PHYSICS

BOOKS - CP SINGH PHYSICS (HINGLISH)

WAVE NATURE OF LIGHT

Example

1. Two sources of intensity I and 4I are used in an interference experiment. Find the intensity

at a point where the waves from two sources superimpose with a phase difference of (a) zero, (b) $\pi / 2$, (c) π and (d) ratio of maximum and minimum intensity.

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2. Two coherent sources of light of intensity ratio β produce interference pattern. Prove that in the interferencepattern

$$\frac{I_{\max} - I_{\min}}{I_{\max} + (I_{\min})} = \frac{2\sqrt{\beta}}{1 + \beta}$$

where $I_{\max}$ and $I_{\min}$ are maximum and mininum intensities in the resultant wave.

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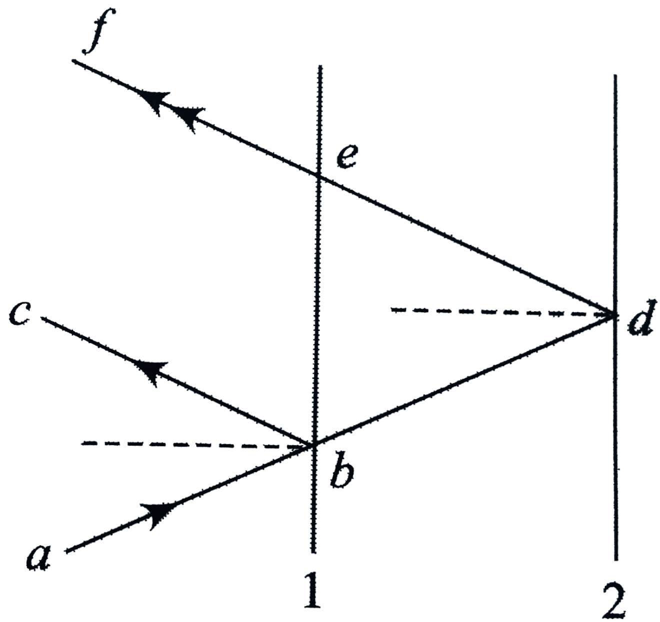
3. A narrow monochromatic beam of light of intensity 1 is incident on a glass plate as shown in figure Another identical glass plate is kept close to the first one and parallel to it. Each glass plate reflects 25% of the light incident on it and transmits intensities in the interference pattern formed by two beams obtained after one reflection at each plate.



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4. In Young's double slit expriment, separation between slits is $1mm$, distance of screen from slits is $2.5m$. If wavelength of incident light is $400nm$. Determine

(a) Fringe width.

(b) Angular frige width.

(c) Distance between 4^{th} bright fringe and 3^{rd} dark fringe.

(d) If whole arrangement is immersed in water $(\mu_{\omega} = 4/3)$, new angular fringe width.

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

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6. A beam of light consisting of two wavelengths $650 nm$ and $520 nm$ is used to obtain interference fringes in a Young's double slit experiment.

(a) Find the distance of the third bright fringe on the screen from the central maximum for the wavelength $650 nm$.

(b) What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide? The distance between the slits is $2 mm$ and the distance between the plane of the slits and screen is $120 cm$.

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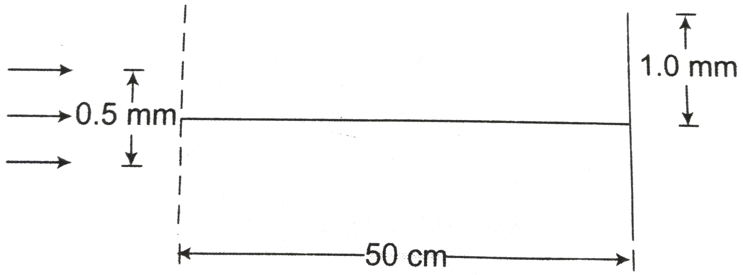
7. White coherent light $(400 nm - 700 nm)$ is sent through the slits of a YDSE. $D = 0.5 mm$, D=50 cm. There is a hole in the screen at a point $1.0 mm$ away (along the width of the fringes) from the central line.

(a) Which wavelength will be absent in the light coming from the hole?

(b) Which wavelength(s) will have a strong intensity?



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8. In a YDSE, the separation between slits is $2mm$ where as the distance of screen from the plane of slits is $2.5m$. Light of wavelengths in the range $200 - 800nm$ is allowed to fall on the slits. Find the wavelengths in the visible region that will be present on the screen at $1mm$ from central maximum. Also find the wavelength that will be present at that point of screen in the infrared as well as in the ultraviolet region.

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9. White light is used to illuminate the two slits in a Young's double slit experiment. The separation between the slits is b and the screen is at a distance d`(gtb) from the slits. At a point on the screen directly in front of one of the slits, certain wavelength are missing. Some of these missing wavelength are

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10. In a Young's double slit interference experiment the fringe pattern is observed on a screen placed at a distance D from the slits. The slits are separated by a distance d and are illuminated by monochromatic light of wavelength λ. Find the distance from the central point where the intensity falls to (a) half the maximum, (b) one fourth of the maximum.

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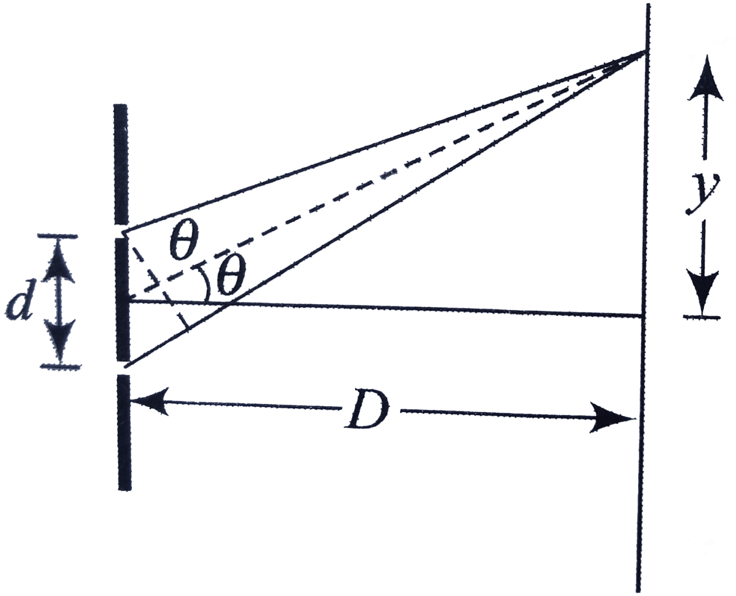
11. In an interference arrangement similar to double-slit experiment, S_1 and S_2 are illuminated with coherent source microwave source each of frequency 1 MHz. the sources are synchronized to have zero phase difference . This slits are separated by distance $d = 150.0m$ The intensity $I(\theta)$ is measured as a funciton of θ, where θ is defined as shown in figure. If I_0 is maximum intensity, calculate $I(\theta)$

For :

a. $\theta = 0$ b. $\theta = 30^\circ$

c. $\theta = 90^\circ$



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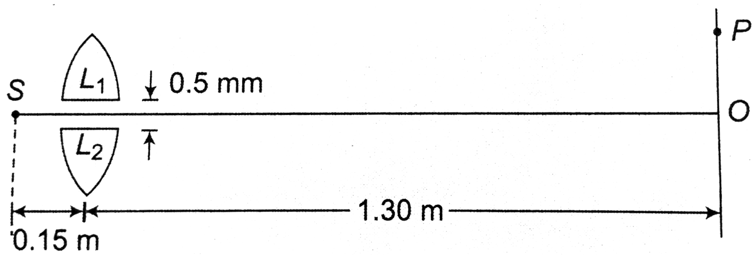
12. In figure S is a monochromatic point source emitting light of wavelength $\lambda = 500 nm$. A thin lens of circular shape and focal length

$0.10m$ is cut into two identical halves L_1 and L_2 by a plane passing through a doameter. The two halves are placed symmetrically about the central axis SO with a gap of $0.5mm$. The distance along the axis from A to L_1 and L_2 is $0.15m$, while that from L_1 and L_2 to O is $1.30m$. The screen at O is normal to SO.

(a) If the 3^{rd} intensity maximum occurs at point P on screen, find distance OP.

(b) If the gap between L_1 and L_2 is reduced from its original value of $0.5mm$, will the distance OP increases, devreases or remain the same?



