PHYSICS

BOOKS - AAKASH SERIES

WAVES OPTICS

Problem

1. A circular beam of light of diameter (width) falls on a plane surface of glass. The angle of incidence is .I., angle of refraction is .r. and refractive index of glass is μ. Then the diameter of the refracted beam d. is.......

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2. What speed should a galaxy move with respect to us so that the sodium line at 589.0 nm is observed at 589.6 nm?

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3. In YDSE , the interfering waves have amplitude in the ratio 3 : 2. Find the ratio of maximum and minimum Amplitude of resultant wave.

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4. The ratio of distance of two satellites from the centre of earth is 1 : 4. The ratio of their time periods of rotation will be :

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5. Two coherent sources are $0.18mm$ apart and the fringes are observed on a screen 80 cm away. It is found that with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of $10.8mm$ from the central fringe. Calculate the wavelength of light.

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6. In YDSE, the two slits are separated by $0.1mm$ and they are $0.5m$ from the screen. The wavelenght of light used is $5000A^0$. Find the distance between 7th maxima 11th minima on the screen.

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7. 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 it

$\lambda = 2000 A^0$ and $d = 7000 A^0$.

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

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9. A certain mass of substance in 10 g of benzene lowers the freezing point by $1.28^{\circ} C$ and in 100 g of water lowers the freezing point by $1.395^{\circ} C$ separately. If the substance has normal molecular weight in benzene and completely dissociated in water, calculate number of moles of ions formed by its 1 mole dissociation in water $\left(K_{f_{\text{water}}} = 1.86, K_{f_{\text{benzene}}} = 5.00\right)$

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10. In a double-slit experiment the angular width of a fringe is found to be 0.2^0 on a screen placed 1 m away. The wavelenght of light used is 600 nm. What will be the angular width of the fringe if the entire experimental apparatus is immersed in water? Take refractive index of water to be $4/3$.

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11. A beam of light consisting of two wavelengths $6500A^0$ and $5200A^0$ is used to obtain interference fringes in a Young's double slit experiment.

Find the distance of the third bright fringe on the screen from the central maximum for wavelength $6500A^0$. The distance between the slits is 2mm and the distance between the plane of the slits and the screen is 120 cm.

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12. A beam of light consisting of two wavelengths $6500A^0$ and $5200A^0$ is used to obtain interference fringes in a Young.s double slit experiment.

What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide? Distance between the slits is 2mm, distance between the slits and the screen $L = 120cm$.

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13. The maximum intensity in the case of n identical incoherent waves each of intensity

$2\frac{W}{m^2}$ is n $32\frac{W}{m^2}$ the value of n is.

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14. In YDSE, bichromatic light of wavelengths 400 nm and 560 nm are used. The distance between the slits is 0.1 mm and the distance between the plane of the slits and the screen is 1m. The minimum distance between two successive regions of complete darkness is

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

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16. Compare the intensities of two points located at respective distance $\frac{\beta}{4}$ and $\frac{\beta}{3}$ from the central maixma in a interference pattern of YDSE (β is the fringe width).

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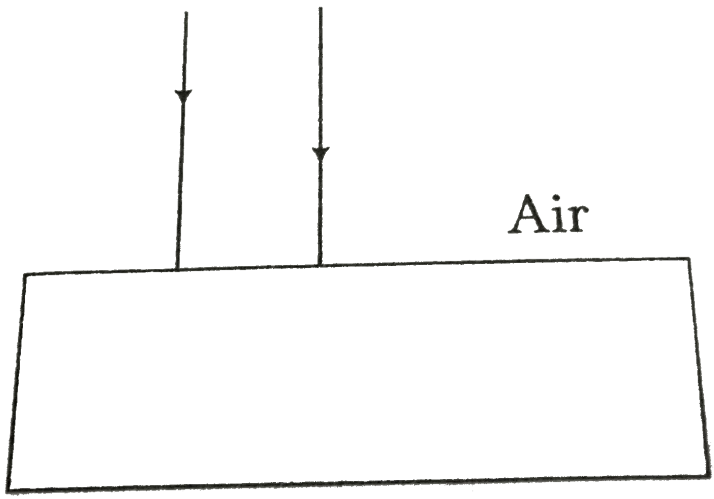
17. A parallel beam of light of intensity I is incident on a glass plate. 25% of light is reflected in any reflection by upper surface and 50% of light is reflected by any reflection

from lower surface. Rest is refracted The ratio of maximum to minimum intensity in interference region of reflected rays is



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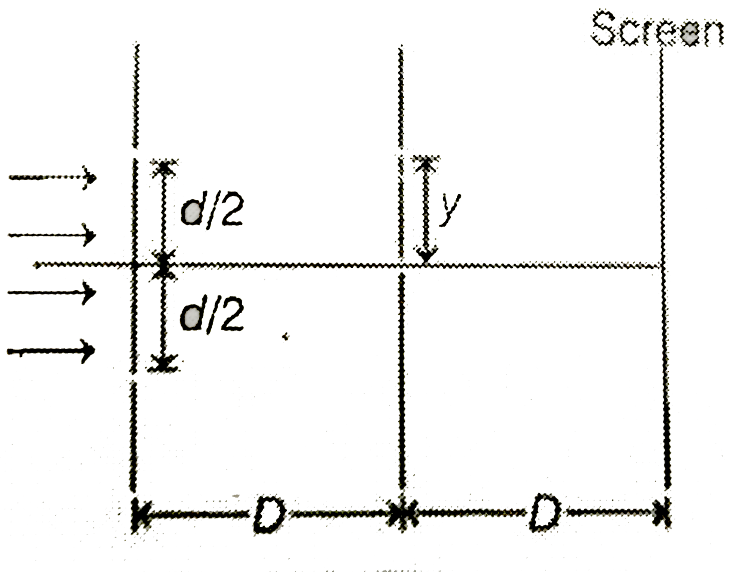
18. In the Young's double slit experiment apparatus shown in figure, the ratio of maximum to minimum intensity on the screen is 9. The wavelength of light used is λ, then the value of y is



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19. In Young.s double slit experiment intensity at a point is $(1/4)$ of the maximum intensity. Angular position of this points is

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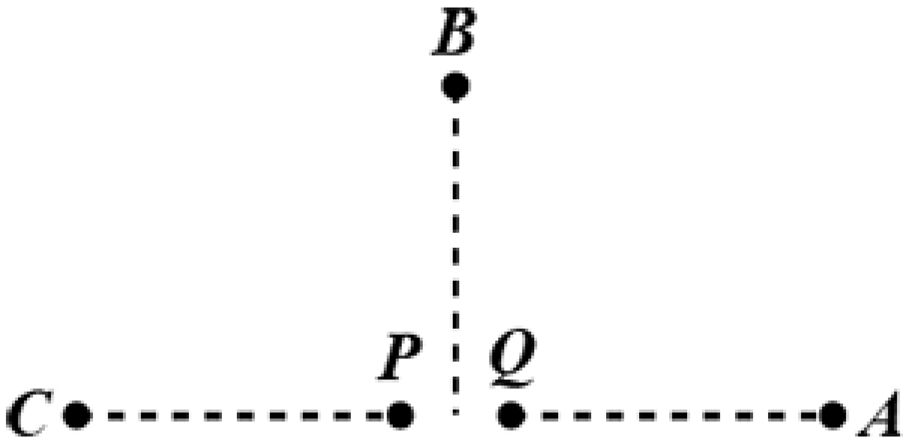
20. Fig, here shows P and Q as two equally intense coherent sources emitting radiations of wavelength 20m. The separation PQ si 5m, and phase of P is ahead of the phase Q by 90°. A, B and C are three distant points of observation equidistant from the mid - point of PQ. The intensity of radiations of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



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21. In YDSE $a = 2mm$, D = 2m, $\lambda = 500$ nm. Find distance of point on screen from central

maxima where intensity becomes 50% of central maxima

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22. A current I is flowing in a straight conductor of length L. The magnetic induction at a point distant $\frac{L}{4}$ from its centre will be

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23. White coherent light (400 nm- 700 nm) is sent through the slits of a young.s double slit experiment. The separation between the slits is $0.5mm$ and the screen is 50 cm away from the slits. There is a hole in the screen at a point 1 mm from the centre.

In the above problem which wavelength have a strong intensity at the hole?

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24. Two coherent sources are 0.15 mm apart and fringes are observed 1m away with monochromatic light of wavelength 6000^0. Find

The fringe width in air.

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25. Two coherent sources are 0.15 mm apart and fringes are observed 1m away with monochromatic light of wavelength 6000^0.

Find

The fringe width in a liquid of refraction index

$5/2$.

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26. Young's double slit experiment is made in a liquid. The tenth bright fringe in liquid lies in screen where 6th dark fringe lies in vacuum. The refractive index of the liquid is approximately

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27. In Young's double-slit experiment, the y-coordinate of central maxima and 10th maxima are 2 cm and 5 cm, respectively, When the YDSE apparatus is immersed in a liquid of refractive index 1.5, the corresponding y-coordinates will be

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28. A plate of thickness t made of a material of refractive index μ is placed in front of one of the slits in a double slit experiment. (a) Find the changes in he optical path due to introduction of the plate. (b) Wht should be the minimum thickness t which will make the intensity at the centre of the fringe pattern zero ? Wavelength of the light used is λ. Neglect any absorption of light in the plate.

