5. Questions 59 and 60 are based on following paragraph : A beam of light consisting of two wavelengths 6500Å and 5200Å is used to get interference fringes in Young's double slit

experiment with slit distance 2 mm and screen distance 120 cm.

59. The distance of 3rd fringe on screen from central maxima for wavelength 6500Å is

A. $2.02mm$

B. $1.17mm$

C. $0.95mm$

D. $0.67mm$

Answer: B

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6. The least distance from the central maxima where the fringes due to both wavelength coincide is

A. $3.02mm$

B. $2.12mm$

C. $1.56mm$

D. $1.22mm$

Answer: C

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7. Questions 61 and 62 are based on following paragraph :

A Young's double slit arrangement produces interference fringes for sodium light with wavelength 5890Å that are $0.20mm$ apart.

61. Their fringe angular separation in air is

A. 0.10°

B. 0.18°

C. 0.09°

D. 0.06°

Answer: B

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8. The new angular fringe separation when apparatus is dipped in water is

A. 0.135°

B. 0.12°

C. 0.60°

D. 0.40°

Answer: A

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9. The wavelength of light observed on the earth , from a moving star is found to decrease by $0.05\,\%$ .Relative to the earth the star is :

A. Moving away with a velocity of $1.5 \times 10^5 \frac{m}{s}$

B. Coming closer with a velocity of

$$1.5 \times 10^4 \frac{m}{s}$$

C. Moving away with a velocity of

$$1.5 \times 10^4 \frac{m}{s}$$

D. Coming closer with a velocity of

$$1.5 \times 10^4 \frac{m}{s}$$

Answer: B

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10. The displacement of the interfering light wates are $y_1 = 4\sin\omega t$ and $y_2 = 3\sin\left(\omega t + \frac{\pi}{2}\right)$.The amplitude of the resultant wvae is :

A. 5

B. 7

C. 1

D. 0

Answer: A

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11. A star is moving towards the earth with a speed of $4.5 \times 10^6 \frac{m}{s}$.If the true wavelength of a certain line in the spectrum received from the star is 5890Å, its apparent wavelength will be about $\left[c = 3 \times 10^5 \frac{m}{s}\right]$.

A. 5890Å

B. 5978Å

C. 5802Å

D. 5896Å

Answer: C

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12. Due to Doppler's effect, the shift in wavelength observed is 0.1Å for a star producing wavelength 6000Å. Velocity of recession of the star will be

A. $2.5\frac{km}{s}$

B. $10\frac{km}{s}$

C. $5\frac{km}{s}$

D. $20\frac{km}{s}$

Answer: C

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13. In a Young's double slit experiment, the slits separated by 1 mm are illuminated by a mixture of two wavelengths $\lambda = 600nm$ and $\lambda' = 750nm$.The distance of screen from slits is 1 m. The minimum distance from the common central bright fringe where the

bright fringe of one interfernece pattern will coincide with the bright fringe of second interference pattern will be :

A. $0.3cm$

B. $0.3mm$

C. $0.3m$

D. $30mm$

Answer: B

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

A. 6000Å

B. 9000Å

C. 4000Å

D. 5000Å

Answer: A

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15. The velocity of a moving galaxy is $300kms^{-1}$ and the apparent change in wavelength of a spectral line emitted from the galaxy is observed as 0.5 nm. Then, the actual wavelength of the spectral line is

A. 3000Å

B. 5000Å

C. 6000Å

D. 4500Å

Answer: B

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16. How fast a person should drive his car so that the red signal of light appears green? (Wavelength of red colour = 6200Å and wavelength for green colour = 5400Å)

A. $1.5 \times 10^8 \frac{m}{s}$

B. $7 \times 10^7 \frac{m}{s}$

C. $3.9 \times 10^7 \frac{m}{s}$

D. $2 \times 10^8 \frac{m}{s}$

Answer: C

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17. In a Young's double slit experiment, the angular width of a fringe formed on distance

screen is 0.1°.The wvae length of light find spacing between the slit.

A. $3.4 \times 10^{-6} m$

B. $4.3 \times 10^{-4} m$

C. $4.3 \times 10^{-6} m$

D. $3.4 \times 10^{-4} m$

Answer: D

View Text Solution

18. In double refraction we get two refracted rays called O-ray and E - ray, then

A. only the O-ray is polarised

B. Only the E - ray is polarised

C. Both O and E rays are polarised

D. Neither O-ray nor E -rays are polarised.

Answer: C

View Text Solution

19. A parallel bema of fast moving elecyrons in incident normally on a narrow slit. A screen is placed at a large distance from the slit.If the spped if the electrons is increased, which of the following statement is correct.

A. Diffraction pattern is not observed on the screen in the case of electrons

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

C. The angular width of the central maxima will decrease

D. The angular width of the central maxima will remain the same.

Answer: C

View Text Solution

20. The two slits are 1 mm apart from each other and illuminated with a light of wavelength $5 \times 10^{-7} m$.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. $1.5mm$

B. $0.75mm$

C. $1.25mm$

D. $0.625mm$

Answer: C

View Text Solution

21. Consider Fraunhoffer diffraction pattern obtained with a single slit at normal incidence.At the angular paosition of first diffraction minimum, the phase difference between the wavelets from the opposite edges of the slit is

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

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

C. π

D. 2π

Answer: D

View Text Solution

22. θ is the polarising angle for two optical media, whose critical angles are C_1 and C_2. The correct relation is :

A. $\sin\theta = \dfrac{\sin C_1}{\sin C_2}$

B. $\tan\theta = \dfrac{\sin C_1}{\sin C_2}$

C. $\theta = \dfrac{C_2}{C_1}$

D. $\sin\theta = \dfrac{\sin C_2}{\sin C_1}$

Answer: B

View Text Solution

23. In Young's double slit experiemnt the wavelength of light was changed from 7000Å to 3500Å.While doubling the separation between slits, which of the following is not rue?