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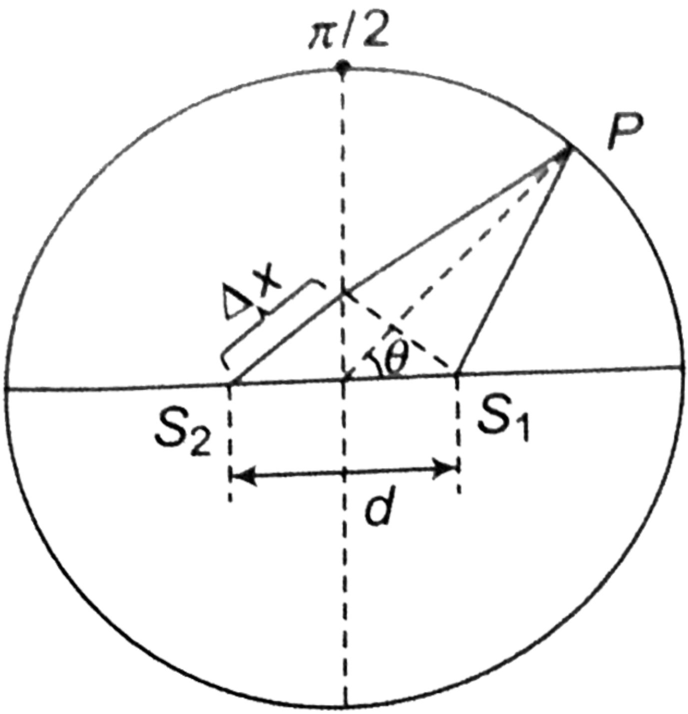
13. Two coherent radio-frequency point sources separated by $2.0m$ are radiating in phase with $\lambda = 0.50m$. A detector moves in a circuit of large radius around the two sources in a plane containing them as shown in figure. Find (a) the angular position of interference maxima for $0 \leq \theta \leq 90^{\circ}$ and (b) number of maximum in the range $\left(-\frac{\pi}{2}\right) \leq \theta \leq \frac{\pi}{2}$ and in one complete rotation.



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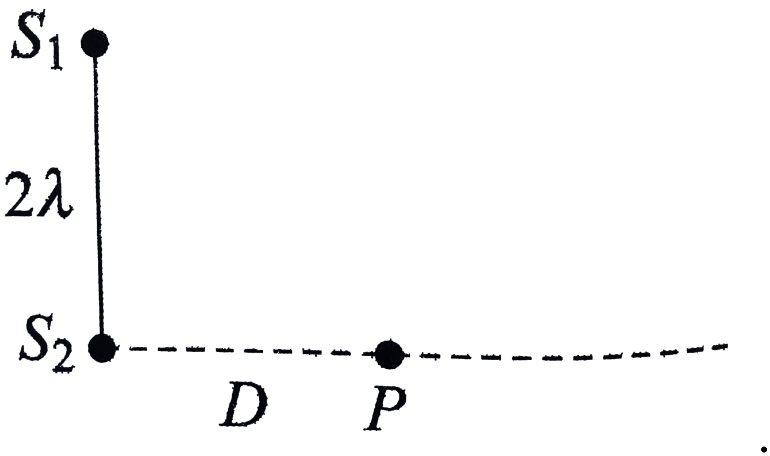
14. Two coherent point sources S_1 and S_2 vibrating in phase emit light of wavelength λ. The separation between the sources is 2λ. Consider a line passing through S_2 and perpendicular to line S_1S_2. Find the position of farthest and nearest minima.



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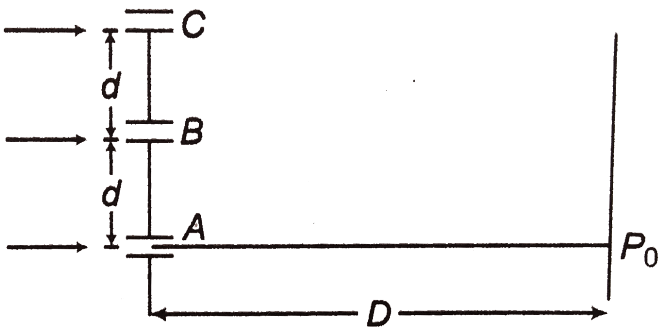
15. figure shows three equidistant slits illuminated by a monochromatic parallel beam of light. Let $BP_0 - AP_0 = \frac{\lambda}{3}$ and $D > > \lambda$.



(a) Show that d = $\sqrt{(2\lambda D) / 3}$

(b) Show that the intensity at P_0 is three times the intensity due to any of the three slits individually.

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16. A parallel beam of monochromatic light is used in a Young's double slit experiment. The slits are separated by a distance d and the screen is placed parallel to the plane of the slits. Show that if the incident beam makes an angle $\theta = \sin^{-1}\left(\frac{\lambda}{2d}\right)$ with the normal to the plane of the slits, there will be a dark fringe at the centre Po of the pattern.

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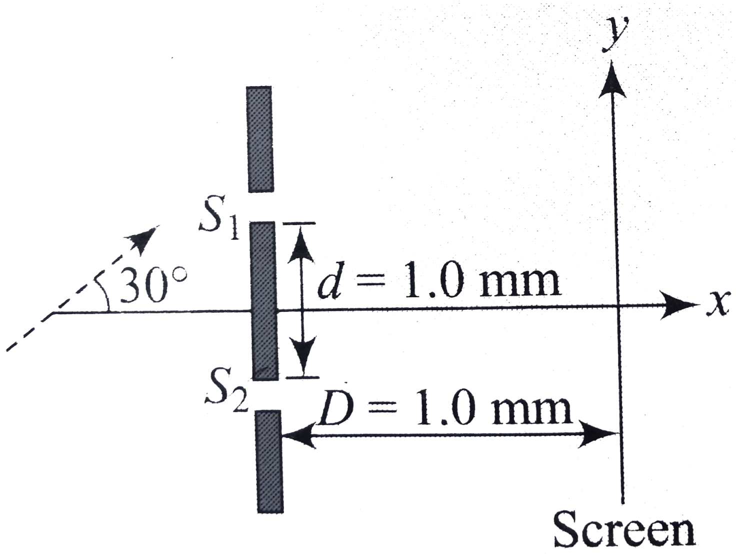
17. A coherent parallel beam of microwaves of wavelength $\lambda = 0.5mm$ falls on aYoung's double- slit apparatus. The separation between the slits is 1.0 mm. The intensity of microwaves is measured on a screen placed parallel to the plane of the slits at a distance of 1.0 m from it as shown in Fig. 2.42.

If the incident beam makes an angle or 30° with the x-axis (as in the dotted arrow shown in the figure), find the y-coordinates of the first minima on either side of the central maximum.



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18. In YDSE using monochromatic light the fringe pattern shifts by a certain distance on the screen when a mica sheet of refractive index 1.6 and thickness 1.964 microns is introduced in the path of one of the interfering waves. The mica sheet is then removed and the distance between the plane of slits and the screen is doubled. It is found that the distance between successive maxima (or minima) now is the same as the observed fringe shift upon the introduction of the mica sheet. Calculate the wavelength of the light.

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19. A monochromatic light of $\lambda = 500nm$ is incident on two identical slits separated by a distance of $5 \times 10^{-4}m$. The interference pattern is seen on a screen placed at a distance of $1m$ from the plane of slits. A thin glass plate of thickness $1.5 \times 10^{-6}m$ and refractive index $\mu = 1.5$ is placed between one of the slits and the screen. Find the intensity at the centre of the screen if the intensity is I_0 in the absence of the plate. Also find the lateral shift of the central maxima and number of fringes crossed through centre.

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20. A thin paper of thickness 0.02 mm having a refractive index 1.45 is pasted across one of the slits in a YDSE. The paper transimits $4/9$ of the light energy falling on it.

a. Find the ratio of maximum intensity to the minimum intensity in interference pattern.

b. How many fringes will cross through the center if an indentical paper piece is pasted on the other slit also? The wavelength of the light used is 600 nm.

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21. In YDSE, the sources is red ligth of wavelength $7 \times 10^{-7} m$. When a thin glass plate of refractive index 1.5 is put in the path of one of the interfering beams, the central bright fringe shifts by 10^{-3} m to the position previously occupied by the 5th bright fringe.

If the source is now changed to green light of wavelength $10^{-7} m$, the central fringe shifts to a position initially occupied by the sixth bright fringe due to red ligth. What will be refractive index of glass plate for the second ligth for changed source of ligth?

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22. A double slit apparatus is immersed in a liquid of refractive index 1.33. It has slit and the screen 1 mm. The slits are illuminated by a parallel beam of light whose wavelength in air is $6300 \mathring{A}$

a. calculate the fringe width.

b. One of the slits of the apparatus is covered by a thin glass sheet of refractive index 1.53. Find the smallest thickness of the sheet to bring athe adjacent minima on the axis.

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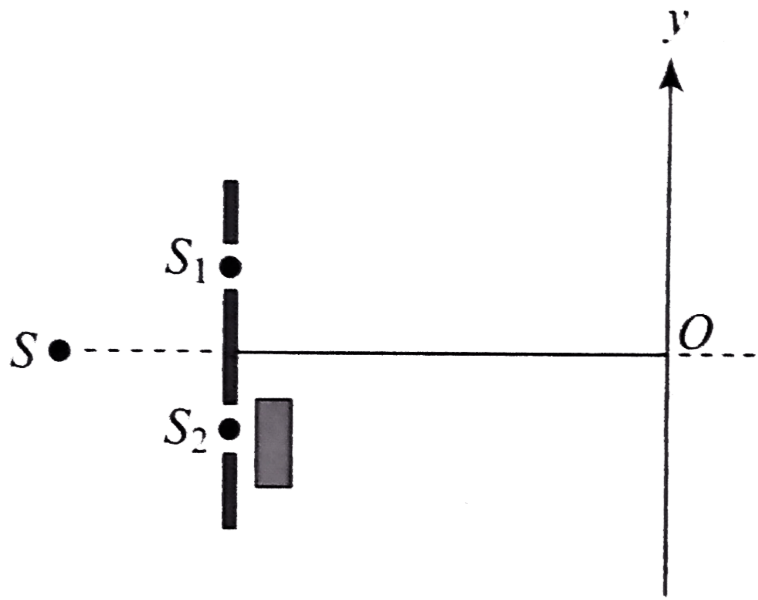
23. A YDSE is performed in a medium of refractive index $4/3$, A light of 600 nm wavelength is falling on the slits having 0.45 nm separation . The lower slit S_2 is covered b a thin glass plate of thickness 10.4 mm and refractive index 1.5. The interference pattern is observed on a screen placed 1.5 m from the slits as shown in figure. (All the wavelengths in this problem are for the given medium of refractive index $4/3$, ignore absorption.)