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29. 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 beams. When this plate is replaced by another plate of same thickness, the shift of fringes is $(3/2)x$. The refractive index of second plate is

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30. A thin sheet of a transparent material $(\mu = 1.60)$ is placed in the path of one of the interfering beams in a YDSE using sodium light, $\lambda = 5890\dot{A}$. The central fringe shifts to a

position originally occupied by the 12th bright fringe. Calculate the thickness of the sheet.

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31. A double - slit apparatus is immersed in a liquid of refractive index 1.33 it has slit separation of 1mm and distance between the plane of slits and screen 1.33 m the slits are illuminated by a parallel beam of light whose wavelength in air is 800 nm.

(i) Calculate the fringe width.

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

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33. YDSE is carried out in a liquid of refractive index $\mu = 1.3$ and a thin film of air is formed in front of the lower slit as shown in the figure. If a maxima of third order is formed at the origin O, find the thickness of the air film. Find the positions of the fourth maxima. The wavelength of light is air is $\lambda_0 = 0.78 \mu m$ and $D / d = 1000$.

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34. YDSE is carried out in a liquid of refractive index $\mu = 1.3$ and a thin film of air is formed in front of the lower slit as shown in the figure. If a maxima of third order is formed at the origin O, find the thickness of the air film. Find the positions of the fourth maxima. The wavelength of light is air is $\lambda_0 = 0.78 \mu m$ and $D / d = 1000$.

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35. An interference is observed due to two coherent sources S_1 placed at origin and S_2 placed at $(0, 3\lambda, 0)$. Here, lambda is the wavelength of the sources. A detector D is moved along the positive x-axis. Find x-coordinates on the x-axis (excluding $x = 0$ and $x = \infty$) where maximum intensity is observed.

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36. Two coherent fight sources A and B with separation 2λ are placed on the x-axis symmetrically about the origion. They emit light of wavelength λ. Obtain the positions of maxima on a circle of large radius, lying in the x-y plane and with centre at the origion.

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37. Two coherent point sources S_1 and S_2 vibrating in phase 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 $s_1 s_2$ where a minimum of intensity occurs is

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38. In an arrangement of double slit arrangement fig. The slits are illuminated by light of wavelenth 600 mm. The distance of the first point on the screen from the centre maximum where intensity is 75% of central maximum is

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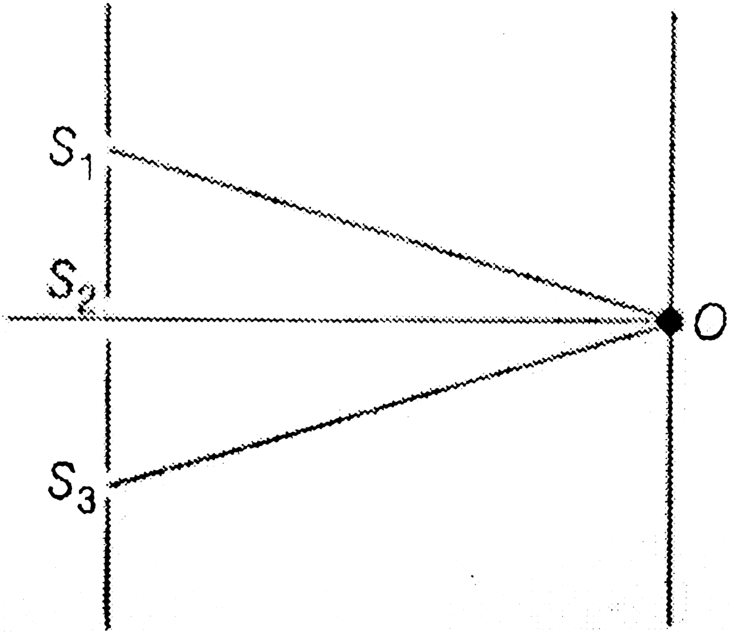
39. In the figure shown $S_1O - S_2O = S_3O - S_2O = \frac{\lambda}{4}$, Intensity at O due to any one of the slits is I_0. What is the intensity due to all the three coherent sources

S_1, S_2 and S_3 ?



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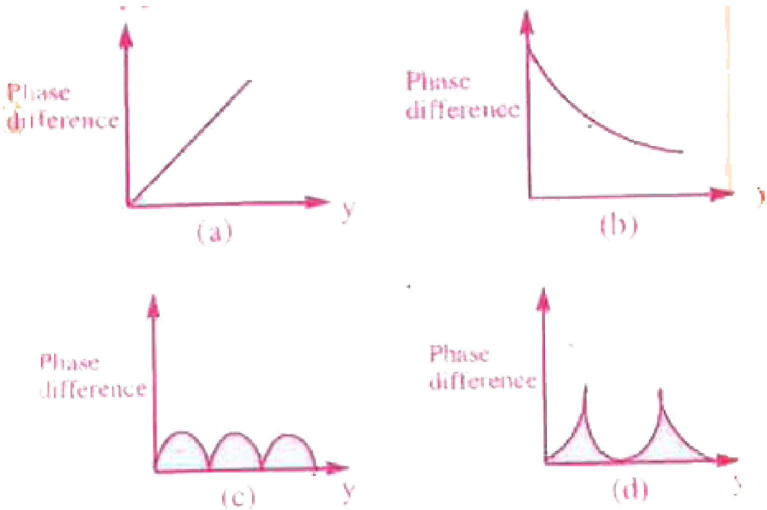
40. Which of the following graphs best represent the variation of phase difference between he interferring waves in a double slit experiment with the distance from the central maximum?



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41. The graph between the path difference versus phase difference is a/an

1) straight line 2) parabola 3) sine curve 4) none of these

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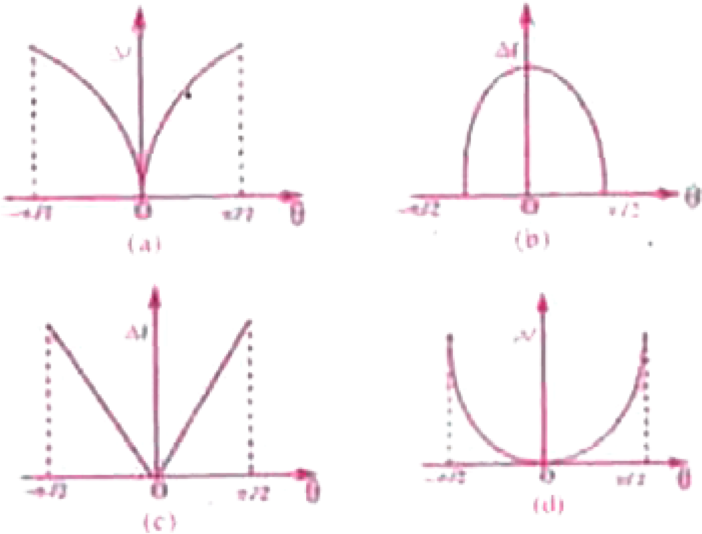
42. Which of the following graphs represent the variation of the path difference $(\triangle l)$ between the interferring waves in a double slit experiment with the .angular position. (θ) of the point on the screen?



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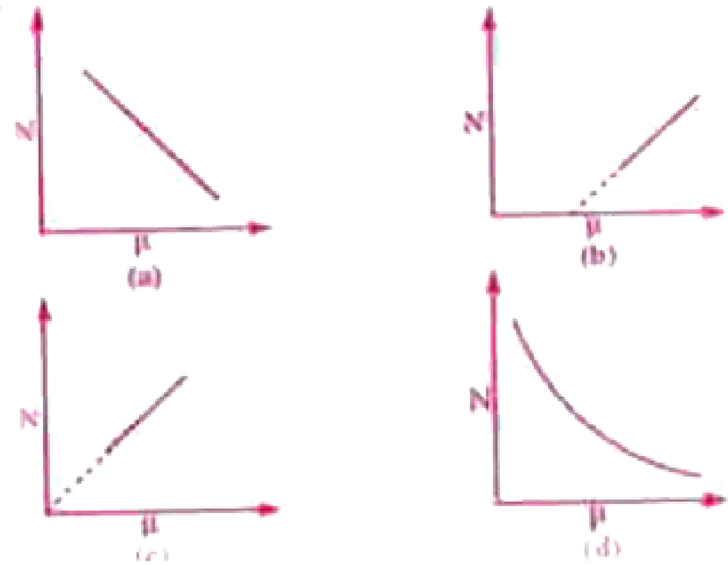
43. A Young.s double slit experiment set up is completely submerged in a transparent liquid. Which of the following graphs best represent the variation of total number of fringes N observed on the screen with the index of referring μ of the liquid?