A. width of the fringe changes

B. the colour of bright fringe changes

C. separation between successive bright fringe changes

D. the separation between successive dark fringes remains same

Answer: A

View Text Solution

24. A ray of light is incident on the surface of glass plate at an angle of inceidence equal to Brewsters angle ϕ.If n represents the

refractive index of glass with respect to air, then the angle between the reflected and the refracted rays is :

A. $90 + \phi$

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

C. 90°

D. $90^\circ - \frac{\sin^{-1}(\sin \phi)}{n}$

Answer: C

View Text Solution

25. The angle of incident at whch reflected light is totally polarised fro reflection from air to glass (ref. Index n) is :

A. $\sin^{-1}(n)$

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

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

D. $\tan^{-1}(n)$

Answer: D

View Text Solution

26. The max. No. Of possible interference maxima for slit separation equal to twice the wavelength of YDSE is :

A. ∞

B. 5

C. 3

D. zero

Answer: B

View Text Solution

27. A Young' s double slit experiment uses a monochromatic source.The shape of interference fringes is :

A. parabola

B. straight line

C. circle

D. hyperbola

Answer: B

View Text Solution

28. If I_0 is the intensity of principal maxima in single slit diffraction pattern, then what is intensity, if slit width is doubled?

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

B. I_0

C. $4I_0$

D. $2I_0$

Answer: B

View Text Solution

29. A beam of electrons is used in YDSE experiment.The slit width is d. When velocity of electron is increased, then

A. no interference is observed

B. fringe width increases

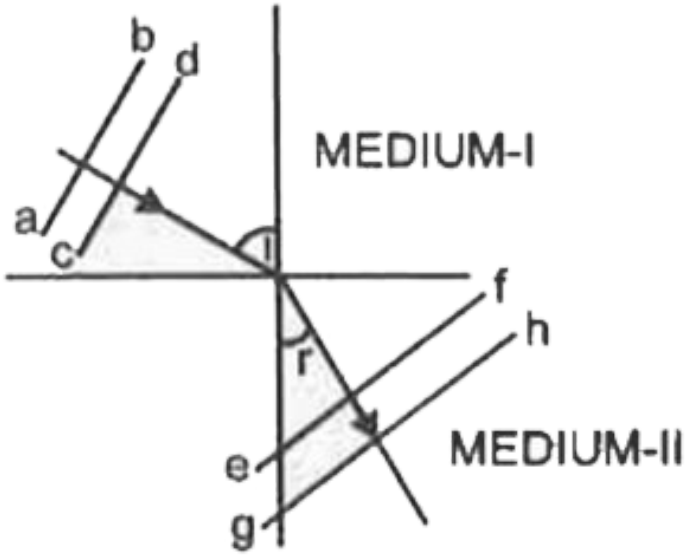
C. fringe width decreases

D. fringe width remains same

Answer: C

View Text Solution

30. The figure shows a surface XY separating two transparent media, medium - 1 and medium - 2.The lines ab and cd represent wavefronts of a light wave travelling in medium -1 and incident on XY. Then lines ef and gh represent wavefronts of the light wave in medium- medium after refraction.



84. Light travels as a

A. parallel beam in each medium

B. convrgent beam in each medium

C. divergent beam in each medium

D. divergent beam in one medium and convergent beam in the other medium.

Answer: A

View Text Solution

31. Speed of light is:

A. the same in medium-1 and medium - 2

B. larger in medium-1 than in medium -2

C. larger in medium - 2 than in medium -1

D. different at b and d

Answer: B

View Text Solution

32. Questions number 86-88 are based on the following paragraph :

An initialy parallel cylindircal beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I$, where μ_0 and $\mu(2)$ are positive constant and I is the intensity of the light beam.The intensity

of the bema is decreasing with increasing radius.

86. The initial shape of the wavefront of the beam is:

A. planar

B. convex

C. concave

D. convex near he axis and concave near the periphery.

Answer: A

View Text Solution

33. The spped of light in the medium is :

A. maximum on the axis of the beam

B. minimum on the axis of the beam

C. the same everywhere in the beam

D. directly proportional to the intensity 1.

Answer: B

View Text Solution

34. As the beam enters the medium, it will:

A. travel as a cylindrical beam

B. diverge

C. converge

D. diverge near the axis and converge near the periphery.

Answer: A

View Text Solution

Mcq Level Ii

1. Unploarised light of intensity I_0 falls on a Nicol prism.The light emerging from this Nicol Prism falls on another Nicol whose polarising axis is inclined to that of first by an ange 30° .The light emerginh from the second Nicol has the intensity:

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

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

C. $\frac{\sqrt{3}}{2} I_0$

D. $\frac{3}{8}I_0$

Answer: D

View Text Solution

2. A Fresnel's biprism is used to form the interference fringes.The distance between the source and the biprism is 20 cms and that between the biprism and the screen is 80 cm. If $\lambda = 6563\text{Å}$ and the separation between the

virtual sources is 3.6 mm, then the fringe width is :

A. $1.82cm$

B. $0.182cm$

C. $0.0182cm$

D. $0.00182cm$

Answer: C

View Text Solution

3. In a Young's double slit experiment the fringes are displaced by a distance x when a glass plate of refractive index 1.5 is introduced in the path of one of the bemas.When this plate is replaced by another plate of the same thickness, the shift of fringes is $\frac{3}{2}x$.The refractive index of the second plate is :

A. 2.25

B. 2.0

C. 1.75

D. 1.25

Answer: C

View Text Solution

4. The slits in Young's double slit experiment are 0.5 mm apart and interference pattern is observed on a screen distant 100 cm from the slits. It is found that the 9th bright fringe is at a distance of 8.835 mm. From the second dark fringe. The wavelength of light will be :

A. 7529Å

B. 6253Å

C. 6779Å

D. 5890Å

Answer: D

View Text Solution

5. Angular width of a central max is 30° when the slits is illuminated by light of wavelength 6000Å.Then width of the slit will be approx:

A. $12 \times 10^{-6} m$

B. $12 \times 10^{-7} m$

C. $12 \times 10^{-8} m$

D. $12 \times 10^{-9} m$

Answer: B

View Text Solution

6. If velocity of a galaxy relative to earth is $1.2 \times 10^{6} m s^{-1}$ then % increase in wavellenth

of light from galaxy as compared to the similar source on earth will be :

A. 0.3%

B. 0.4%

C. 0.5%

D. 0.6%

Answer: B

View Text Solution

7. Doppler shift for the light of wavelength 6000Å emitted from the sun is 0.04Å.If radius of the sun is 7×10^8 m then time period of rotation of the sun will be :

A. 30 dyas

B. 365 dyas

C. 24 hour

D. 25 days

Answer: D

View Text Solution

View Text Solution

8. On itroducing a thin mica sheet of thickness 2×10^{-6} m and refractive index 1.5 in the path of one of the waves, central bright maxima shifts by n fringes.Wavelength of the wave ised is 5000Å, then n is :