Now, if 600 nm, find the wavelength of the ligth that forms maximum exactly at point O.

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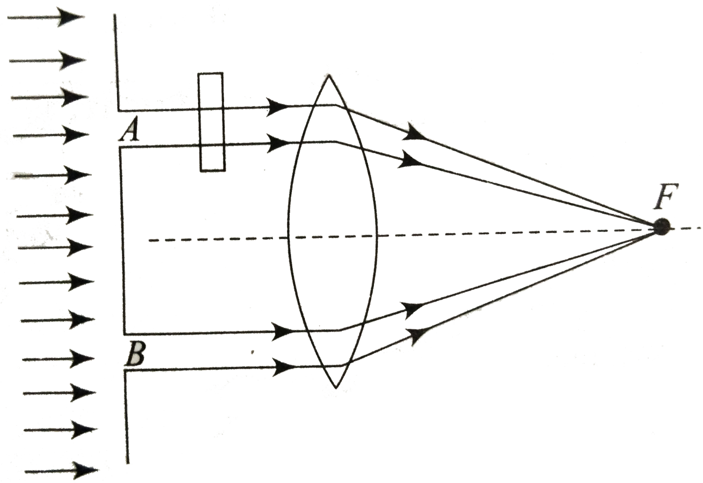
24. In a modified Young's double-slit experiment, a monochromatic uniform and parallel beam of light of wavelength $6000 Å$ and intensity $(10 / \pi)$ W m^{-2} is incident normally on two circular apertures A and B of radii 0.001 m and 0.002 m, respectively. A perfectly transparent film of thickness $2000 Å$ and refractive index 1.5 for the wavelength of $6000 Å$ is placed in front of aperture A (see the figure). Calculate the power (in mW) received at the focal spot F of the lens. Then lens is symmetrically placed with respect to the aperture. Assume that 10% of the power received by each aperture goes in the original direction and is brought to the focal spot.



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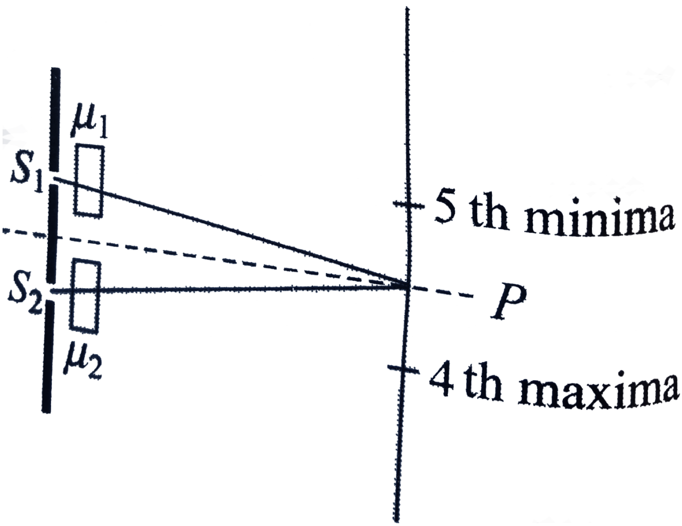
25. In Young's experiment the upper slit is covered by a thin glass plate of refractive index 1.4 while the lower slit is covered by another glass plate, having the same thickness as the first one but having refractive index 1.7 interference pattern is observed using light of wavelength 5400Å

It is found that point P on the screen where the central maximum $(n=0)$ fell before the glass plates were inserted now has $3/4$ the original intensity. It is further observed that what used to be the fourth maximum earlier, lies below point P while the fifth minimum lies above P.

Calculate the thickness of glass plate. (Absorption of light by glass plate may be neglected.



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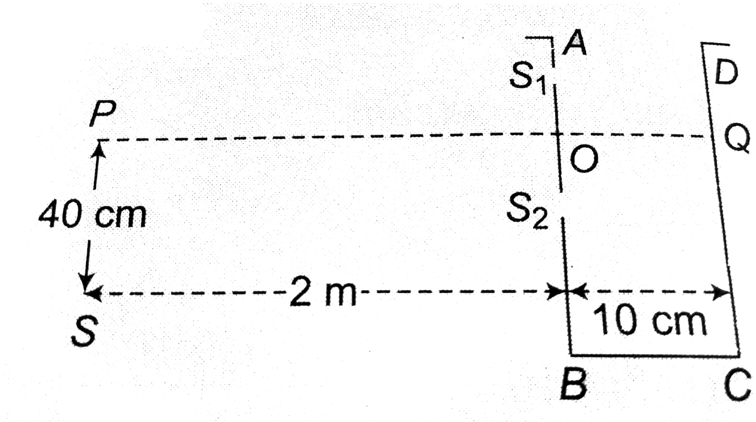
26. A vessel ABCD of $10cm$ width has two small slits S_1 and S_2 sealed with idebtical glass plates of equal thickness. The distance between the slits is $0.8mm$. POQ is the line perpendicular to the plane AB and passing through O, the middle point of S_1 and S_2. A monochromatic light source is kept at S, $40cm$ below P and $2m$ from the vessel, to illuminate the slits as shown in the figure. Calculate the position of the central bright fringe on the other wall CD with respect of the line OQ. Now, a liquid is poured into the vessel and filled up to OQ. The central bright fringe is fiund to be at Q. Calculate the refractive index of the liquid.



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27. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1.0 mm wide and the resulting diffraction pattern is observed on a screen 2m away. What is the distance between the first dark fringe on either side of the central bright fringe?

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28. A screen is placed 50cm from a single slit, which is illuminated with 6000Å light. If distance between the first and third minima in the diffraction pattern is 3.0 mm, what is the width of the slit?

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

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30. A lens of focal length $1m$ forms Fraunhofer diffraction pattern of a single slit of width $0.04cm$ in its focal plane. The incident light contains two wavwlength λ_1 and λ_2. It is found that the fourth minimum crresponding to λ_1 and the fifth minimum corresponding to λ_2 occur at the same point $0.5cm$ from the central maximum. Compute λ_1 and λ_2

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31. When sunlight is incident on water surface at glacing angle of 37°, the reflected light is found to be completely plane-polarised. Determine (a) the refractive index of water and (b) angle of refraction.

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32. Two polaroids are oriented with their planes perpendicular to incident light and transmission axis making an angle of 30° with each other. What fraction of incident unpolarised light transmitted?

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

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

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Exercises

1. Lifgt is

A. wave phenomenon

B. particle phenomenon

C. both particle and wave phenomenon

D. none

Answer: C

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2. The speed of light depends

A. on elasticity of the medium only

B. on inertia of the medium only

C. on elasticity as well as inertia

D. neither on elasticity nor on inertia

Answer: D

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3. The equation of a light wave i written as $y = A\sin(kx - \omega t)$. Here y represents

A. displacement of either particles

B. pressure in the medium

C. density of the medium

D. electric field or magnetic field

Answer: D

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4. When light is refracted into a medium

A. its wavelength and frequency remain unchanged

B. its wavelength increases but frequency remain unchanged

C. its wavelength decreases but frequency remain unchanged

D. its wavelength anf frequency both decrease

Answer: C

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5. Wave nature of light follows because

A. light rays travel in a straight line

B. light exhibits the phenomena of reflection and refraction

C. light exhibits the phenomenon of interference, diffraction, polarisation etc.

D. light causes the phenomenon of photoelectric effect

Answer: C

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6. Ray optics is valid when characteristic dimensions are

A. of the same order as the wavelength of light

B. much smaller than the wavelength of light

C. much large than the wavelength of light

D. of the order of $1mm$

Answer: C

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7. Light appears to travel in straight lines since

A. it is not absorbed by the atmosphere

B. it is reflected by the atmosphere

C. its wavelength is very small

D. its velocity is very large

Answer: C

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8. The velocity of light in diamond, glass and water decreases in the following order

A. watergt glassgt diamond

B. diamondgt glassgt water

C. diamondgt watergt glass

D. watergt diamondgt glass

Answer: A

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9. Choose the correct option:

A. Light of single wavelength is called monochromatic light.

B. The best monochromatic light are LASERs in which the spread of wavelength is very small but not zero.

C. The wavelength of visible light is around 380-780 nm. The obstacles or openings encountered in normal situations are generally of the order of mm. As wavelength is several is thousands times smaller than the usual obstacles or openings. The diffraction (bending of light) is almost neglible and light waves propagate in straight lines and cast shadows of obstacles. This is the geometrical optics approximation. By the above analysis rectilinear propagation of light can be explained.