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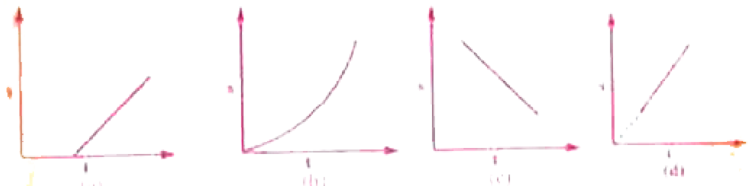
44. The graph between the shifts of the interferring pattern in a double slit experiment with the thickness t of a transparent slab introduced in front of one of the slits is best represented by



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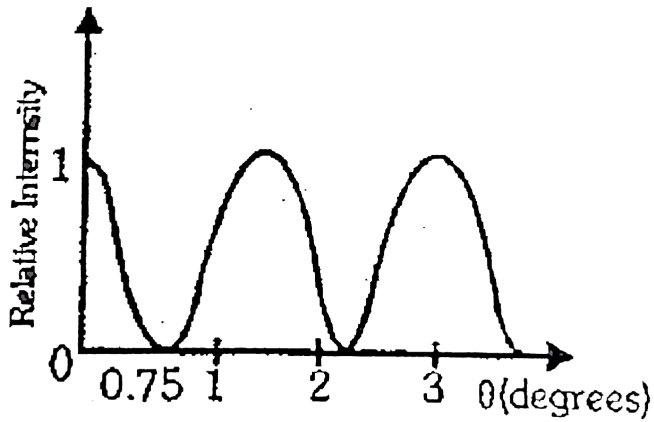
45.



Light of wavelength 520 nm passing through a double slit, produces interference pattern of relative intensity versus deflection angle θ as shown in the figure. Find the separation d between the slits.

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

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

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

(c) the separation between the two slits is increased

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

(e) the width of the source slit is increased (f) the monochromatic source is replaced by a source of white light? (In each operation, take all parameters, other than the one specified, to remain unchanged.)

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

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(f) the monochromatic source is replaced by a source of white light? (In each operation, take all parameters, other than the one specified, to remain unchanged.)

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50. What is the effect on the interference fringes in a Young.s double-slit experimental due to each of the following operations :

The width of the source slit is increased.

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51. What is the effect on the interference fringes in a Young.s double-slit experimental due to each of the following operations :

The monochromatic source is replaced by a source of white light?

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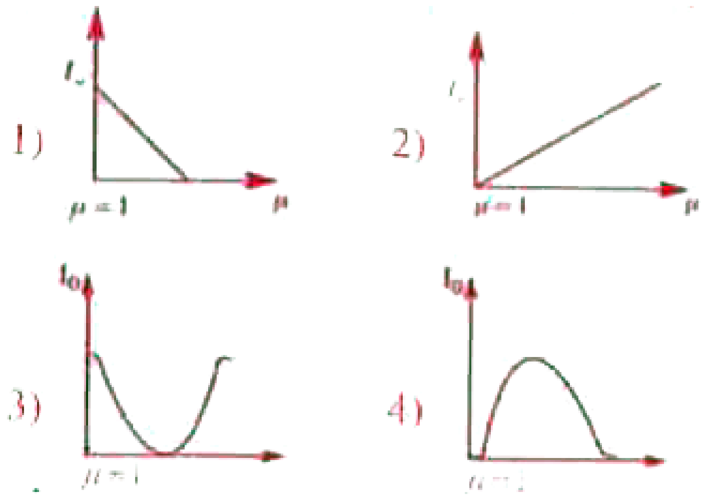
52. In a YDSE if a slab whose refractive index can be varied is palced in fron of one of the slits then the variation of resultant intensity of mid-point of screen with μ will be represented by (assume slits of equal width and there is no absorption by slab)



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53. A galaxy moves with respect to us so that sodium light of 589.0 nm is observed at 589.6

nm. The speed of the galaxy is

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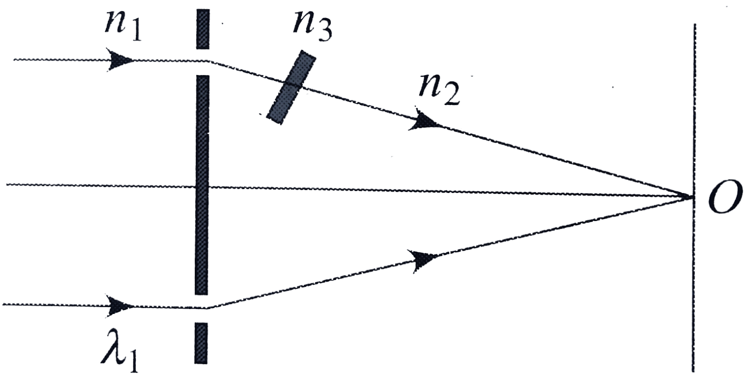
54. In YDSE shown in figure a parallel beam of light is incident on the slits from a medium of refractive index n_1. The wavelength of light in this medium is λ_1. A transparent slab of thickness t and refractive index n_3 is put in front of one slit. The medium between the screen and the plane of the slits is n_2. The phase difference between the light waves reaching point O (symmetrical, relative to the slits) is



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55. Explain the following giving reasons :

(i) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency.

(ii) When ligjt travels from a rarer to a denser medium, the speed decreases. Does this decrease in speed imply a reduction in the energy carried by the wave ?

(iii) In the wave picture of light, intensity of light is determined by the square of the amplitude of the wave. What determines the intensity in the photon picture of light ?

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56. When light travels from a rarer to a denser medium , the speed decreases . Does this decrease in speed imply a decrease in the energy carried by the light wave ? Justify your answer .

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57. Explain the following giving reasons :

(i) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency.

(ii) When ligjt travels from a rarer to a denser medium, the speed decreases. Does this decrease in speed imply a reduction in the energy carried by the wave ?

(iii) In the wave picture of light, intensity of light is determined by the square of the amplitude of the wave. What determines the intensity in the photon picture of light ?

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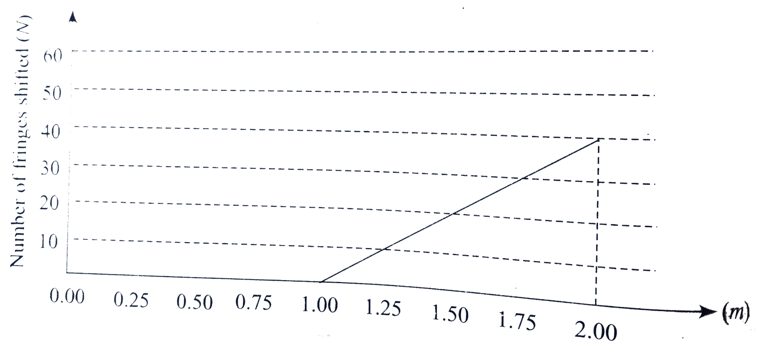
58. The slits in a double-slit interference experiment are illuminated by orange light $(\lambda = 60nm)$. A thin transparent plastic of thickness t is placed in front of one of the slits. The nunber of fringes shifting on screen is plotted versus the refractive index μ of the plastic in graph shown in figure. The value of t is



A. $8.8mm$

B. $649\mu m$

C. $24\mu m$

D. $600nm$

Answer: C

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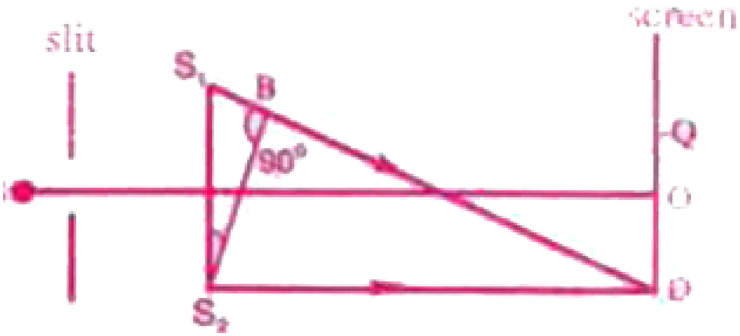
59. As shown in the figure Q, above point O is the position of first bright fringe. On the other side of O, D is the position of 11th bright fringe with respect to Q. If the wavelength of light used is $6000A^0$ then the value of S_1B will be



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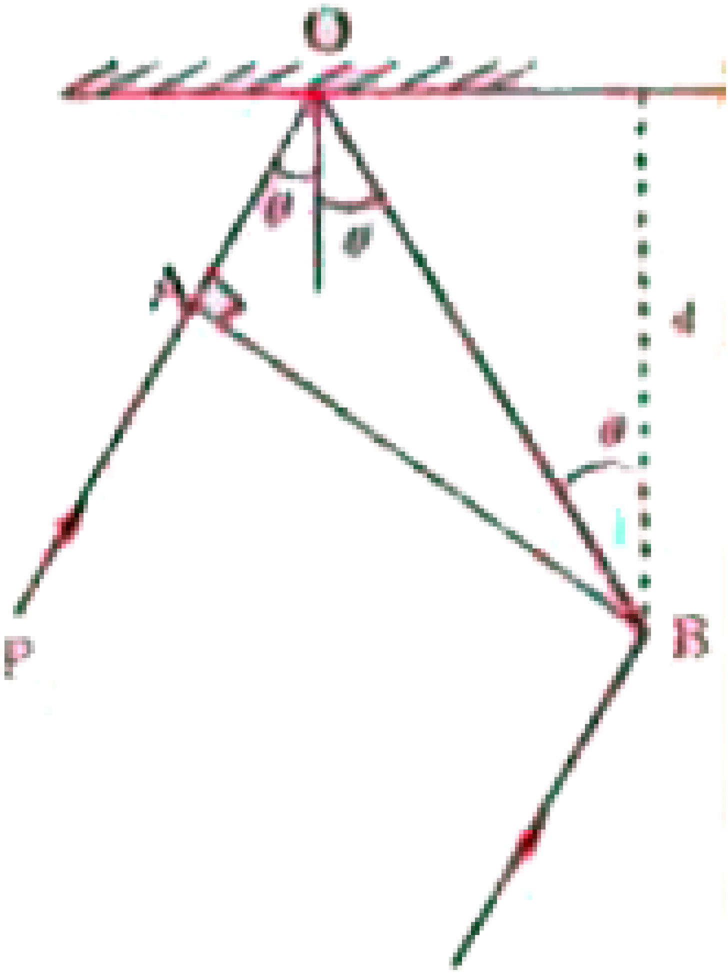
60. In the figures PO and QB are the extreme rays of a wavefront AB of monochromatic light of wavelength λ. The value of angle θ for which the ray QB and ray OB interference constructively is



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

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62. A screen is placed 50 cm from a single slit which is illuminated with light of wavelength 6000 Ã.... If the distance between the first and third minima in the diffraction pattern is 3.0 mm. The width of the slit is

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

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64. In double slit experiment what should be the width of each slit to obtain 10 maxima of the double slit pattern within the central maxima of single slit pattern with d=2 mm.