A. 1

B. 2

C. 5

D. 10

Answer: B

View Text Solution

9. Two beams of light having intensities I and 4I interfere to produce a fringe pattern on the screen.Phase differenced between the beams is $\frac{\pi}{2}$ at point A and π at point B.Then difference between the resultant intensities at A and B is :

A. 3I

B. 4I

C. 5I

D. 6I

Answer: B

View Text Solution

10. A plane relectromagentic wave from of frequency v_0 falls normally on the surfave of a mirror approaching with a relativistic velocity

v. Then frequency of the reflected wave will be (given $\beta = \frac{v}{c}$):

A. $\frac{1-\beta}{1+\beta}v_0$

B. $\frac{1+\beta}{(1-\beta)v_0}$

C. $\frac{(1+\beta)v_0}{1-\beta}$

D. $\frac{1-\beta}{(1+\beta)v_0}$

Answer: C

View Text Solution

11. A spectral line of wavelength 0.59 mm is observed in the directions to the opposite edges of the solar disc along its equator.A difference in wavelength equal to $(\Delta\lambda)$, 8 picometre is observed.Period of sun's revolution around its own axis will be about (Radius of sun = 6.95×10^8m)

A. 30 days

B. 35 days

C. 25 days

D. 365 days

Answer: C

View Text Solution

12. In Young's double slit experiemnt using monochromatic light, fringe pattern shifts by a certain distance on the screen when a mica sheet of refractive index 1.6 and thickness 1.964 mm is introduced in the path of one of the twao waves.If now mica sheet is removed

and distance between slit and screen is doubled, distance between successive max. or min. remains unchanged.The wavelength of the monochromatic light used in the experiment is :

A. 4000Å

B. 6500Å

C. 5892Å

D. 6071Å

Answer: C

View Text Solution

13. In a Y oung's double slit experiment, separation between the slits is 2×10^{-3} m and distance of the screen from the slit is 2.5 m. Light in the range of 2000 - 8000 $\mathring{A}$ is allowed to fall on the slits.Wvelength in the visible region that will be present on the screen at 10^{-3} m from the central maxima will be :

A. $4000\mathring{A}$

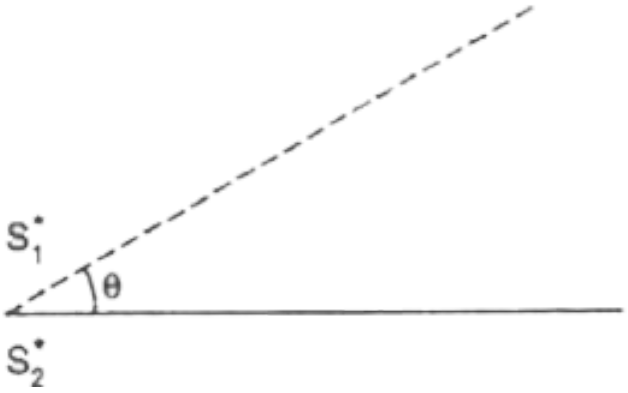
B. 5000Å

C. 6000Å

D. 8000Å

Answer: A

View Text Solution



14.

Fig. Shows two coherent sources S_1 and S_2, emitting wavelength λ.The separation $S_1S_2 = 1.51$. S_1 is ahead in phase by $\frac{\pi}{2}$ relative to S_2.The maxima occurs in a direction given by $\sin^{-1}$ of :

A. 0

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

C. $\frac{1}{6}$ only

D. $\frac{1}{2} - \frac{1}{6}$ and $-\frac{5}{6}$

Answer: D

View Text Solution

15. In a biprism experiment, the eye piece was palced at a distance of 20 cm from the source.The distance between two virtual sources was found to be 0.075 cm. Find the wavelength of source of light if the eye piece

ahs to be moved through a distance of 1.888 cm for 20 fringes to cross the field of view :

A. 5900Å

B. 2400Å

C. 3200Å

D. 4500Å

Answer: A

View Text Solution

16. 80 g of impure sugar when dissolved in a litre of water gives an optical rotation of 9.9° when placed in a tube of length 20 cm.If the specific rotation of sugar is 66°, find percentage purity of sugar solution:

A. $93.75\ \%$

B. $72\ \%$

C. $56\ \%$

D. $32\ \%$

Answer: A

View Text Solution

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

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: C

View Text Solution

18. The distance between the slit and biprism and screen and biprism are 50 cm each.The obtuse angle of biprism is 179° and its refractive index is 1.5. If the distance between

successive fringes is 0.135 mm, the wavelength of light used is :

A. 5893Å

B. 11786Å

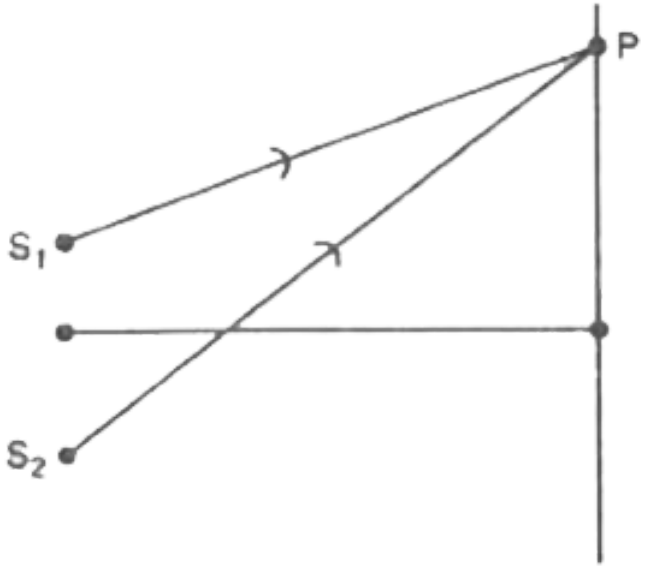
C. 2946Å

D. 6574Å

Answer: B

View Text Solution

19. In an interference pattern the path difference between waves starting from S_1 and S_2 and reaching at P is 1.5 microns i.e. $S_2P - S_1P = 1.5$ microns. If the wavelength of light used be 6000Å, then the point P is :