D. All options are correct.

Answer: D

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10. Choose the correct option:

(i) A surface on which the wave disturbance in same phase at all points is called a wavefront.

(ii) The direction of a wave at a point is perpendicular to the wavefront through that point.

(iii) The wavefronts of a wave originating from a point source is spherical.

The wavefronts for a wave going along a fixed direction are planes perpendicular to that direction.

A. (i), (ii)

B. (ii), (iii), (iv)

C. (i), (ii), (iii)

D. all

Answer: D

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11. A wavefront and a ray of light are

A. perpendicular to each other

B. parallel to each other

C. converging towards each other

D. diverging from one another

Answer: A

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12. Huygen's principle of secondary waves

A. allows us to find the focal length of a thick lens

B. gives us the magnifying power of a microscope

C. is a geometrical method to find the position of a wavefront

D. is used to determine the velocity of lifgt

Answer: C

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13. Huygen's priciple of secondary wavelets may be used to

A. find the velocity of light in vacuum

B. explain the particle behaviour of light

C. find the new position of the wavefront

D. explain photoelectric effect

Answer: C

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14. Which one of the following phenomena is not explained by Huygens construction of wavefront?

A. refraction

B. reflection

C. diffraction

D. origin of spectra

Answer: D

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15. By Huygen's wave theroy of light, we cannot explain the phenomenon of

A. interference

B. diffraction

C. photoelectric effect

D. polarisation

Answer: C

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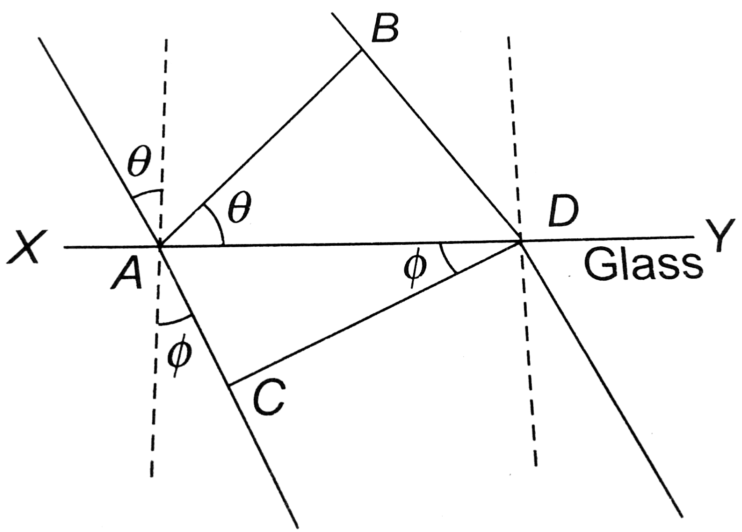
16. In the adjoining figure, a wavefront AB moving in air is incident on a plane glass surface XY. Its position CD, after refraction through a glass slab is shown also along with the normals drawn at A and D. The refractive index of glass with respect to air will be equal to



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

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

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

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

Answer: A

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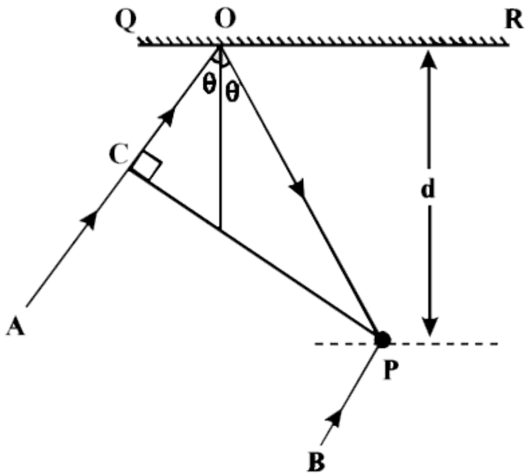
17. In the adjacent diagram, CP represents a wavefront and AO & BP, the corresponding two rays. Find the condition on θ for constructive interference at P between the ray BP and reflected ray OP.



A. $\cos\theta = 3\lambda / 2d$

B. $\cos\theta = \lambda / 4d$

C. $\sec\theta - \cos\theta = \lambda / d$

D. $\sec\theta - \cos\theta = 4\lambda / d$

Answer: B

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18. Which of the following sources gives best mionochromatic light?

A. A candle

B. A bulb

C. A mercury tube

D. A laser

Answer: D

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19. A laser beam is used for carrying our surgery because it

A. many wavelength

B. un-coordinated wavelength

C. coordinated waves of exactly the same wavelength

D. divergent beams

Answer: C

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20. Two sources of light are said to be coherent if the waves produced by them have the same

A. wavelength

B. amplitude

C. wavelength and amplitude

D. wavelength and a constant phase difference

Answer: D

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

A. two sources which emit radiations of the same frequency

B. two sources which emit radiations of nearly the same frequency

C. two sources which emit radiations of the same frequency and have a definite phase relationship

D. two sources which emit radiations of different wavelengths

Answer: C

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22. For the sustained interference of light, the necessary condition is that the two sources should

A. the same frequency

B. nearly the same frequency

C. the same frequency and have a definite phase relationship

D. different wavelengths

Answer: C

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23. Four light waves are represented by

$i.\ y = a_1 \sin \omega t$

ii. $y = a_2 \sin(\omega t + \varepsilon)$

iii. $y = a_1 \sin 2\omega t$

iv.$y = a_2 \sin 2(\omega t + \varepsilon)$ Inteference fringes may be observed due to superposition of

A. (i) and (ii), (iii) and (iv)

B. (i) and (iii), (iii) and (iv)

C. (ii) and (iv), (iii) and (iv)

D. (iii) and (iv) only

Answer: A

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24. Young's experiment establishes that

A. light consists of waves

B. light consists of particles

C. light is neither particle nor wave

D. light is both particle and wave

Answer: A

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25. The phenomenon of interference is shown by

A. longitudinal mechanical waves only

B. transverse machanical transverse waves only

C. non-mechanical transverse waves only

D. all the above types of waves

Answer: D

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26. In the interference pattern, energy is

A. created at the positions of maxima

B. destroyed at the positions of maxma

C. conserved but is redistributed

D. not conserved

Answer: C

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27. For observing sustained interferencr with good contrast, which of the following option are correct?

(i) The sources must be coherent i.e. the phase difference must remain constant.

(ii) The frequencies, wavelengths and amplitudes of interfering waves must be equal and light must be monochromatic.

(iii) The source must be close to each other and must be narrow.

(iv) If the interfering beams are polarised, they must be in the same state of polarisation.

A. (i), (ii)

B. (ii), (iii), (iv)

C. (i), (ii), (iii)

D. all

Answer: D

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28. The contrast in the fringes in an interference pattern depends on

A. fringe width

B. wavelength

C. intensity ratio of the sources

D. distance between the slits

Answer: C

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29. A Young's double slit experiment uses a monochromatic source. The shape of the interference fringes formed on a screen is

A. straight line

B. parabola

C. hyperbola

D. circle

Answer: C

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30. If two slightly, different wavelengths are present in the light used in Young's double-slit experiment, then

A. the sharpness of fringes will more than the case when only one wavelength is prasent

B. the sharpness of fringes will decrease as we move away from the central fringe

C. the central fringe will be white

D. the central fringe will be dark

Answer: C

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31. A beam of electron is used $YDSE$ experiment . The slit width is d when the velocity of electron is increased ,then

A. no interference is observed

B. fringe width increases

C. fringe width decreases

D. fringe width remains same

Answer: C

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32. If three slits are used in Young's experiment instead of two, we get

A. no fringe pattern

B. the same fringe pattern as that with two slits

C. a pattern with fringe width reduced to half of that in the two slit pattern

D. alternate bright and dim fringes

Answer: D

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

A. fringes will appear as for monochromatic light

B. fringes will appear for a moment and then they will disappear

C. no fringes will appear

D. only bright fringes will appear

Answer: C

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34. If the source of light used in a young's double slit experiment is changed from red to violet

A. the fringe will become brighter

B. consecutive fringes will come closer

C. the intensity of minima will increase

D. the central bright fringe will become a dark fringe

Answer: B

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35. 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. do not change at all

B. move slightly farther apart

C. move slightly closer together

D. disappear completely

Answer: B

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36. Light of wavelength λ in air enters a medium of refractive index μ. Two points in this medium, lying along the path of this light, are at a distance of x apartThe phase difference between these point is

A. $\mu\left(\frac{2\pi}{\lambda}\right)x$

B. $\frac{1}{\mu}\left(\frac{2\pi}{\lambda}\right)x$

C. $(\mu-1)\left(\frac{2\pi}{\lambda}\right)x$

D. $\frac{1}{\mu-1}\left(\frac{2\pi}{\lambda}\right)x$

Answer: A

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37. Ratio waves originating from sources S_1 and S_2 having zero phase difference and common wavelength λ will show completely destructive interference at a point P is $S_1P - S_2P$ is

A. 5λ

B. 2λ

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

D. $\frac{11\lambda}{2}$

Answer: D

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38. 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. $6mm$

B. $8mm$

C. $12mm$

D. $16mm$

Answer: B

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39. In a Young's double slit experiment (slit distance d) monochromatic light of wavelength λ is used and the figure pattern observed at a distance L from the slits. The angular position of the bright fringes are