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65. Calculate the smallest angular separation resolved by the human eye, given : aperature $= 2.5mm$ and effectived $\lambda = 5500\dot{A}$. If a scale with mm markings is viewed by the unaided eye, deduce the largest distance to which the markings will be visible.

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66. Assume that light of wavelength 6000Å is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 100 inch

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67. Three mass points each of mass m are placed at the vertices of an equilateral triangle of side l. What is the gravitational field and potential at the centroid of the triangle due to the three masses?

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68. Light of wavelength 589 nm is used to view an object under a microscope. The aperature of the objective has a diameter of $0.900cm$.

Find

What effect would this have on the resolving power, if water $(\mu = 1.33)$ fills the space between the object and objective.

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69. Light of wavelength 589 nm is used to view an object under a microscope. The aperature of the objective has a diameter of $0.900 cm$.

Find

The limiting angle of resolution.

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70. Light of wavelength 589 nm is used to view an object under a microscope. The aperature of the objective has a diameter of $0.900 cm$. Find

What effect would this have on the resolving power, if water $(\mu = 1.33)$ fills the space between the object and objective.

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71. In Kepler's law of periods $T^2 = kr^3$, the constant $k = 10^{-13} s^2 m^{-3}$. Express the constant k in days and kilometers. The moon is at a distance of 3.84×10^5 km from the earth. Obtain its time period of revolution in days.

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72. A microscope has objective of aperture 8mm and focal length $2.5cm$. Estimate its resolving power. Given $\lambda = 5500\dot{A}$.

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73.

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74. For what distance is ray optics a good approximation when the aperture is 3 mm wide and the wavelength is 500 nm?

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75. 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 appreciable diffraction effects?

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76. When light of particular wavelength falls on a plane surface at an angle of incidence 60° then the reflected light becomes completely plane polarized Find the refractive index of surface material and the angle of refraction through it.

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77. When light of a certain wavelength is incident on a plane surface of a material at a glancing angle 30°, the reflected light is found to be completely plane polarized Determine

Angle of refraction.

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78. Two polaroid's are oriented with their planes perpendicular to incident light and transmission axis making an angle of 30° with each other. What fraction of incident unpolarized light transmitted?

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79. Unpolarized light falls on two polarizing sheets placed one on top of the other. What must be the angle between the characteristic directions of the sheets if the intensity of the final transmitted light is one - third the maximum intensity of the first transmitted beam

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80. Unpolarised light of intensity $32Wm^{-2}$ passes through three polarisers such that the transmission axis of the last polariser is crossed with first. If the intensity of the emerging light is $3Wm^{-2}$, the angle between the axes of the first two polarisers is

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

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Exercise Ia

1. Wave theory of light is not initially accepted because

A. It does not explain reflection and refraction

B. It does not explain photoelectric effect

C. It does not explain Doppler.s effect

D. It does not explain propagation of light through vacuum

Answer: D

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2. In geometrical optics a ray of light is defined as

A. Path of propagation of light

B. path of propagation os shadows

C. Direction of formation of image

D. path of propagation of energy for $\lambda \rightarrow 0$

Answer: D

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3. Select the correct option in the following.

A. Christian Huygens a contemporary of Newton established the wave theory of light by assuming that light waves were transverse

B. Maxwell provided the compelling theroretical evidence that light is transverse wave

C. Thomas Young experimentally proved the wave behavior of light and Huygens assumption

D. All the statements given above, correctly answers the question what is light

Answer: B

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4. Which of the following phenomenon is not explanined by Huygen's construction of wavefront ?

A. refraction

B. reflection

C. diffraction

D. origin of spectra

Answer: D

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5. In Newton.s corpuscular theory, no attempt was made to explain

A. the different colours of light

B. the speed of light

C. the laws of reflection

D. interference diffraction and polarization

Answer: D

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6. In the explanation of laws of refreaction by Newton.s corpuscular theory, identify the true statement

A. he assumed that light travels faster in a denser medium than in a rarer medium

B. he assumed hypothetical medium called ether, near a refracting surface

C. density of ether near the refracting surface is variable within certain range

D. light corpuscles within this range of variable density experiences no force

Answer: D

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7. Which of the following experiment proved that ..There is no ether.. in the universe

A. Foucault.s experiment

B. Lenard.s experiment

C. Michelson- Morley experiment

D. Thomson.s experimet

Answer: C

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8. The term gene for Mendellan factor was coined by

A. Newton.s corpuscular theory

B. Huygen.s wave theory

C. Electromagnetic theory

D. Quantum theory

Answer: C

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9. State the plane of polarization.

A. Newton.s corpuscular theory

B. Huygen.s wave theory

C. Electromagnetic theory

D. Quantum theory

Answer: C

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10. Choose the wrong statement

A. in isotropic medium, a ray of light is perpendicular to the wavefront

B. when the medium is anisotropic the rays are not always perpendicular to the wavefronts

C. Huygen.s theory assumed that intensity of secondary wave lets is not uniform, but varies from a maximum in forwared direction to a minimum in backward direction

D. ace to Huygen.s theory the intensity of secondary wavelets is uniform in both forward and backward directions

Answer: D

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11. Assertion In refraction from a plane surface, if object is virtual, then its image will be real.

Reason Plane surface always makes opposite natured image. If object is real, then image is virtual and vice-versa.

A. phase is same for all points

B. phase changes at constant rate at all points along the surface

C. constant phase difference continuously changes between the points

D. phase changes all over the surface

Answer: A

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12. A rectangular illuminated slit produces

A. spherical wave front

B. plane wavefront

C. cylindrical wavefront

D. all the above

Answer: C

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13. Huygen.s principle is used

A. to determine the velocity of light

B. to find the position of a wave front

C. to determine the wavelength of light

D. to find the focal length of a lens

Answer: B

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14. Plane wave front is not produced by a

A. only point source of light at finite distance

B. only rectangular illuminated slit at finite distance

C. any source of light at finite distance

D. all the above

Answer: D

Watch Video Solution

15. Geometrical shadow is formed due to the phenomenon of

A. diffraction of light

B. polarisation of light

C. interference of light

D. rectilinear propapation of light

Answer: D

Watch Video Solution

16. Nature of wave front depends on

A. shape of source

B. distance of source

C. both 1 and 2

D. none of these

Answer: C

Watch Video Solution

17. When a light wave in a rarer medium is reflected from the surface of an optically denser medium, it suffers a phase change of (in radian)