A. II nd Max.

B. II nd Min.

C. Third min.

D. Fourth min.

Answer: C

View Text Solution

20. A slit of width d is placed in front of a lens of focal length $0.5m$ and is illuminated normally with light of wavelength 5.89×10^{-7} m. The first diffraction minima on either side

of the central max. Are separated by 2×10^{-3} m. The width of the slit is :

A. 1.47×10^{-4} m

B. 2.29×10^{-4} m

C. 1.47×10^{-7} m

D. $2.29 \times 10^{-7} m$

Answer: B

View Text Solution

21. In a double slit experiment using monochromatic light, the fringe patern shifts by a certain distance on the screen when a mica sheet of $\mu = 1.6$ and thickness $t = 1.964 \mu m$ is introduced in the path of the one of the interfering waves.The mica sheet is then removed and the distance between the slits and the screen is doubled.It is found that the distance between successive max. or min. is now the same as the observed fringe shift

upon introducing of the mica sheet. Calculate the wavelength of light used in experiement:

A. 3246Å

B. 5892Å

C. 6257Å

D. 7825Å

Answer: B

View Text Solution

22. In a biprism, 21 fringes are distinctly seen on screen at a distance of 1 m, when the sources are 0.5 mm apart, what is the coherent length and coherent time of the set up .($\lambda = 6000\text{Å}$):

A. $2 \times 10^{-14}\,\text{sec}$

B. $2 \times 10^{-5}\,\text{sec}$

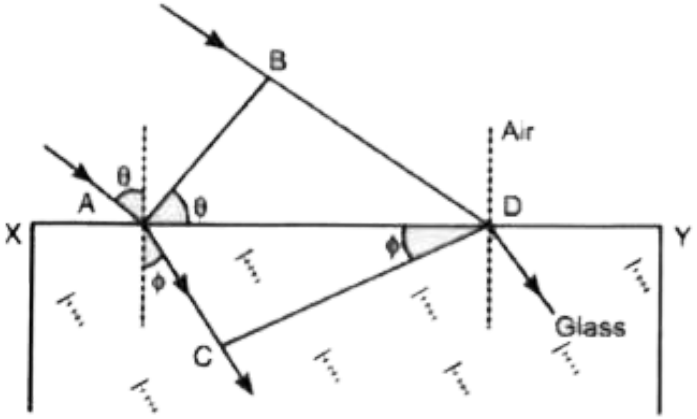
C. $3 \times 10^{-4}\,\text{sec}$

D. $3 \times 10^{-5}\,\text{sec}$

Answer: A

View Text Solution

23. A wavefront AB moving in air is incident on a plane glass surface XY as given in figure.Its position CD after refraction through the glass slab is shown along with normals A to D. The refractive index of glass w.r.t. Air will be equal to :



A. $\frac{BD}{AC}$

B. $\frac{AB}{CD}$

C. $\frac{BD}{AD}$

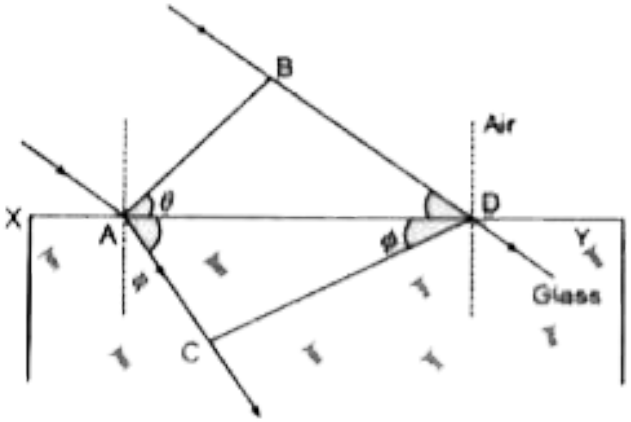
D. $\frac{AC}{AD}$

Answer: A

View Text Solution

24. A wavefront AB moving in air is incident on a plane glass surface XY as given in figure.Its position CD after refraction through the glass

slab is shown along with normals A to D. The refractive index of glass w.r.t.air is given by :



A. $\frac{BD}{AC}$

B. $\frac{\sin\theta}{\sin\phi}$

C. $\frac{\sin\phi}{\sin\theta}$

D. $\frac{AB}{CD}$

Answer: B

View Text Solution

25. A broad source of light $\lambda = 6800\text{Å}$ illumintates normally two glass plates 12 cm long. They touch at one end and are separated by a wire 0.048 mm. In diameter at the other end.How many bright fringes appear over the 12 cm. Distance.

A. 141

B. 120

C. 101

D. 151

Answer: A

View Text Solution

26. Two coherent sources of intensity ratio β interfere, the $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ is:

A. $\frac{\beta}{1+\beta}$

B. $\frac{2\sqrt{\beta}}{1+\sqrt{\beta}}$

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

D. $\frac{2\beta}{1+\sqrt{\beta}}$

Answer: C

View Text Solution

27. Two identical sources of light are separated through a distance $d = \frac{\lambda}{8}$, where λ is the wavelength of the waves emitted by either source. The phase difference of the sources is

$\frac{\pi}{4}$.Intensity distribution in the radiation field as a function of θ is :

A. $4I_0 \frac{\cos^2(\pi)}{4}$

B. $4I_0 \frac{\cos^2(\pi)}{8}$

C. $4I_0 \cos^2\left[\frac{\pi}{8}\sin\theta\right]$

D. $4I_0 \cos^2\left[\frac{\pi}{8}(\sin\theta + 1)\right]$

Answer: D

View Text Solution

28. White light reflected at normal incidence from a soap film, has maximum at 6000Å and the minimum at 4500Å in the visible region with no minimum in between.If $\mu = 1.33$ for the film, the thickness of the film is :

A. $0.23\mu m$

B. $0.34\mu m$

C. $0.44\mu m$

D. $0.5\mu m$

Answer: B

View Text Solution

29. White light of spectral range 4000 - 7000 $\mathring{A}$ is incident normally on a soap film of uniform thickness 0.0004 mm and $\mu = 1.3$. The wvaelengths of the light which are strongly reflected are :