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

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

C. $\sin^{-1}\left(\frac{N\lambda}{L}\right)$

D. $\sin^{-1}\left(\frac{\left(N+\frac{1}{2}\right)\lambda}{L}\right)$

Answer: A

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40. In Young's double slit experiment, the phase difference between the light waves reaching third bright fringe from the central fringe will be $(\lambda = 6000\text{Å})$

A. $zero$

B. 2π

C. 4π

D. 6π

Answer: D

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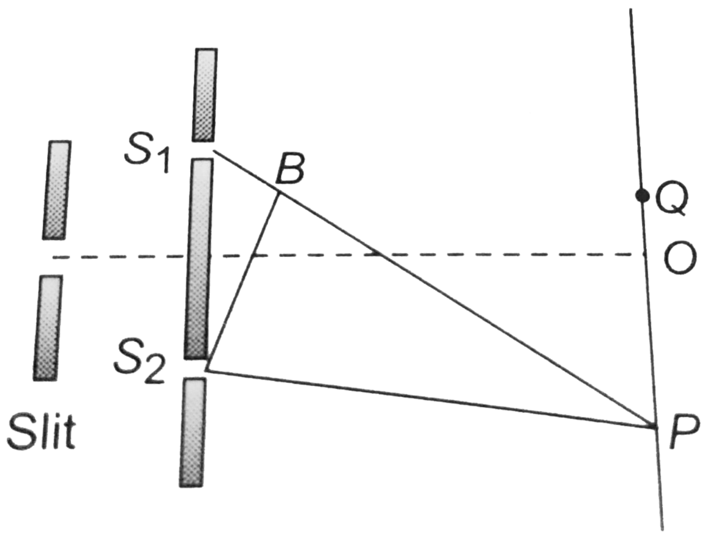
41. In the figure is shown Young's double slit experiment. Q is the position of the first bright fringe on the right side of O. P is the 11^{th} bright fringe on the other side, as measured from Q. If the wavelength of the light used is $600 nm$. Then S_1B will be equal to



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

B. $6.6 \times 10^{-6} m$

C. $3.138 \times 10^{-7} m$

D. $3.144 \times 10^{-7} m$

Answer: A

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

A. $1.67 cm$

B. $1.5 cm$

C. $0.5 cm$

D. $5.0 cm$

Answer: B

Watch Video Solution

43. 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. $0.65mm$

B. $1.63mm$

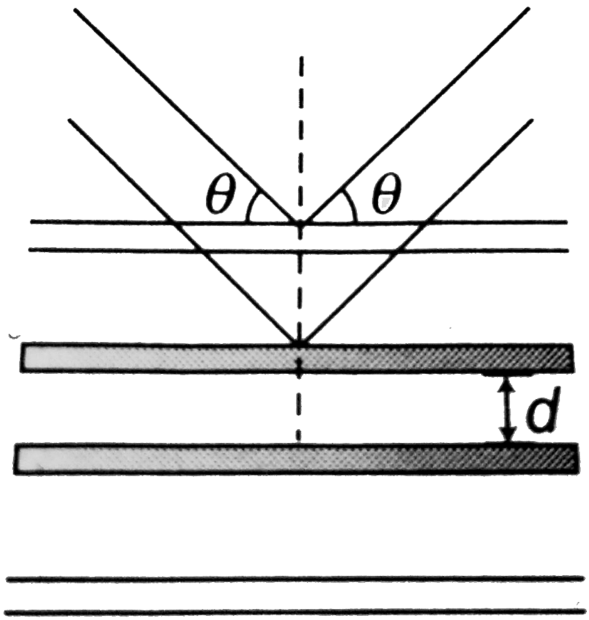
C. $3.25mm$

D. $4.88mm$

Answer: B

Watch Video Solution

44. A beam with wavelength λ falls on a stack of partially reflecting planes with separation d. The angle θ that the beam should make with planes so that the beams reflected from successive planes may interfere constructively is (where n=1, 2, ...)



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

B. $\tan^{-1}\left(\frac{n\lambda}{d}\right)$

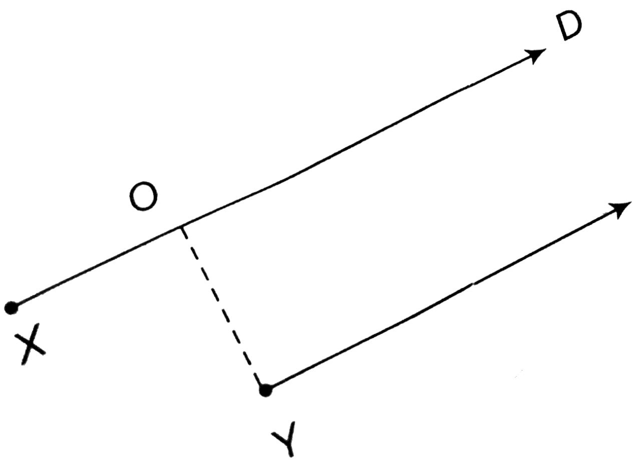
C. $\sin^{-1}\left(\frac{n\lambda}{2d}\right)$

D. $\cos^{-1}\left(\frac{n\lambda}{2d}\right)$

Answer: C

Watch Video Solution

45. Two point sources X and Y emit waves of same frequency and speed but Y lags in phase behind X by $2\pi d$ radian. If there is a maximum in direction D, the distance XO using n as an integer is given by



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

B. $\lambda(n+l)$

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

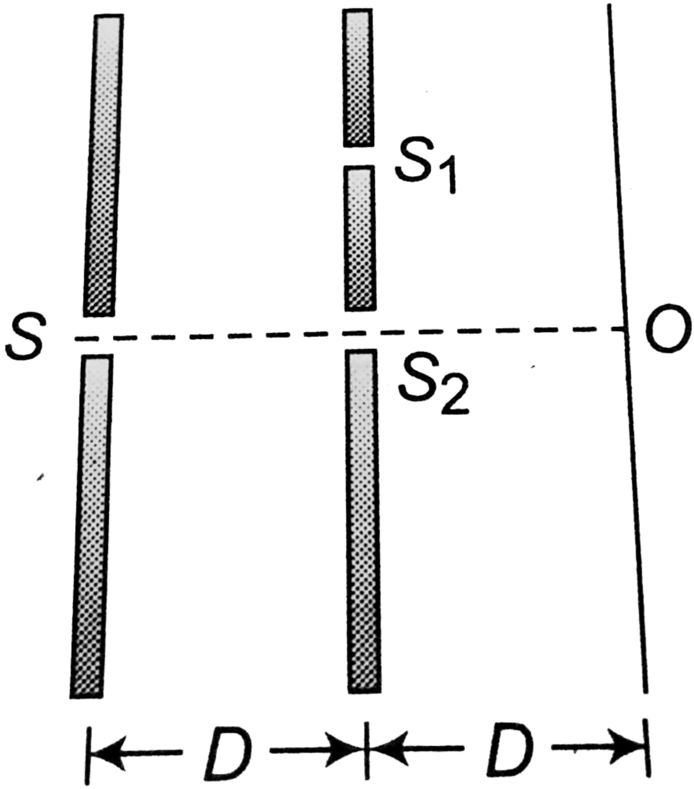
D. $\lambda(n-l)$

Answer: B

Watch Video Solution

46. Two ideal slits S_1 and S_2 are at a distance d apart, and illuninated by light of wavelength λ passing through an ideal source slit S placed on the line through S_2 as shown. The distance between the planes of slits and the source slit is D. A screen is held at a distance D from the plane of the slits. The minimum value of d for which there is darkness at O is

$(d < < D)$



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

B. $\sqrt{\lambda D}$

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

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

Answer: B

Watch Video Solution

47. Lights of wavelengths $\lambda_1 = 4500\text{Å}, \lambda_2 = 6000\text{Å}$ are sent through a double slit arrangement simultaneously. Then

A. no interference pattern will be formed

B. the third bright fringe of λ_1 will coincide with fourth bright fringe of λ_2

C. the third bright fringe of λ_2 will coincide with fourth bright fringe of λ_1

D. the fringes of wavelength λ_1 will be wider than fringes of wavelength λ_2

Answer: C

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48. In Young's double slit experiment, the wavelength of red light is 5200Å. The value of n for which nth bright band due to red light coincides with $(n+1)th$ bright band due to blue light($\lambda = 7800 Angstrom$), is

A. 2

B. 3

C. 4

D. 5

Answer: A

Watch Video Solution

49. The incident light on a Yound's experiment has wavelengths $400nm$ and $600nm$. The distance between the two interfering sources is 2 mm and screen is at a distance of 1 m. The position from central fringe, where bright fringes of two wavelengths coincide first is at a distance of

A. $0.6mm$

B. $0.3mm$

C. $6mm$

D. $3mm$

Answer: A

Watch Video Solution

50. In Young's experiment, the distance between the slits is 0.025 cm and the distance of the screen from the slits is 100 cm. If two distance between their second maxima in cm is

A. 0.048

B. 0.096

C. 0.12

D. 0.192

Answer: B

Watch Video Solution

51. White light is used to illuminate the two slits in a Young's

double slit experiment. The separation

between the slits is b and the screen is at a distance $d(>>b)$ from the slits. At a point on the screen directly in front of one of the slits, certain wavelengths are missing. Some of these missing wavelength are

A. (i), (ii)

B. (ii), (iii)

C. (i), (iii)

D. (ii), (iv)

Answer: C

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52. A Young's double slit experiment is performed with white light.