A. 2π

B. $\pi/2$

C. π

D. zero

Answer: C

Watch Video Solution

18. Two waves are said to be coherent, if they have

A. different frequency, and same phase

B. same frequency, and same phase

C. same frequency, but different phase

D. different frequency, and differenct phase

Answer: B

Watch Video Solution

19. Which of the following chemical is a base analogue ?

A. two sodium vapour lamps of same power connected in parallel to the same mains

B. two identical filament bulbs connected in series to the same mains

C. two slits in an opaque screen illuminated by a monochromatic source of light

D. all the above

Answer: C

Watch Video Solution

20. A pair of coherent sources may be

A. one virtual and the other real

B. both real

C. both virtual

D. All the above

Answer: D

Watch Video Solution

21. LASER light is considered to be coherent because it consists of

A. many wavelengths

B. un coordinate wave lengths

C. co-ordinate wave of exactly the same wavelength

D. divergent beams

Answer: C

Watch Video Solution

22. Choose the correct statement

A. in the case narrow source of light coherent sources are obtained by the division of wavefront

B. in the case of narrow or extended source of light coherent sources are obtained by the division of amplitude only

C. both of the above

D. none of the above

Answer: C

Watch Video Solution

23. The transverse nature of electromagnetic waves is proved by which of the following?

A. constructive interference if the phase difference between then is 90°

B. destructive interference if the path difference between them is $\lambda/2$

C. either constructive or destructive interference only if they are of same amplitude

D. either constructive or destructive interference even though they are of different wavelengths

Answer: B

Watch Video Solution

24. Of the following which pair can be coherent sources

A. two sodium vapour lamps of same power connected in parallel to the same mains

B. two identical filament bulbs connected in series to the same mains

C. two slits in an opaque screen illuminated by a monochromatic source of light

D. all the above

Answer: C

Watch Video Solution

25. Which of the following is not a condensation polymer?

A. a source along with its virtual image in the case of Lloyd.s single mirror

B. two virtual images of the same source in the case of Fresnel.s biprism

C. Two real images of the same source as in case of Billet.s split lens

D. two sodium vapour lamps of same frequency

Answer: D

Watch Video Solution

26. To demonstrate the phenomenon of interference, we require two sources which emit radiation

A. nearly the same frequency

B. the same frequency

C. different wavelength

D. the same frequency and having a definite phase relationship

Answer: D

Watch Video Solution

27. Interference is possible in

A. longitudinal waves

B. transverse waves

C. both

D. none

Answer: C

Watch Video Solution

28. State one condition for obtaining a sustained interference of light.

A. energy is destroyed at the dark bands

B. energy is created at the bright bands

C. energy is conserved but distributed among bright and dark bands

D. all the above are true

Answer: C

Watch Video Solution

29. Colours of soap film in sun light is due to

A. dispersion

B. diffraction

C. interference

D. double refraction

Answer: C

Watch Video Solution

30. In Young.s double slit experiment sodium light is replaced by blue lamp, then the fringe width

A. increase

B. decreases

C. remains same

D. becomes zero

Answer: B

Watch Video Solution

31. In Young.s double slit experiment the band width is minimum for the colour

A. red

B. yellow

C. green

D. blue

Answer: D

Watch Video Solution

32. If interference is complete or cent percent then the frequency of observed crossover will be

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

B. bright fringes will be more bright and dark fringes will be more dark

C. the brightness of the bright fringes and the darkness of the dark fringes remain same

D. cannot be decided

Answer: A

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33. The graph between the separation of the slits and fringe width in Young.s double slit experiment is (assume that the distance between the source and the screen and the wavelength of the source are kept constant)

A. straight line with negative slope

B. rectangular hyperbola

C. straight line with positive slope

D. parabola

Answer: B

Watch Video Solution

34. In Young.s double slit experiment both the slits are similar. If width of one of the slits is doubled then

A. dark fringes become narrower

B. bright fringes become less bright

C. dark fringes become slightly brighter

D. bright fringes become narrower

Answer: C

Watch Video Solution

35. The contrast in the fringes in any interference pattern depends on -

A. fringe width

B. intensity ratio of the sources

C. distance between the slits

D. wavelength

Answer: B

Watch Video Solution

36. If Young.s double slit apparatus is shifted from air to water, then

A. fringe width decreases

B. fringe width increases

C. fringe width remains same

D. fringe system disappers

Answer: A

Watch Video Solution

37. After crossing two plants, the progenies are found to be male sterile. This phenomenon is found to be maternally inherited and is due to some genes which reside in

A. polarisation

B. diffraction

C. interference

D. none

Answer: C

Watch Video Solution

38. What is the difference between $2.0m$ and $2.00m$.

A. zero

B. 4π

C. 6π

D. 8π

Answer: D

Watch Video Solution

39. If one of the slits in Young's double slit experiment is fully closed, the new pattern has ----------- central maximum in angular size.

A. the central fringe is dark

B. the bright fringe nearest the central white fringe is violet

C. the bright fringe nearest the central white fringe is red

D. the fringe system is not formed

Answer: C

Watch Video Solution

40. If one of the slits in Young's double slit experiment is fully closed, the new pattern has ------------ central maximum in angular size.

A. the contrast between the bright and dark bandds decreases

B. the width of the bands decreases

C. the central band becomes dark band

D. the interference bands disappear producing uniform illumination

Answer: D

Watch Video Solution

41. Young's slit experiment establishes that

A. light consist of particles

B. light consist of waves

C. light is both particle and wave

D. none of these

Answer: B

Watch Video Solution

42. Two coherent sources S_1 and S_2 produce interference fringes. If a thin mica plate is introduced in the path of light from S_1 then the central maximum

A. shift towards S_2

B. shift towards S_1

C. do not shift to any side

D. disappear

Answer: B

Watch Video Solution

43. In Young's double slit experiment a mica sheet of thickness t and refractive index μ is introduced in the path of ray from the first source S_1 By how much distance thhe fringe pattern will be displaced.

A. $dt/D(\mu - 1)$

B. $\dfrac{(\mu - 1)tD}{d}$

C. $Dt\mu/d$

D. $dt\mu/D$

Answer: B

Watch Video Solution

44. When a thin metal plate is placed in the path of one of the interfering beams of light

A. the fringes become blurred

B. the fringes become brighter

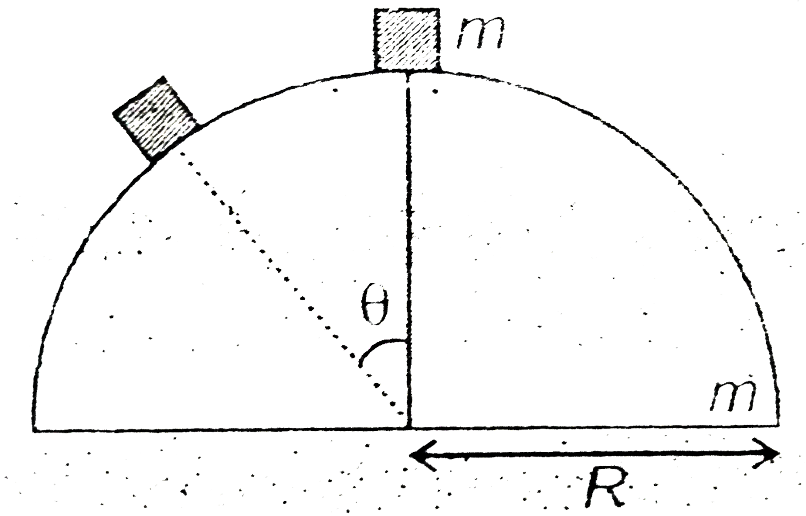
C. the fringes disappear

D. the fringe width increase

Answer: C

Watch Video Solution

45. A particle is placed on the top of a hemispherical shell of same mass. Shell is free to move on the smooth ground. If particle is given a given a gentle push and reaches to angular position q as shown in figure then for an observer fixed on a shell, ratio of reaction force exerted by shell to pseudo force (as observed from shell) acting on particle, is



A. straight line

B. parabola

C. hyperbola

D. circle

Answer: C

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46. If interference is complete or cent percent then the frequency of observed crossover will be

A. no interference

B. interference with bright bands

C. interference with bright bands

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

Answer: D

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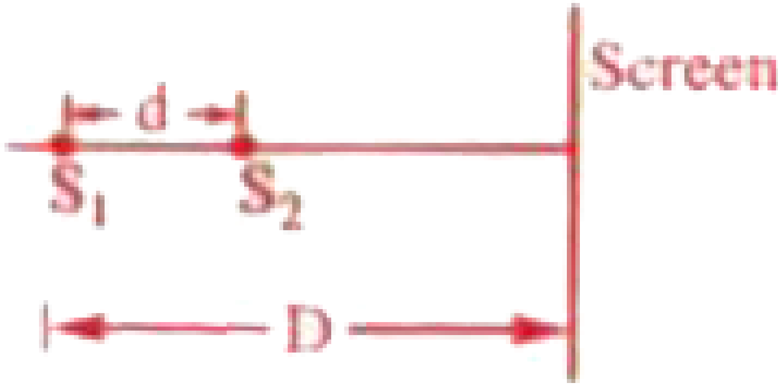
47. Two coherent sources S_1 and S_2 are separated by a small distance d. The fringes obtained on the screen will be:



A. straight lines

B. semicirles

C. concentric circles

D. points

Answer: C

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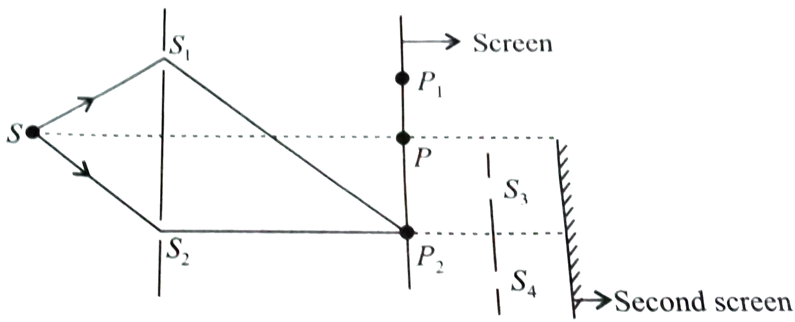
48. Figure shows a standard two slit arrangement with slits S_1, S_2. P_1, P_2 are the two minima points on either side of P. At P_2 on the screen, there is a hole and behind P_2 is a second 2 -slit arrangement with slits S_3, S_4 and a second screen behind them.



A. There would be no interference pattern on the second screen but it would be lighted

B. the second screen would be totally dark

C. the would be a single bright point on the second screen

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

Answer: D

Watch Video Solution

49. If the intensities of the two interfering beams in Young.s double -Slit experiment be I_1 and I_2 then the contrast between the maximum and minimum intensity is good when

A. I_1 is much greater than I_2

B. I_1 is much smaller than I_2

C. $I_1 = I_2$

D. either $I_1 = 0$ or $I_2 = 0$

Answer: C

Watch Video Solution

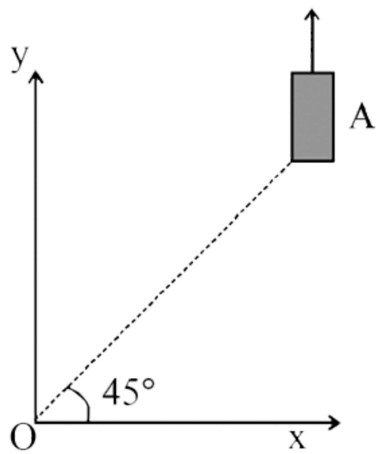
50. On a frictionless horizontal surface, assumed to be the $x-y$ plane, a small trolley A is moving along a straight line parallel to the $y-$ axis (see figure) with a constant velocity of $(\sqrt{3}-1)m/s$. At a particular instant, when the line OA makes an angle of $45(\circ)$ with the $x-$ axis, a ball is thrown along the surface from the origin O. Its velocity makes an angle ϕ with the $x-$ axis and it hits the trolley.