A. 4000 and 6000 $\mathring{A}$

B. 4500 and 6500 $\mathring{A}$

C. 4160 and 6933 $\mathring{A}$

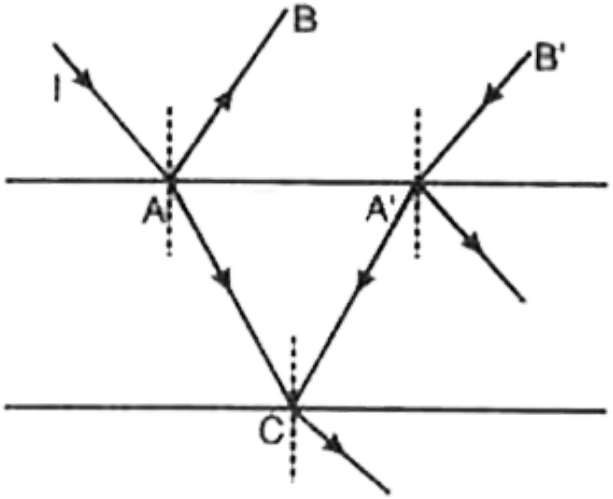
D. 5240 and 6730 Å

Answer: C

View Text Solution

30. A ray of light of intensity I is incident on a parallel glass slab at a point A as shown.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 $\frac{I_{\max}}{I_{\min}}$ is :



A. $4:1$

B. $8:1$

C. $7:1$

D. $49:1$

Answer: D

View Text Solution

31. Light from a source emitting two wavelengths λ_1 and λ_2 is made tyo fall on Young's double slit appratus after filtering one of the wavelengths.The position of interference pattern is noted.When filter is removed, both the wavelength are incident.It is found that maximum intentsity is produced where the fourth maxima occured intially. If the other wvaelength is filtered, at the same

location, the third maxima is found. What is the ratio of wavelengths?

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

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

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

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

Answer: B

View Text Solution

32. Two light rays having the same wavelength λ in vacuum are in phase initially. Then the first ray travels a path L_1 through a medium of refractive index n_1 while the second ray travels a path of length L_2 through a medium of refractive index n_2. The two waves are then combined to observe interference. The phase difference between the two waves is :

A. $\frac{2\pi}{\lambda}(L_2 - L_1)$

B. $\frac{2\pi}{\lambda}(n_1 L_2 - n_2 L_1)$

C. $\frac{2\pi}{\lambda}(n_2 L_1 - n_1 L_2)$

D. $\frac{2\pi}{\lambda}\left(\frac{L_1}{n_1}-\frac{L_2}{n_2}\right)$

Answer: B

View Text Solution

33. Young's duble slit experiment is set up in a liquid.The 10th bright fringe in the liquid lies where the 6th dark fringe lies in vacuum. The refractive index of the liquid is approximately :

A. 1.8

B. 1.54

C. 1.67

D. 1.2

Answer: A

View Text Solution

Mcq Level Ii Assertions

1. Statement I : If phase difference between the light waves emerging from slits of Young's

experiment is π radian, then central fringe will be dark.

Statement II : Light from two coherent sources is reaching screen. If path difference at a point on the screen for the yellow light is $\frac{3\lambda}{2}$, then the fringe at that point is coloured, bright.

A. Statement I is true, statement II is false.

B. Statement I is false, statement II is true

C. Statement I is true, statement II is true. Statement II is correct explanation of statement I.

D. Statement I is true, statement II is true and statement I is not correct explanation of statement II.

Answer: A

View Text Solution

2. Statement I : The air film in Newton's rings apparatus is replaced by an oil film. The radii of the rings, decreases.

Statement II : A slit of width 'a' is illuminated

by white light. The first minima for red light $(\lambda = 6500\text{Å})$ will fall at $\theta = 30^\circ$ when value of a is 1.3 micron.

A. Statement I is true, statement II is false.

B. Statement I is false, statement II is true

C. Statement I is true, statement II is true and statement I is correct explanation of statement II

D. Statement I is true, statement II is true and statement II is not correct

explanation of statement I.

Answer: A

View Text Solution

Mcq Level Ii Paragraph Questions

1. Questions 124 and 125 are based on paragraph given below: Unpolarised light of intensity 32 W m^{-2} passes through three polarisers such that transmission axis of last

polariser is crossed with first, the intensity of emergent light is 3 Wm^{-2}.

124. The nagle between transmission axis of first two polarisers is

A. 10°

B. 20°

C. 30°

D. 40°

Answer: A

View Text Solution

2. The angle at which transmission intensity is max. Is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: C

View Text Solution

3. Two towers on top of two hills are 40 km apart. The line joining them passes 50 m above a hill halfway between the towers. What is the longest wavelength of radio waves, which can be sent between the towers without apprreciable diffraction effects?

A. $5.2cm$

B. $7.5cm$

C. $12.5cm$

D. $15.2cm$

Answer: B

View Text Solution

4. Light passes successively through two polarimeter tubes each of length 0.29m. The first tube contains dextrorotatory solution of concentration 60 kg m^{-3} and specific rotation 0.01 rad m^2kg^{-1}. The second tube contains laevo-rotatory solution of concentration 30 kg m^{-3} and specific rotation 0.2 rad m^2kg^{-1}.The net rotation produced is :

A. 15°

B. 0°

C. 20°

D. 10°

Answer: C

View Text Solution

5. The human eye has an approximate angular resolution of $\phi = 5.8 \times 10^{-4}$ rad and a typical photprinter prints a minimum of 300

dpi (dots per inch = 2.54 cm). At what minimal distance z should a printed page be held so that one does not see the individual dots ?

A. 10 cm

B. 12.5 cm

C. 13 cm

D. 14.5 cm

Answer: B

View Text Solution

6. For the same objective , the ratio of the least separation between two points to be distinguisghed by a microscope for light of 5000Å and electrons accelerated through 100 V used as the illuminating substance is

A. 10^{-3}

B. 0.5×10^{-3}

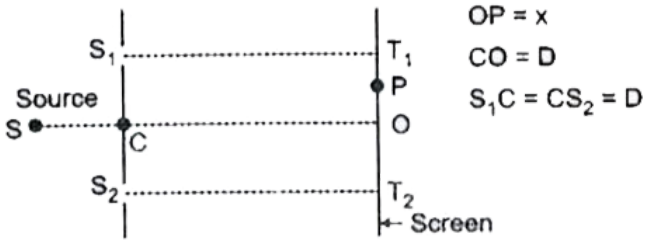
C. 0.2×10^{-3}

D. 10^{-4}

Answer: C

View Text Solution

7. Consider a two slit interferennce arrangements such that the distance of the screen from the slits is half the distance between the slits.That the first minima on the screen falls at a distance D from the centre O, then D is