A. The central fringe will be white

B. There will not be completely dark fringe

C. The fringe next to the central will be red

D. The fringe next to the central will be violet

Answer: C

Watch Video Solution

53. In Young's doble-slit experiment, if the monochromatic source of light is replaced by white light, then one sees

A. no interference fringe pattern

B. coloured fringes

C. black and white fringes

D. white central fringe surrounded by a few coloured fringes on either side

Answer: D

Watch Video Solution

54. A Young's double-slit set-up for interference shifted from air to within water. Then the

A. fringe pattern disappears

B. fringe width decreases

C. fringe width increases

D. fringe width remains unchanged

Answer: B

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55. In a YDSE, $\lambda = 4000 \mathring{A}$, fringes observed have a width β. The light illuminating the set-up now has $\lambda = 6000 \mathring{A}$ and the separation between the interfering sources is halved.

What is the ratio of the distance between the screen and the interfering sources before and now if the fringe and now if the fringe width ramains unaltered

A. $1/3$

B. $3/1$

C. $3/4$

D. $2/3$

Answer: B

Watch Video Solution

56. 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

57. 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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58. In two separate set-ups of YDSE, using light of same wavelength, fringes of equal width are observed. If ratio of slit separation in the equal width are observed. If ratio of slit separation in the two is $2:3$, the ratio of the distance between source and screen in the two set-ups is

A. $2:3$

B. $3:2$

C. $4:9$

D. $9:4$

Answer: A

Watch Video Solution

59. In a Young's double-slit experment, the fringe width is β. If the entire arrangement is now placed inside a liquid of refractive index μ

, the fringe width will become

A. β

B. $\frac{\beta}{\mu}$

C. $\frac{\beta}{\mu + 1}$

D. $\frac{\beta}{\mu - 1}$

Answer: B

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60. In Young's double-slit experiment using $\lambda = 6000 Å$, distance between the screen and the source is 1m. If the fringe-width on the screen is 0.06 cm, the distance between the two coherent sources is

A. $0.01 mm$

B. $1 cm$

C. $0.01 mm$

D. $1 mm$

Answer: D

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61. The distance between two coherent sources is 0.1 mm. The fringe-width on a screen 1.2 m away from the source is 6.0 mm. The wavelength of light used is

A. 4000Å

B. 5000Å

C. 6000Å

D. 7200Å

Answer: B

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62. An interference pattern is obtained by Young's double-slit arrangement and the fringe-width is β. If the distance between the slits is halved and the distance of the screen fron the slits is made three times, the new fringe-width will be tripled

A. 0.25β

B. 2β

C. 6β

D. 8β

Answer: C

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63. In Young's double-slit experiment , we get 60 fringes in the field of view if we use light of wavelength $4000 Å$. The number of fringes we will get in the same field of view if we use light of wavelength 6000Å is

A. 40

B. 90

C. 60

D. 50

Answer: A

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64. In a Young's double-slit experiment, let S_1 and S_2 be the two slits, and C be the centre of the screen. If $\angle S_1CS_2 = \theta$ and λ is wavelength, the fringe width will be

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

B. $\lambda\theta$

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

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

Answer: A

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65. The maximum number of possible interference maxima for slit-separation equal to twice the wavelength in Young's double-slit experiment is

A. infinite

B. five

C. three

D. zero

Answer: B

Watch Video Solution

66. 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 $d = 7000 \text{Å}$?

A. 12

B. 7

C. 18

D. 4

Answer: B

Watch Video Solution

67. In a Young's double-slit experiment, the intensity ratio of maxima and minima is infinite. The ratio of the amlitudes of two sources

A. infinity

B. unity

C. two

D. cannot be predicted

Answer: B

Watch Video Solution

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

A. `4I and I

B. `5I and 3I

C. 9I and I

D. 9I and 3I

Answer: C

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69. Interference fringes are obtained due to the interference of wave from two coherent sources of light with amplitudes a_1 and $a_2 (a_1 = 2a_2)$. The ratio of the maximum and minimum intensities of light in the interference pattern is

A. 2

B. 4

C. 9

D. ∞

Answer: C

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

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

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

(iii) the amplitude ratio is 3

(iv) the amplitude ratio is 2

A. (i), (ii)

B. (ii), (iii)

C. (i), (iii)

D. (ii), (iv)

Answer: D

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

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

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

Answer: D

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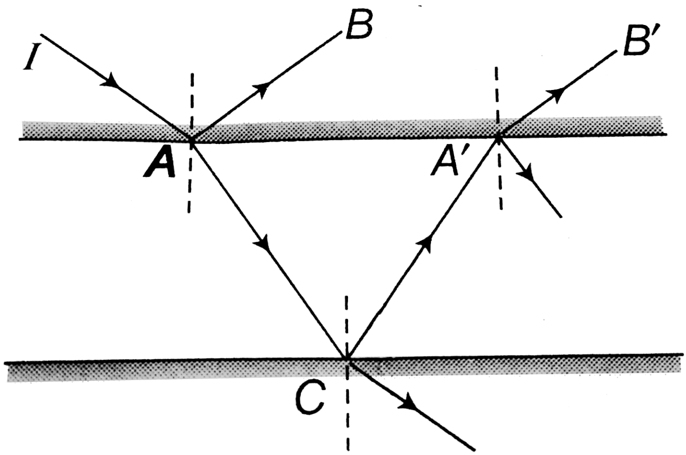
72. A ray of light intensity I is incident on a parallel glass-slab at a point A as shown in figure. It undergoes partial reflection and refraction. At each reflection 25% of incident energy is reflected. The rays AB and $A'B'$

undergo interference. The ratio $I_{\max} / I_{\min}$ is



A. $4:1$

B. $8:1$

C. $7:1$

D. $49:1$

Answer: D

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73. In a YDSE with identical slits, the intensity of the central bright fringe is I_0. If one of the slits is covered, the intensity at the same point is

A. I_0

B. $I_0 / 2$

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

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

Answer: C

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74. The maximum intensity of fringes in Young's experiment is I. If one of the slit is closed, then the intensity at that place becomes I_o. Which of the following relation is true?

A. $I = I_0$

B. $I = 2I_0$

C. $I = 4I_0$

D. (4)there is no relation between I and I_0

Answer: C

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75. In Young's double slit experiment the intensity of light on the screen where the where the path difference is λ is k (λ being the wavelength of light used). The intensity at a point where the path difference is $\frac{\lambda}{4}$ will be

A. $I/4$

B. $I/2$

C. I

D. zero

Answer: B

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76. 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

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77. 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

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78. If the intensities of the two interfering beam in Young's double-slit experiment are I_1 and I_2, then the constrast between the maximum and minimum intensities are good when

A. $|I_1 - I_2|$ is large

B. $|I_1 - I_2|$ is small

C. either I_1 or I_2 is zero

D. $I_1 = I_2$

Answer: D

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79. In Young's interference experiment, if the slit are of unequal width, then

A. fringes will not be formed

B. the positions of minimum intensity will not completely dark

C. bright fringes will not be formed at the centre of the screen

D. distance between two consecutive bright fringe will not be equal to the distance between two consecutive dark fringes

Answer: B

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80. In Young's experiment with one source and two slits, one of the slits is covered with black paper. Then

A. the fringes will be barker

B. the fringes will be narrower

C. the fringes will be broader

D. the fringes will be obtained and the screen will have uniform illumination

Answer: D

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81. In Young's interference expriment with one source and two slits, one slit is covered with a cellophane of sheet which absorbs half the intensity. Then

A. no fringes are obtained

B. bright fringes will be brighter and dark fringes will be darker

C. all fringes will be darker

D. bright fringes will be less bright and dark fringes will be less dark

Answer: D

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82. Three waves of equal frequency having amplitudes $10\mu m, 4\mu m, 7\mu m$ arrive at a given point with successive phase difference of $\pi / 2$, the amplitude of the resulting wave in μm is given by

A. 4

B. 5

C. 6

D. 7

Answer: B

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83. Fig, here shows P and Q as two equally intense coherent sources emitting radiations of wavelength 20m. The separation PQ si 5m, and phase of P is ahead of the phase Q by 90°. A, B and C are three distant points of observation equidistant from the mid - point of PQ. The intensity of radiations of A, B, C will be in the ratio

A. $0:1:4$

B. $4:1:0$

C. $0:1:2$

D. $2:1:0$

Answer: D

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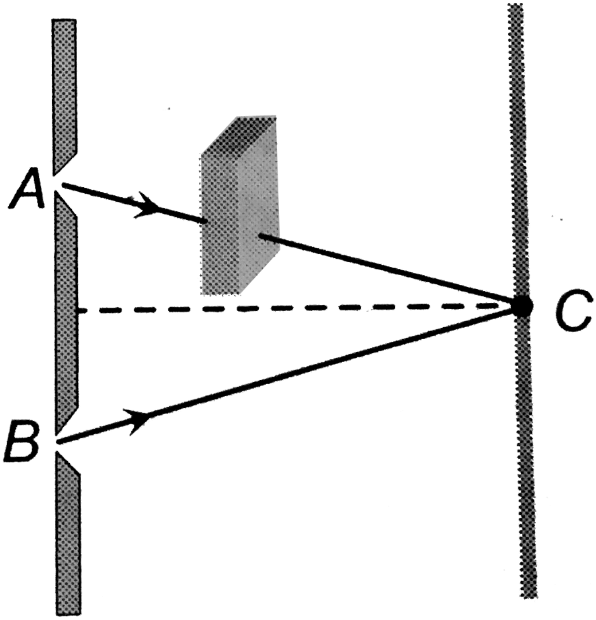
84. In Young's experiment, monochromatic light is used to illuminate the two slits A and B. Interference fringes are observed on a screen placed in front of the slits. Now if a thin glass plate is placed normally in the path of the beam coming from the slit