(a) The motion of the ball is observed from the frame of the trolley. Calculate the angle θ made by the velocity vector of the ball with the $x-$

axis in this frame .

(b) Find the speed of the ball with respect to the

surface , if $\phi = (4\theta) / (3)$.



A. End A of screen

B. End B of screen

C. does not shift at all

D. Either end A or B depending on extra phase difference caused by shifting of source

Answer: B

Watch Video Solution

51. If a broad source is used in interference experiment choose the incorrect statement

A. a broad source is equivalent to a large number of narrow sources lying side by side

B. each set these sources produce it.s own interference pattern which may overlap and cause general illumination

C. intensity of bright fringes increases and they become broad

D. bright and dark fringes will disappear

Answer: C

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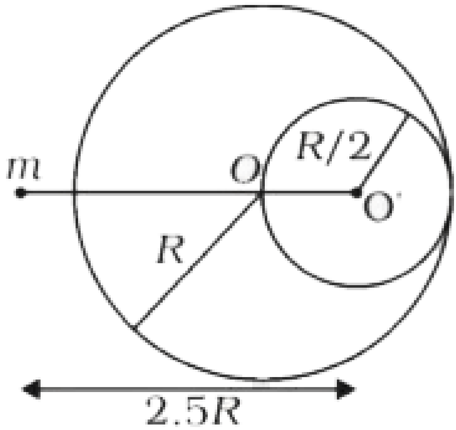
52. A solid sphere of radius R/2 is cut out of a solid sphere of radius R such that the spherical cavity so formed touches the surface on one side and the centre of the sphere on the other side, as shown. The initial mass of the solid sphere was M. If a particle of mass m is placed at a distance 2.5R from the centre of the cavity, then what is the gravitational attraction on the mass m?



A. be a fine sharp slit white in colour at the centre

B. a bright slit white at the centre diffusing to zero intensities at the edges

C. a bright slit white at the centre diffusing to regions of different colour

D. only be a diffused slit white in colour

Answer: A

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53. In Young's interference experiment, the central bright fringe can be indentified due to the fact that it

A. as it has greater intensity than the other bright fringes

B. as it is wider than the othe rbright fringes

C. as it is narrower than the other bright fringes

D. by using white light instead of monochromatic light

Answer: D

Watch Video Solution

54. Three particles each of mass m are placed at the three corners of an equilateral triangle of side a. The work which should be done to increase the sides of the triangle to 2a is

A. the fringes become blurred

B. the fringes become brighter

C. the fringes disappear

D. the fringe width increase

Answer: C

Exercise Ia Diffraction

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

A. fresnel

B. fraunhofer

C. young

D. grimaldi

Answer: D

Watch Video Solution

2. What is meant by diffraction of light?

A. the bending of light at the surface of separation when is travels from rarer medium to denser medium

B. the bending of light at the surface of separation when is travels from denser medium to rarer medium

C. encroachment of light into the geometrical shadow of the obstacle placed in its path

D. emergence of a light ray grazing the surface of separation when it travels from denser to rarer medium

Answer: C

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3. Both light and sound waves suffer diffraction. Why it is more difficult to observe diffraction with light waves?

A. light wave do not require medium

B. wavelength of light waves is far smaller

C. light waves are transverse

D. speed of light is far greater

Answer: B

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4. The silver lining surrounding the profile of a mountain just before sunrise is due to

A. interference

B. diffraction

C. dispersion

D. refraction

Answer: B

Watch Video Solution

5. When a compact disc is illuminated by a source of white light,colured lines are observed.This is due to

A. dispersion

B. diffraction

C. interference

D. refraction

Answer: B

Watch Video Solution

6. Which of the following statements is correct

A. diffraction is because of interference of light from same source where as interference is due to light from two individual sources

B. diffraction pattern is due to interference of light from secondary waves of the same wave front whereas interference is due to superposition of two waves derived from the same source

C. diffraction is due to interference of light waves derived from the same source whereas interference is bending of light at the obstacle

D. none of the above

Answer: B

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7. Bright colours exhibited by spider.s web, exposed to sunlight are due to

A. interference

B. resolution

C. diffraction

D. polarisation

Answer: C

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8. A plane wavefront is divided into a number of half period zones as per Fresnel theory. The resultant amplitude at a point due to secondary waves spreading from a zone is

A. directly porportional to the square root of the area of the zone

B. inversely proportional to the square of the distance of the point from the zone

C. inversely proportional to the distance of the point from the zone

D. independence of obliquity

Answer: C

Watch Video Solution

9. Which element is the lightest of all other solid elements ?

A. increase

B. decreases

C. remains same

D. may increase or decrease depending upon the wavelength

Answer: B

Watch Video Solution

10. Two point sources of sound are kept at a separation of 10 cm. They vibrate in phase to produce waves of wavelength 5.0 cm. What would be the phase difference between the two waves arriving at a point 20 cm from one source

(a) on the line joining the sources and (b) on the perpendicular bisector of the line joining the sources ?

A. $\pi/2$

B. $\pi/4$

C. π

D. zero

Answer: C

Watch Video Solution

11. 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 wave length

C. unpolarised

D. of shorter wave length

Answer: B

Watch Video Solution

12. In Fresnel.s diffraction wavefront must be

A. spherical

B. cylindrical

C. plane

D. both 1 and 2

Answer: D

Watch Video Solution

13. The source is at some distance from an obstacle. Distance between obstacle and the point of observation is .b. and wavelength of light is $.\lambda..$ Then the distance of nth Fresnel Zone will be at a distance..........from the point of observation.

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

B. $b-\frac{n\lambda}{2}$

C. $b+\frac{n\lambda}{2}$

D. $b-n\lambda$

Answer: C

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14. A very small opaque disc is placed in the path oa a monochromatic light. Its geometric shadow has

A. bright point at the center of shadow surrounded by alternate bright and dark rings

B. dark point at the center of shadow surrunded by alternate bright and dark rings

C. uniform darkness

D. uniform illumination

Answer: A

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

A. no change

B. diffraction bands become narrower and crowded together

C. bands become broader and farther apart

D. bands disappear

Answer: B

Watch Video Solution

16. In a diffraction pattern the width of any fringe is

A. directly proportional to slit width

B. inversely proportional to slit width

C. independent of the slit width

D. inversely proportional to square of slit width

Answer: B

Watch Video Solution

17. Yellow light is used in a single slit diffraction experiment with a slit of 0.6 mm. If yellow light is replaced by x-rays, than the observed pattern will reveal:

A. the the central maximum is narrower

B. more number of fringes

C. less number of fringes

D. no diffraction patterns

Answer: D

Watch Video Solution

18. In diffraction froma a single -slit, the angular width of the centre maxima does not depends on

A. λ of light used

B. width of slit

C. distance of slits from the screen

D. ratio of λ and slit width

Answer: C

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19. The correct relation between limit of resolution and resolving power is

A. limit of resolution $= \frac{1}{\text{resolving power}}$

B. limit of resolution α resolving power

C. limit of resolution $\alpha = \frac{1}{\text{resolving power}}$

D. limit of resolution α (1- resolving power)

Answer: A

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20. The resolving power of electron microscope is

A. 400 times

B. 40 times

C. 4000 times

D. 4 times

Answer: C

Watch Video Solution

21. The limit of resolution of eye is approximately

A. 1^{11} angle

B. 1^{1} angle

C. 1 mm

D. 1 cm

Answer: B

Watch Video Solution

22. The angular resolution of the telescope is determined by the

A. image produced by the telescope

B. objective of the telescope

C. both 1 and 2

D. neither 1 or 2

Answer: B

23. In telescope of objective diameter (2a), the radius of the central bright region (r_0) is

A. $\frac{0.61\lambda f}{a}$

B. $\frac{0.75\lambda f}{a}$

C. $\frac{1.94\lambda f}{a}$

D. $\frac{2.43\lambda f}{a}$

Answer: A

24. For better resolution, a telescope must have a

A. large diameter objective

B. small diameter objective

C. may be large

D. neither large nor small

Answer: A

Watch Video Solution

25. What will be ratio (D/f) in microscope where, D is the diameter of the aperture and .f. is the focal length of the objective lens?

A. $\tan\beta$

B. $\frac{\tan(\beta)}{2}$

C. $2\tan\beta$

D. $\frac{\tan(\beta)}{6}$

Answer: C

Watch Video Solution

26. The resolving power of a microscope is basically determined by the

A. speed of the light used

B. wavelength of the ligth used

C. both 1 and 2

D. neither 1 or 2

Answer: B

Watch Video Solution

27. If the red light is replaced by blue light illuminating the object in a microscope, then the resolving power of the microscope

A. A) decreases

B. B) increases

C. C) gets halved

D. D) remains unchanged

Answer: B

Watch Video Solution

28. For a telescope to have large resolving power, then the

A. focal length of its objective should be large

B. focal length of its eye piece should be large

C. focal length of its eye piece should be small

D. aperture of its objective should be large

Answer: D

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29. If I_0 is the intensity of the pricipal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled ?