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

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

C. $\frac{\lambda}{2\sqrt{5}}$

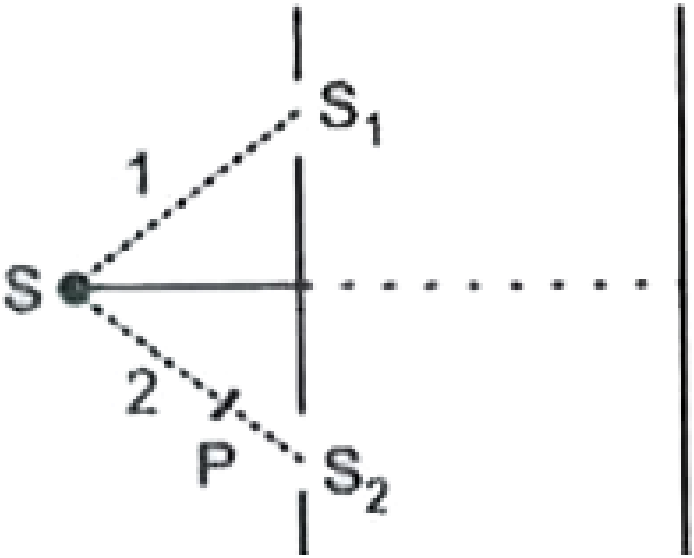
D. $\frac{\lambda}{\sqrt{3}}$

Answer: C

View Text Solution

8. Figure shows 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 then the intensity of the principal maxima as well as of the first minima are



A. $\frac{I_0}{2}, \frac{I_0}{3}$

B. $\frac{5I_0}{8}, \frac{I_0}{8}$

C. $\frac{3I_0}{2}, \frac{5I_0}{2}$

D. $\frac{I_0}{2}, \frac{I_0}{5}$

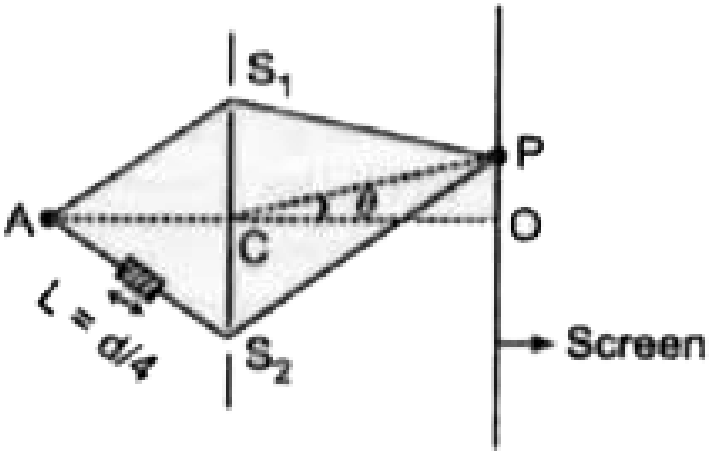
Answer: B

View Text Solution

9. AC = CO = D , $S_1C = S_2C = d < \ < D$

A small transparent slab containing material of $\mu = 1.5$ is placed along AS_2. What will be

the distance from O of the principal maxima



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

B. $-\frac{D}{5}$

C. $\frac{D}{10}$

D. $-\frac{D}{16}$

Answer: D

View Text Solution

10. A beam of light is passed through a polaroid and the latter is rotated with the beam of light as axis. The intensity of the emergent light varies between a maximum and a minimum.Then the light used is :

A. a mixture of elliptically polarised and unpolarised light only

B. elliptically polarised light only

C. Either (a) or (b)

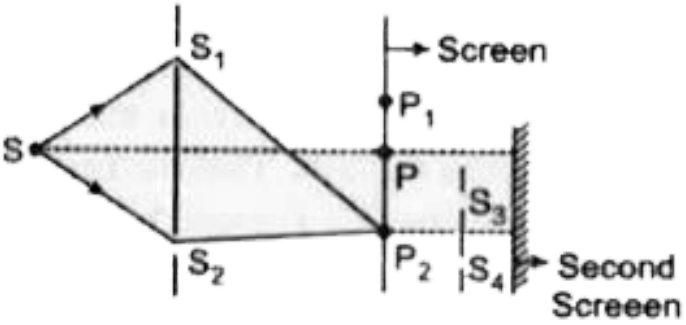
D. Neither (a) nor (b)

Answer: A

View Text Solution

11. Figure shows a two slit arrangement with slits S_1, S_2, P_1, P_2 are the two minima ponts on either side of P(Fig). At P_2 on the screen, there is a hole and behind P_2 is a second 2-slit arranngement 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.

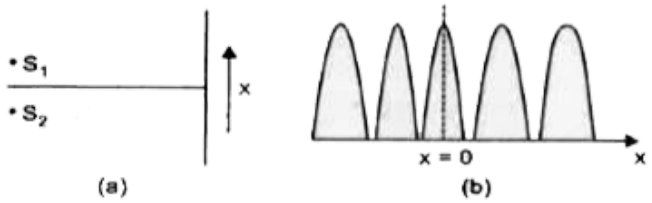
D. There would be a regular two slit pattern on the second screen.

Answer: D

View Text Solution

12. Two source S_1 and S_2 of intensity I_1 and I_2 are placed in front of a screen [Fig. A]. The pattern of intensity distribution seen in the central portion is given by Fig.(b). In this case

which of the following statements are true



(a)

A. S_1 and S_2 have the same intensities.

B. S_1 and S_2 have a constamt 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

View Text Solution

13. Consider sunlight incident on a pinhole of width 10^3Å. The image of the pinhold seen on a screen shall be

A. a sharp white ring

B. different from a geometrical image.

C. a diffused central spot, white in colour.

D. diffused coloured region around a sharp central white spot.

Answer: B::D

View Text Solution

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

A. $2.2mm$

B. $3.4mm$

C. $5.71mm$

D. $6.2mm$

Answer: C

View Text Solution

15. Fraunhoffer diffraction experiment at a single slit using light of wavelength 400 mm, the first minima is formed at an angle of 30°.