A. the fringes will disappear

B. the fringe width will increase

C. the fringe width will decrease

D. there will be no change in the fringe width but the pattern shifts

Answer: D

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85. In a Young's double-silt experiment the source slit S and the two slits A and B are horizontal with slit A above slit B. The fringe are observed on a vertical screen. The optical path length from S to B is increased slightly by introducing a tranparent slab. As a result the fringe pattern on the screen moves

A. vertically downwards

B. vertically upwards

C. horizontally to the left

D. horizontally to the right

Answer: A

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86. When a transparent parallel plate of uniform thickness t and refractive index μ is interposed normally in the path of a beam of light, the optical path is

A. increased by μt

B. decreased by μt

C. decreased by $(\mu - 1)t$

D. increased by $(\mu - 1)t$

Answer: D

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87. Light of wavelength 5000Å is travelling in air. A thin glass plate (mu=1.5) of thickness $1mm$ is placed in the path of light. The change in phase of light is

A. zero

B. $\pi / 2$

C. π

D. $(3\pi) / 2$

Answer: A

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88. 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. $5cm$

B. $2.5cm$

C. $0.25cm$

D. $0.1cm$

Answer: B

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89. A thin sheet of glass (refractive index 1.5) of thickness 6 microns, introduced in the path of one of the interfering beams in a double-slit experiment shift the central fringe to a position earlier occupied by the fifth bright fringe. The wavelength of light used is

A. 3000Å

B. 6000Å

C. 4500Å

D. 7000Å

Answer: B

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90. 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: C

Watch Video Solution

91. Interference fringes were produced in Young's double-slit experiment using light of wavelength 5000Å. When a film of thickness $2.5 \times 10^{-3} cm$ was placed in front of one of the slits, the fringe pattern shifted by a distance equal to 20 fringe-widths. The refractive index of the material of the film is

A. 1.25

B. 1.35

C. 1.4

D. 1.5

Answer: C

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92. When one of the slits of Young's experiment is covered with a transparent sheet of thickness $4.8mm$, the central fringe shifts to a position originally occupied by the 30th bright fringe. What should be the thickness of the sheet if the central fringe has to shift to the position occupied by 20th bright fringe?

A. $3.8mm$

B. $1.6mm$

C. $7.6mm$

D. $3.2mm$

Answer: D

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93. In the ideal double-slit experiment, when a glass-plate (refractive index 1.5) of thickness t is introduced in the path of one of the interfering beams (wavelength λ), the intensity at the position where the central maximum occurred previously remains unchanged. The minimum thickness of the glass-plate is

A. 2λ

B. $2\lambda / 3$

C. $\lambda / 3$

D. λ

Answer: A

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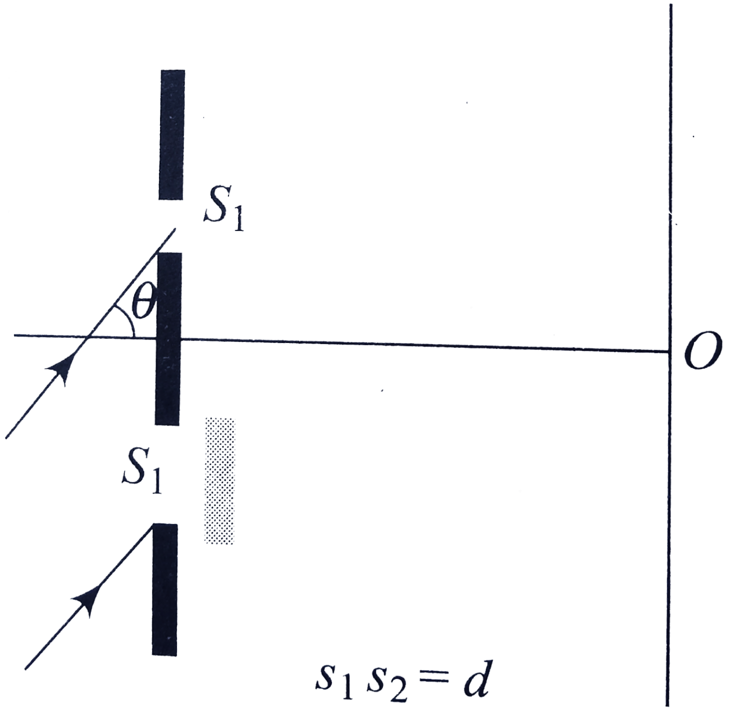
94. A monochromatic beam of light fall on YDSE apparatus at some angle (say θ) as shown in figure. A thin sheet of glass is inserted in front of the lower slit s_2. The central bright fringe (path difference $= 0$)

will be obtained



A. at O

B. above O

C. below O

D. anywhere depending on angle θ, thickness of plate t

Answer: D

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95. 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. $8\mu m$

B. $6\mu m$

C. $4\mu m$

D. $10\mu m$

Answer: A

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96. When exposed to sunlight, thin films of oil on water often exhibit brilliant colours due to the phenomenon of

A. disperion of light

B. interference of light

C. absorption of light

D. scattering of light

Answer: B

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97. When viewed in white light, soap bubbles show colours because of

A. interference

B. scattering

C. diffraction

D. dispersion

Answer: A

Watch Video Solution

98. A parallel beam of sodium light of wavelength $6000Å$ is incident on a thin glass plate of $\mu = 1.5$, such that the angle of refraction in the plate is 60°. The smallest thickness of the plate which will make it appear dark by reflected light is

A. $40Å$

B. $4Å$

C. $400Å$

D. $4000Å$

Answer: D

Watch Video Solution

99. If wavelength 4500Å and 6000Å are found to be missing in the reflected spectrum in thin air film interference, the thickness of the film for normal incidence is nearly

A. 9000Å

B. 10500Å

C. 5250Å

D. 4240Å

Answer: A

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100. White light may be considered to be mixture of waves of λ ranging between 3900Å and 7800Å. An oil film of thickness $10, 000 \text{Å}$ is examined normally by the reflected light. If $\mu = 1.4$, then the film appears bright for

A. $4000 \text{Å}, 4667 \text{Å}, 5600 \text{Å}, 7000 \text{Å}$

B. $4308 \text{Å}, 5091 \text{Å}, 6222 \text{Å}$

C. $4000\text{Å}, 5091\text{Å}, 5600\text{Å}$

D. $4667\text{Å}, 6222\text{Å}, 7000\text{Å}$

Answer: B

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101. A person sets up Young's experiment using a sodium lamp and placing two slits $1m$ from a screen. The person is not sure of slit separation and he varies the separation and finds that the interference fringes disappear if the slits are too far apart. The angular resolution of his eye is $(1/60)^{\circ}$. How far apart are the slits when he just cannot see the interference pattern? $(\lambda = 5980\text{Å})$

A. $5mm$

B. $4.01mm$

C. $2.025mm$

D. $3.025mm$

Answer: C

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102. The penetration of light into the region of geometrical shadow is called

A. polarisation

B. interference

C. diffraction

D. refraction

Answer: C

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103. Diffraction effects are easier to notice in the case of sound waves than in the case of light waves because

A. sound waves are longitudinal

B. sound is perceived by the car

C. sound waves are mechanical waves

D. sound waves are of longer wavelength

Answer: D

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104. A parallel monochromatic beam of light is incident normally on a narrow slit. A diffraction patten is formed on a screen placed perpendicular to the direction of incident beam. At the first maximum of the diffraction pattern the phase difference between the rays coming from the edges of the slit is

A. 0

B. $\pi / 2$

C. π

D. 2π

Answer: D

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105. Diffraction pattern of a single slit consists of a central bright band which is

A. wide, and is flanked by alternate dark and bright bands of decreasing intensity

B. narrow, and is flanked by alternate dark and dright bands of equal intensity

C. wide, and is flanked by alternate dark and bright bands of equal intensity

D. narrow, and is flanked by alternate-dark and bright bands of decreasing intensity

Answer: A

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106. To observe diffraction, the size of the obstacle

A. should be of the same order as the wavelength

B. should be much larger than the wavelength

C. has no relation to wavelength

D. should be exactly half the wavelength

Answer: A

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107. A diffraction is obtained by using a beam of red light. What will happen if the red light is replaced by the blue light?