A. $2I_0$

B. $4I_0$

C. I_0

D. $I_0/2$

Answer: B

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30. In an experiment, a physical quantity is given by $Y = \frac{a^2 b}{c^3}$. The permissible percentage error

A. $Z_F \approx \lambda / a^2$

B. $Z_F \approx 2\lambda / a^2$

C. $Z_F \approx a^2 / \lambda$

D. $Z_F \approx / \lambda$

Answer: C

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31. The diffraction pattern due to a straight edge contains

A. alternate bright and dark bands of same width

B. alternate bright and dark bands with decreasing width as the order of the band increases in the illuminated part

C. alternate bright and dark bands with increasing width as the order of the band increases

D. none of the above is true

Answer: B

Watch Video Solution

32. As we move away from the edge into the geometrical shadow of a straight edge, the intensity of illumination

A. decreases

B. increases

C. remains same

D. none of the above

Answer: A

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33. In the case of diffraction bands due to a straight edge, as we move away from the edge

A. intensity of the bright band increases and that of the dark band decreases

B. intensity of the bright band decreases and that of the dark band increases

C. intensity of the bright band decreases but that of the dark band remains unchanged

D. intensity of the bright band remains unchanged but that of the dark band increases

Answer: B

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Exercise Ia Polarasation

1. Transverse wave nature is established by

A. interference

B. diffraction

C. polarisation

D. all the above

Answer: C

Watch Video Solution

2. Transverse wave nature of light was first proposed by

A. Huygen

B. fraunhofer

C. maxwell

D. fresnel

Answer: C

Watch Video Solution

3. Which of the following cannot be polarised?

A. radio waves

B. X-rays

C. ultra violet rays

D. sound waves

Answer: D

Watch Video Solution

4. Which of the following phenomenon is not common to sound and light waves

A. interference

B. diffraction

C. polarisation

D. reflection

Answer: C

Watch Video Solution

5. In the propagation of electromagnetic waves the angle between the direction of propagation and plane of polarization is

A. zero

B. 45°

C. 90°

D. 180°

Answer: A

Watch Video Solution

6. In the case of light waves the angle between plane of vibration and plane of polarization is

A. 180°

B. 90°

C. 45°

D. zero

Answer: D

Watch Video Solution

7. Polarisation can be produced by

A. reflection

B. double refraction

C. scattering

D. all of the above

Answer: D

Watch Video Solution

8. In the case of linearly polarized light, the magnitude of he electric field vector

A. is parallel to the direction of propagation

B. does not change with time

C. increases and decreases linearly with time

D. varies periodically with time

Answer: D

Watch Video Solution

9. Which of the following represents a volt?

A. $y(x, t) = a\sin(kx - \omega t)$

B. $z(x, t) = a\sin(kx - \omega t)$

C. $z(x, t) = a\sin(kx - \omega t + \phi)$

D. both 2 and 3

Answer: D

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10. The tangent of polarizing angle is numerically equal to

A. diversity of the reflecting medium

B. refractive index of the reflecting medium

C. velocity of light in reflecting medium

D. elastic modulus of reflecting medium

Answer: B

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11. Ordinary light is incident on the upper surface of a glass slab at theh polarizing angle. Then

A. the reflected ray is completely plane polarized with vibrations perpendicular to the plane of incidence

B. the refracted ray is also completely plane polarized with vibrations in the plane of incidence

C. the reflected ray is partically polarized with vibrations perpendicular to the plane of incidence

D. both reflected and refracted rays are completely polarized having both of them vibrations in the plane of incidence

Answer: A

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12. Ordinary (i.e., unpolarised) lights is incident on the surface of a transparent material at the polarising angle. If it is partly reflected and partly refracted, what is the angle between the reflected and the refracted rays?

A. parallel to each other

B. perpendicular to each other

C. inclined to each other making an angle

45°

D. none of the above

Answer: B

Watch Video Solution

13. A calcite crystal placed over an ink dot is rotated. On seeing through the crystal one finds

A. two stationary dots

B. two dots moving along parallel straight lines

C. one dot rotating about the other

D. both dots rotating about a common axis

Answer: C

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14. When unpolarized light is incident on a Tourmaline crystal of proper thickness

a) it exhibits dichroism

b) it absorbs ordinary ray and transmits extraordinary ray

c) it absorbs extraordinary ray and transmits ordinary ray.

A. O-ray is completly absorbed and E-ray is partially absorbed

B. O-ray is partially absorbed and E-ray is completly absorbed

C. Both O-ray & E-ray is completly absorbed

D. Both O-ray & E-ray is partially absorbed

Answer: A

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15. The refractive index of the material of the prism and liquid are 1.56 and 1.32 respectively. What will be the value of θ for the following refraction ?

A. only the O-ray is polarised

B. only the E-ray is polarised

C. both O-ray and E-ray are polarised

D. neither O-ray nor E-ray are polarised

Answer: C

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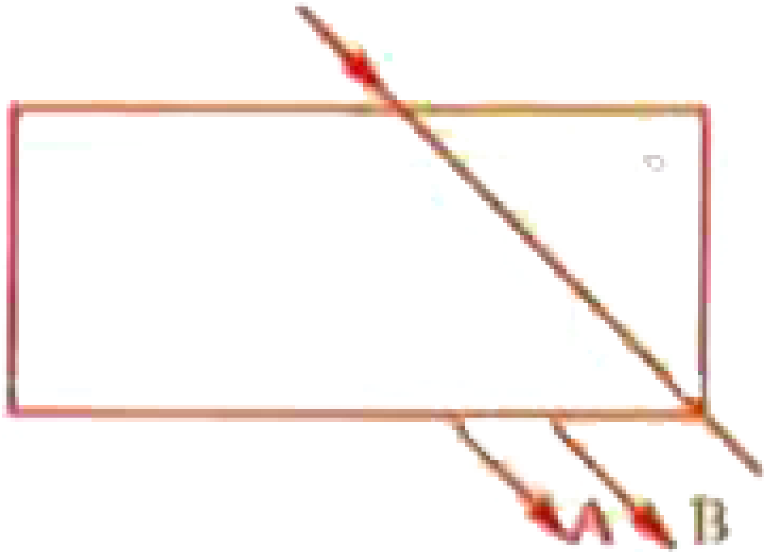
16. A double refracting crystal plate gives two refracted rays A and B for a single incident ray as shown. If μ_A and μ_B are the refractive indices of the crystal for the two rays



A. $\mu_A > \mu_B$

B. $\mu_A = \mu_B$

C. $\mu_A < \mu_B$

D. none

Answer: A

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17. Which of the following is wheat fruit?

A. quartz

B. crown glass

C. tourmaline

D. all the above

Answer: C

Watch Video Solution

18. Dichroism is the property where

A. unequal absorption of ordinary and extraordinary rays takes place

B. equal absorption of ordinary and extraordinary rays takes place

C. plane of polarization rotates

D. none of the above

Answer: A

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19. If a ray of light is allowed to pass through a quartz crystal, then the two refracted rays obtained are

A. plane polarized and planes of polarization are parallel

B. plane polarized and planes of polarization are perpendicular

C. circularly polarized in opposite direction

D. circularly polarized in the same direction

Answer: B

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20. Which of the folloiwng is dichroic

A. poly vinyl alcohol

B. quartz

C. calcite

D. diamond

Answer: A

Watch Video Solution

21. The intensity of the polarized light transmitted through the analyzer is given by

A. Brewster.s law

B. Malus law

C. Fresnel.s assumption

D. Law of superposition

Answer: B

Watch Video Solution

22. A plane polarized light is incident on an analyser and when it is rotated to complete one rotation, one observes

A. one extinction and two brightnesses

B. one brightness and two extinctions

C. two extinctions and two brightnesses

D. no change in the brightness

Answer: C

Watch Video Solution

23. When light falls on two polaroid sheets having their axies matually perpendicular, then it is

A. completly extinguished

B. partly extinguished

C. partly brightnessed

D. completely brightnessed

Answer: A

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24. Polaroids are used

A. A. to eliminate head light glare in automobile

B. B. in production of 3-D motion pictures

C. C. in sun glasses

D. D. all the above

Answer: D

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25. The synthetic material used for the preparation of polaroids prosses the propery of

A. anomalous thermal expansion

B. optical activity

C. dichroism

D. none of the above

Answer: C

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26. If polaroids are to be used to avoid glares of in coming light then

A. visibility will decrease

B. transmittivity of windshield will decrease

C. vehicles will move slowly

D. cost will increase

Answer: A

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27. When light falls on two polaroid sheets, one observes complete brightness then the two polaroids axes are

A. mutually perpendicular

B. mutually parallel

C. angle between their two axes is 45°

D. none of the above

Answer: B

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28. Choose the correct statement.