Then the direction θ of the first secondary maximum is given by :

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

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

C. 60°

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

Answer: B

View Text Solution

16. Two beams of light having intensities I and 4I interfere to produce a fringe pattern on the screen.Phase differenced between the beams is $\frac{\pi}{2}$ at point A and π at point B.Then difference between the resultant intensities at A and B is :

A. 2I

B. 4 I

C. 5 I

D. 7 I

Answer: B

View Text Solution

17. In double slit experiment, when a glass plate of $\mu = 1.5$ ans thickness t is introduced in path of one of the interfering beams of wavelengths λ, the intensity at position of central maxima remains unchanged. Minimum thickness of glass plate is :

A. 2λ

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

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

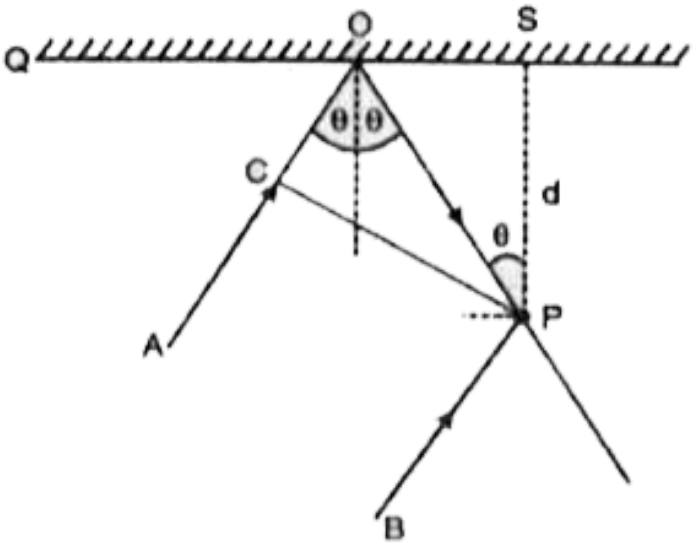
D. λ

Answer: A

View Text Solution

18. On fig. CP represents a wavefront and AO and BP, the corresponding two rays. Find the condition on θ for constructive interference at

P between the ray BP and reflected ray OP :



A. $\cos\theta = \frac{3}{2}\frac{\lambda}{d}$

B. $\cos\theta = \frac{\lambda}{4d}$

C. $\sec\theta - \cos\theta = \frac{\lambda}{4d}$

D. $\sec\theta - \cos\theta = \frac{4\lambda}{d}$

Answer: B

View Text Solution

19. In a Young's double slit experiment, bi - chromatic light of wavelengths 400 nm and 560 nm are used.The distance between slits is 0.1 mm and distance between plane of slits and screen is 1 m.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

View Text Solution

20. Two pointa white dots are 1 mm apart on a black paper.They are viewed by eye of pupil of diameter 3 mm. Nearly what is max. Distance at which these dots can be resolved by eye?(λ of light is 500 mm)

A. 3 m

B. 6 m

C. 1 m

D. 5 m

Answer: D

View Text Solution

21. When an unpolarised light of intensity I_0 is incident on a polarised sheet, the intensity of light which does not get transmitted is :

A. I_0

B. zero

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

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

Answer: D

View Text Solution

22. In Young's double slit experiment, the intensity at a point is 1/4 of maximum intensity, angular position of this point is ?

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

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

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

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

Answer: C

View Text Solution

23. The intensity at a point where the path difference is $\frac{\lambda}{6}$ (λ being the wavelength of the

light used) is I. If I_0 denotes the maximum intensity, $\frac{I}{I_0}$ is equal to :

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

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

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

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

Answer: C

View Text Solution

24. 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 fringe by 10%, the necessary change in the wavelength is :

A. increase of 589Å

B. decrease of 589Å

C. increase of 6479Å

D. zero

Answer: B

View Text Solution

25. A mixture of light, consisting of wavelength 590 nm and unknown wavelength, illuminates Young's double slit and gives rise to two overlapping interference patterns on the screen.The central maximum of both lights coincide.Futther, it is observed that the third bright fringe of known light coincides with the 4th bright firnge of the unknown light.From this data, the wavelength of the unknown light is :

A. $442.5nm$

B. $776.8nm$

C. $393.4nm$

D. $885.0nm$

Answer: A

View Text Solution

26. Questions numbers 149-150 are based on the following paragraph :

A nucleus of mass M + Δm is at rest and

decays into two daughter nuclei of equal mass $\frac{M}{2}$ each. Spped of light is c.

149. The speed of daughter nuclei is :

A. $c\sqrt{\frac{\Delta m}{M+\Delta m}}$

B. $c=\frac{\Delta m}{M+\Delta m}$

C. $c=\sqrt{\frac{2\Delta M}{M}}$

D. $c\sqrt{\frac{\Delta m}{M}}$

Answer: C

View Text Solution

27. The binding energy per nucleon for the parent nucleus is E_1 and that for the daughter nuclei is E_2. Then :

A. $E_1 = 2E_2$

B. $E_2 = 2E_1$

C. $E_1 > E_2$

D. $E_2 > E_1$

Answer: D

View Text Solution

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

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

B. If $\lambda < d < 2\lambda$ at least one more maximum (besides the central

maximum) will be observed on the screen.

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

D. If the intensity of light falling on slit 2 is increased so that it becomes equal to that of slit 1, the intensities of the

observed dark and bright fringes will increase.

Answer: A::B

View Text Solution

Mcq Level Iii

1. The question has a paragraph followed by two statements, Statement - 1 and Sstatement - 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 planeglass 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 changing of π.

Statement - 2 : The centre of the interference pattern is dark.

A. Statement -1 is true, statement -2 is true, Statement - 2 is the correct explanantion of Statement - 1.

B. Statement -1 is true, statement -2 is true, Statement - 2 is not the correct explanation of Statement - 1.

C. Statement -1 is false, Statement -2 is true.

D. Statement - 1 is true, Statement -2 is false.

Answer: A

View Text Solution

2. At two points P and Q on a 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. $2:1$

B. $\sqrt{2}:1$

C. $4:1$

D. $3:2$

Answer: A

View Text Solution

3. In a Young's double slit experiment, two slits act as cherent sources of waves of equal amplitude A and wavelength λ. In another

experiment with the same arrangement the two slits are made to act as incoherent sources of waves of same amplitude and wvaelenght. If the intensity at the middle point of the screen in the first case is I_1 and in the second case is I_2 then the ratio $\frac{I_1}{I_2}$ is :

A. 2

B. 1

C. 0.5

D. 4

Answer: A

View Text Solution

4. 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 sunlight by particles in the atmosphere.The scattering is largest for blue light.