A. the diffraction pattern remains changed

B. diffraction bands become narrower and crowded togather

C. bands became broader and farther apart

D. bands disappear

Answer: B

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108. Yellow light is used in a single slit diffraction experiment with slit width of 0.6 mm. If yellow light is replaced by X-rays, then the observed 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: A

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109. A slit of width a illuminated by red light of wavelength 6500Å. The first minimum will fall at $\theta = 30^\circ$ if a is

A. 3250Å

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

C. $1.3 micron$

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

Answer: C

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110. A single slit of width $0.20 mm$ is illuminated with light of wavelength $500 nm$. The observing screen is placed $80 cm$ from the slit. The width of the central bright fringe will be

A. $1mm$

B. $2mm$

C. $4mm$

D. $5mm$

Answer: C

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111. Light of wavelength 6328Å is incident normally on a slit having a width of $0.2mm$. The distance of the screen from the slit is

$0.9m$. The angular width of the central maximum is

A. 0.09°

B. 0.72°

C. 0.18°

D. 0.36°

Answer: D

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112. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1.0 mm wide and the resulting diffraction pattern is observed on a screen 2m away. What is the distance between the first dark fringe on either side of the central bright fringe?

A. $1.2cm$

B. $1.2mm$

C. $2.4cm$

D. $2.4mm$

Answer: D

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113. The amplitude modulated (AM) radio wave bends apreciably round the cornes of a $1m \times 1m$ board but the frequency modulated (FM) wave only negligible bends.If the average wavelengths of AMandFM waves are λ_0 and λ_f.

A. $\lambda_a > \lambda_r$

B. $\lambda_a = \lambda_r$

C. $\lambda_a < \lambda_r$

D. we do not have sufficient information to decide about the relation of λ_a and λ_r

Answer: A

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114. The fringe pattern observed on Young's double-slit experiment is

A. a diffraction pattern

B. an interference pattern

C. a combination of diffraction and interference pattern

D. neither a diffraction nor an interference pattern

Answer: C

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115. Which of the following properties show that light is a transverse wave?

A. Reflection

B. Interference

C. diffraction

D. polarisation

Answer: D

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116. Longitudinal waves do not exhibit

A. refaction

B. reflection

C. diffraction

D. polarisation

Answer: D

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117. Through which character we can distiguish the light waves from sound waves

A. interference

B. refraction

C. polarisation

D. reflection

Answer: C

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118. Which of the following cannot be polarised?

A. Radio wave

B. Infrared radiation

C. X-rays

D. Sound waves in air

Answer: D

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119. In the propagation of electromagnetic waves the angle between the direction of propagation and plane of polarisation is

A. 0°

B. 45°

C. 90°

D. 180°

Answer: C

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120. In case of linearly polarised light, the magnitude of the electric field vector

A. does not change with time

B. varies periodically with time

C. increases and decreases linearly with time

D. is parallel to the direction of propagation

Answer: B

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121. 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: A

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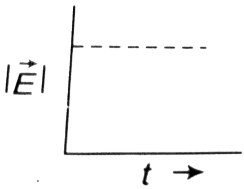
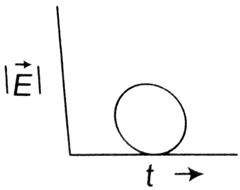
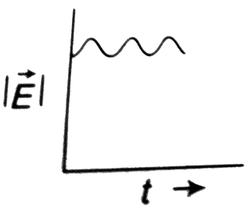
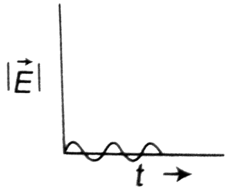
122. Which of the following diagrams represent the veriation of electric field vector with time for a circularly polarised light

A. 

B. 

C. 

D. 

Answer: A

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

A. $90^\circ + \phi$

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

C. 90°

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

Answer: C

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124. When light is incident on a transparent surface at the polarising angle, which of the following is completely polarised?

A. Reflected light

B. Refracted light

C. Both reflected refracted light

D. Neither reflected nor refracted light

Answer: A

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125. The angle of incidence at which reflected light is totally polarized for reflection from air to glass (refractive index n),

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

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126. The angle of polarisation for any medium is 60°. What will be critical angle for this?

A. $\sin^{-1}\sqrt{3}$

B. $\tan^{-1}\sqrt{3}$

C. $\cos^{-1}\sqrt{3}$

D. $\dfrac{\sin^{-1}1}{\sqrt{3}}$

Answer: D

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127. When the angle of incidence on a material is 60°, the reflected light is completely polarised. The velocity of the refracted ray inside the materials is (in m//sec^(-1))

A. 3×10^8

B. $\left(\frac{3}{\sqrt{2}}\right) \times 10^8$

C. $\sqrt{3} \times 10^8$

D. 0.5×10^8

Answer: C

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

A. the intensity of light gradually decreases to zero and remains at zero

B. the intensity of light gradually increases to a maximum and remains maximum

C. there is no change in the intensity of light

D. the intensity of light varies such that it is twice maximum and twice zero

Answer: D

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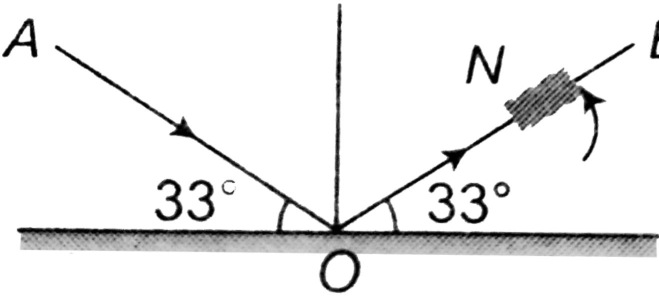
129. A beam of light AO is incident on a glass slab $(\mu = 1.54)$ in a direction as shown in figure. The reflected ray OB is passed throught a Nicol prism. On viewinf through a Nicole prism, we find rotating the prism that

$(\tan^{-1} 1.54 = 57^\circ)$



A. the intensity is reduced down to zero and remains zero

B. the intensity reduces down some what and rises again

C. there is no change in intensity

D. the intensity gradually reduces to zero and then again increases

Answer: D

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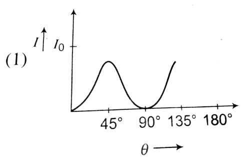
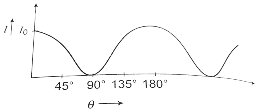
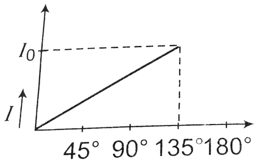
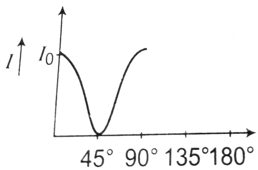
130. The graph showing the dependence of intensity of transmitted light on the angle between polariser and analyser is

A. 

B. 

C. 

D. 

Answer: B

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

A. zero

B. I_0

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

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

Answer: C

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132. Four polaroids are placed such that the optic axis of each is inclined at an angle of 30° with the optic axis of the preceding one. If unpolarised light of intensity I_(0) falls on the first polaroid, the light transmitted from the fourth is

A. I_0

B. $I_0 / 16$

C. $0.21 I_0$

D. none

Answer: C

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133. Two polaroids are placed in the path of unpolarized beam of intensity I_0 such that no light is emitted from the second polarid. If a third polaroid whose polarization axis makes an angle θ with the polarization axis of first polaroid, is placed between these two polariods then the intensity of light emerging from the last polaroid will be

A. $\left(\frac{I_0}{8}\right)\sin^2 2\theta$

B. $\left(\frac{I_0}{4}\right)\sin^2 2\theta$

C. $\left(\frac{I_0}{2}\right)\cos^4 \theta$

D. $I_0 \cos^4 \theta$

Answer: A

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134. A beam of unpolarised light is passed first through tourmaline crystan A and then through another tourmaline crystal B oriented so that its principal plane is parallel to that of A. The intensity of the emergent light is I. If A now rotated by 45° in a plane perpendicular to the direction of the incident ray, the intensity of the emergent light will be

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

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

C. I

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

Answer: A

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135. An optically active compound

A. produces polarised light

B. rotates the plane of polarisation of polarised light

C. converts a plane of polarised light into circularly polarised light

D. converts a circulary polarised light into plane polarised light

Answer: B

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136. the reason of seeing the sun a little before the sunrise is

A. reflection of the light

B. refraction of the light

C. scattering of the light

D. dispersion of the light

Answer: C

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137. Check the correct statements on scattering of light

$S1$: Rayleigh scattering is responsible for the bluish appearance of sky

$S2$: Rayleigh scattering is proportional to $1/\lambda^4$ when the size of the scatterer is much less than λ

$S3$: Clouds having droplets of water (large scattering objects) scatter all wavelengths are almost equal and so are generally white

$S4$: The sun looks reddish at sunset and sunrise due to Rayleigh scattering

A. S1 only

B. S1 and S2

C. S2 and S3

D. S1, S2, S3 and S4

Answer: D

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138. If the ratio of amounts of scattering of two light waves is 1:4, the ratio of their wavelength is

A. $1:2$

B. $\sqrt{2}:1$

C. $1:\sqrt{2}$

D. $1:1$

Answer: B

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139. An astronaut in a spsceship sees the outer space as

A. white

B. black

C. blue

D. red

Answer: B

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140. The sky would appear red instead of blue if

A. atmospheric particles scatter blue light more than red light

B. atmospheric particles scatter all colours equally

C. atmospheric particles scatter red light more than the blue light

D. the sun was much hotter

Answer: C

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