A. Statement -1 is true, Statement -2 is false.

B. Statement -1 is true, statement -2 is true, Statement - 2 is not the correct explanation of Statement - 1.

C. Statement -1 is true, Statement -2 is true,Statement- 2 is not the correct explanation of Statement -1.

D. Statement -1 is false, Statement -2 is true.

Answer: B

View Text Solution

5. In Young' s double slit experiment, one of the slit is wider than other, s that the 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. $\frac{I_m}{9}\left(1+8\cos^2\frac{\theta}{2}\right)$

B. $\frac{I_m}{9}(4+5\cos\phi)$

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

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

Answer: A

View Text Solution

6. Young's double slit experiment is carried out by using green , redm and blue light, one color at 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

View Text Solution

7. A beam of unpolarised light of intensity I_0 is passed through a polaroid A 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. $\frac{I_0}{2}$

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

C. $\frac{I_0}{8}$

D. I_0

Answer: B

View Text Solution

8. Two coherent point sources S_1 and S_2 are separated by a small distance 'd' as shown. The fringes obtained on the screen will be :

A. staright lines

B. semi - circles

C. concentric circles

D. points

Answer: C

View Text Solution

9. 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 intensity), 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. $\frac{1}{3}$

B. 3

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

D. 1

Answer: A

View Text Solution

10. 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

Huygen's principle 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

View Text Solution

Recent Competitive Questions

1. The wavelength of the light used in Young's double slit experiment is λ.The intensity at a point on the screen is I, where the path difference is $\frac{\lambda}{6}$. If I_0 denotes the maximum intensity, then the ratio of I and I_0 is :

A. 0.866

B. 0.5

C. 0.707

D. 0.75

Answer: D

View Text Solution

2. What is the minimum thickness of a thin film required for constructive interference in the reflected light from it? Given, the refractive index of the film = 1.5, wavelength of the light incident on the film = 600nm

A. 100 nm

B. 300 nm

C. 50 nm

D. 200 nm

Answer: A

View Text Solution

3. Wave front is the locus of all points, where the particles of the medium vibrate with the same

A. phase

B. amplitude

C. frequency

D. period

Answer: A

View Text Solution

4. Two monochromatic light waves of amplitude 3A and 2A interfering at a point have a phase difference of 60°. The intensity at that point will be proportional to

A. $5A^2$

B. $13A^2$

C. $7A^2$

D. $19A^2$

Answer: D

View Text Solution

5. Consider the following statements in case of Young's double slit experiment.

1. A slit S is necessary if we use an ordianry

extended source of light.

2. A slit S is not needed if we use an ordinary but well collimated beam of light.

3. A slit S is not needed if we use a spatially coherent source of light

Which of the above statements are correct?

A. 1, 2 and 3

B. 1 and 2

C. 2 and 3

D. 1 and 3

Answer: C

View Text Solution

6. A parallel beam of light of wavelength 6000Å gets diffracted by a single slit of width 0.3 mm. The angular position of the first minima of differacted light is :

A. 2×10^3 rad

B. 3×10^3 rad

C. 1.8×10^{-3} rad

D. 6×10^{-3} rad.

Answer: A

View Text Solution

7. In Young's double slit experiment, fringes of width β are produced on a screen kept at a distance of 1 m from the slit. When the screen is moved away by 5×10^{-2}m, fringe width changes by 3×10^{-5} m. The separation between the slits is 1×10^{-5} m. The wavelength of the light used is :

A. 400 nm

B. 500 nm

C. 600 nm

D. 700 nm

Answer: C

View Text Solution

8. For sustained interference fringes in duble slit experiment, essential condition/s is /are

1. sources must be coherent.

2. the intensities of the two sources must be equal. Here, the correct option/s is /are

A. Neither (1) nor (2)

B. Both (1) and (2)

C. Only (1)

D. Only (2)

Answer: B

View Text Solution

9. In single slit experiment, the width of the slit is reduced. Then, the linear width of the principal maxima

A. decreases but becomes less bright

B. increases but becomes less bright

C. decreases but becomes more bright

D. increases but becomes more bright.

Answer: B

View Text Solution

10. If the two slits in Young's double slit experiment are of unequal width, then

A. the dark fringes are not perfectly dark

B. the bright fringes will have unequal spacig

C. the bright fringes will have unequal brightness

D. the fringes do not appear.

Answer: A

View Text Solution

11. The phenomenon of polarization shows that light has .....nature.

A. dual

B. particle

C. transverse

D. longitudinal

Answer: C

View Text Solution

12. Which of the following is incorrect?

A. Diffraction' helps us to distinguish between sound wave and light wave

B. If the wave is longitudinal, it must be a mechanical wave

C. If the wave is mechanical, it may or may not be a transverse wave

D. Mechanical waves cannot propagate in vacuum.

Answer: B

View Text Solution

13. Which of the following phenomena support the wave theory of light?

(1)Scattering

(2) Interference

(3) Diffraction

(4) Velocity of light in a denser medium is less than the velocity of light in the rare medium :

A. 1, 2 and 3

B. 1, 2 and 4

C. 2, 3 and 4

D. 1, 2 and 4.

Answer: A

View Text Solution

14. A fringe width of a certain interferences pattern is $\beta = 0.002$ cm. What is distance of 5th dark fringe from centre ?

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

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

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

D. $3.28 \times 10^{6} cm$

Answer: A

View Text Solution

15. A polarized light of intensity I_0 is passed through another polarizer whose pass axis makes an angle of 60° with the pass axis of the former.What is the intensity of emergent polarized light from second polarizer ?

A. $I = I_0$

B. $I = \frac{I_0}{6}$

C. $I = \frac{I_0}{5}$

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

Answer: D

View Text Solution

16. In a Young' sdouble slit experiment the slit separation is 0.5 m and distance of screen is 5m. For a monochromatic light of wavelength 500nm, the distance of 3^{rd} maxima from 2^{nd} minima on the other side is :

A. $2.5mm$

B. $2.25mm$

C. $2.75mm$

D. $22.5mm$

Answer: D

View Text Solution

17. The polarizing angle of glass is 57° .A ray of light which is incident at this angle will have an angle of refraction as :

A. 33°

B. 38°

C. 25°

D. 43°

Answer: A

View Text Solution

18. To observe diffraction, the size of the obstacle :

A. should be $\frac{\lambda}{2}$, where λ is the wavelength.

B. should be of the order of wavelength

C. has no relation to wavelength.

D. should be much larger than the wavelength.

Answer: B

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