A. The maximum intensity in the interference pattern of Young"s double slit experiment is four times the intensity of the individual wave

B. in the diffraction pattern due to straight edge the intensity of the bright bands in the illuminated part increases with the increase of the order of the band

C. during double refraction the vibrations of the extra-ordinary ray are perpendicular to the principal section of the crystal

D. light waves can be polarized because they are longitudinal waves

Answer: A

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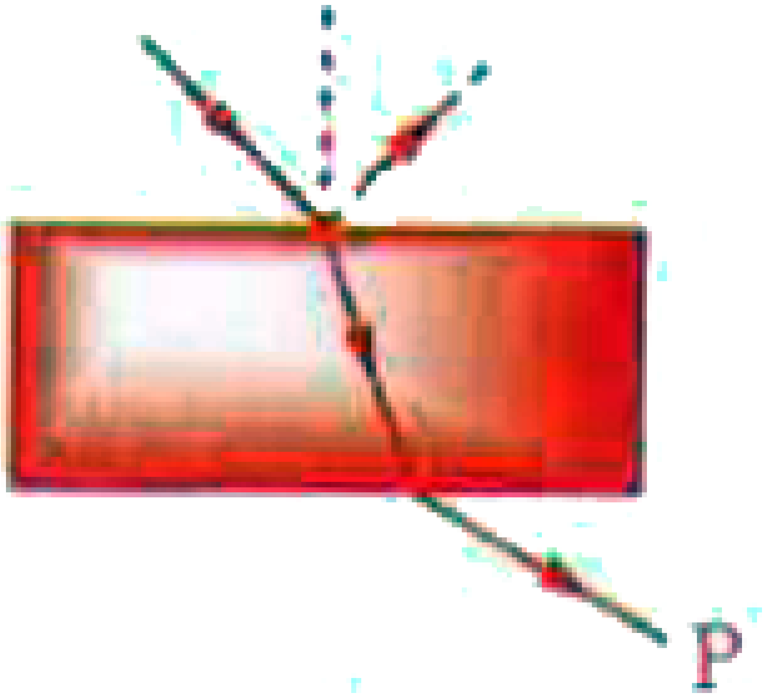
29. Consider is light beam incident from air to a glass slab at

Brewster.s angle as shown in Fig.



A Polaroid is placed in the path of the emergent ray at point P and rotated about an axis passing through the centre and perpendicular to the plane of the polaroid.

A. For a particular orientation, there shall be darkness as observed through the Polaroid

B. The intensity of light as seen through the polaroid shall be independent of the rotation

C. The intensity of light as seen through the polaroid shall go through a minimum but not zero for two orientations of the polaroid

D. The intensity of light as seen through the polaroid shall go through a minimum for four orientations of the polaroid

Answer: C

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Exercise Ia Satement Type Questions

1. Consider the following statement A and B and identify the correct answer

A) In the case of narrow source of light coherent sources are obtained by the division of wave front

B) Diffraction is due to interference of light from secondary sources of the same wave front whereas interference is due to superposition of two waves derived from the same source.

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: B

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2. Instead of using two slits as in young.s experiment, if we use two separate but identical sodium lamps, which of the following occur

a) uniform illumination is observed

b) widely separate interference

c) very bright maximum

d) very minimum.

A. a only

B. a, b only

C. c, d only

D. b, d only

Answer: A

Watch Video Solution

3. Consider the following statement A and B and identify the correct answer

A) In the case of narrow source of light coherent sources are obtained by the division of wave front

B) Diffraction is due to interference of light from secondary sources of the same wave front whereas interference is due to superposition of two waves derived from the same source.

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

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4. Consider the following statement A and B and identify the correct answer

A) Radio waves diffract around buildings but light waves does not

B) To cut down glare of incident light we prefer sun glasses made from polaroids

A. A is false but B is true

B. A is true but B is false

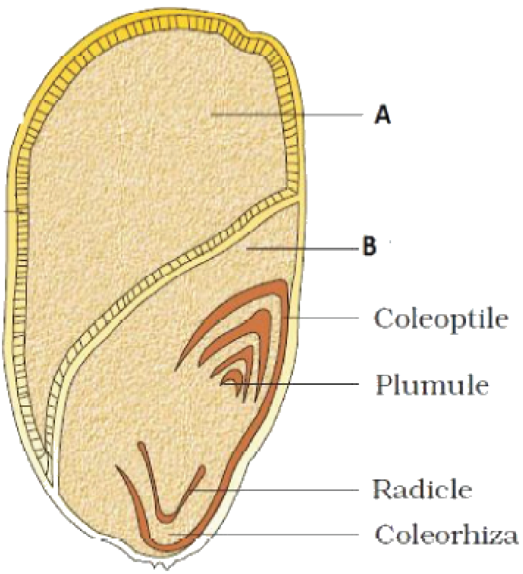
C. Both A and B are true

D. Both A and B are false

Answer: C

Watch Video Solution

5. In the following diagram label A and B



A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

Watch Video Solution

6. Consider the following statement A and B and identify the correct answer

A) Fresnel.s diffraction pattern occurs when the source of light or the screen on which the diffraction pattern is seen or when both are at finite distance from the aperture

B) Diffraction light can be used to estimate the helical structure of nucleic acids

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: B

Watch Video Solution

7. Consider the following statement A and B and identify the correct answer

A) Electric vector of electromagnetic wave is the light vector that affects the retina of the eye

B) In a polarized light the sum of all the components of the vibrations in one direction is eaqul to the sum of all the components of the vibrations perpendicular to that direction

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: B

Watch Video Solution

8. Consider the following statement A and B and identify the correct answer

A) When light falls on two polariod sheets having their axes mutually perpendicular it is completely extinguished

B) When polyvinyl alcohol is subjected to a large strain the molecules get oriented parallel to the direction of strain and material becomes double refractive

A. A is false but B is true

B. A is true but B is false

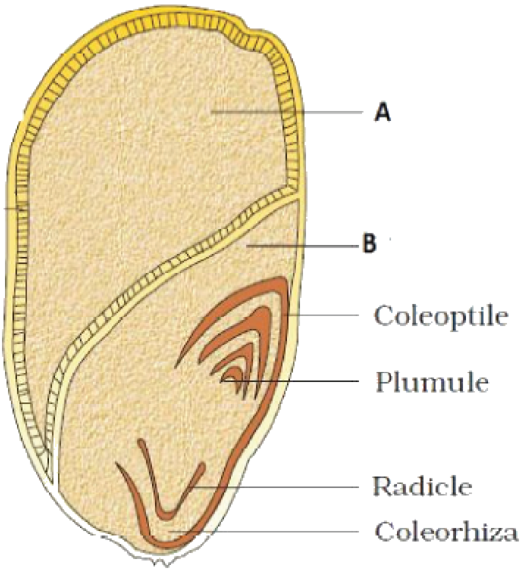
C. Both A and B are true

D. Both A and B are false

Answer: C

Watch Video Solution

9. In the following diagram label A and B



A. A is false but B is true

B. A is true but B is false

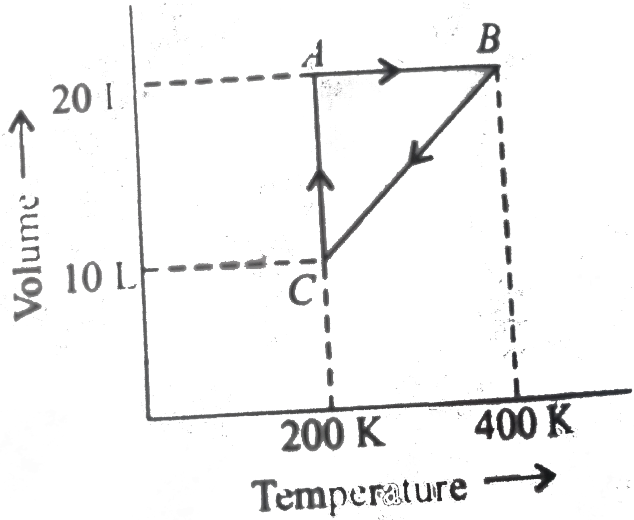
C. Both A and B are true

D. Both A and B are false

Answer: C

Watch Video Solution

10.



The pressures at A and B in the atmosphere are, respectively,

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

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11. In a reaction, ΔH and ΔS both are more than zero. In which of the following cases, the reaction would not be spontaneous?

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

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12. A man in a lift ascending with an upward acceleration a throws a ball vertically upwards with a velocity v with respect to himself and catches it after t_1 seconds. After wards when the lift is descending with the same acceleration a acting downwards the man again throws the ball vertically upwards with the same velocity with respect to him and catches it after t_2 seconds?

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: A

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Exercise Ia More Than One Option

1. In which of the following cases do we obtain a spherical wave fron ?

a) sunlight focussed by a convex lens

b) light diverging from a straight slit

c) light emitted by a point source in an isotropic medium

d) a parallel beam of light reflected from a plane mirror

A. a, b only

B. b, c only

C. a, d only

D. a, c only

Answer: D

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2. Huygen.s principle of secondary wavelets can be used to

a) deduce the laws of rectraction of light

b) deduce the laws of refraction of light

c) explain the transverse nature of light waves

d) predict the location of a wavefront as time passes

A. a, b only

B. a, c only

C. a, b, d only

D. b, c only

Answer: C

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3. When two coherent waves interfere, the minimum and maximum intensities are in the ratio 16 : 25. Then

a) the maximum and minimum amplitudes will be in the ratio 5 : 4

b) the amplitudes of the individual waves will be in the ratio 9 : 1

c) the intensities of the individual waves will be in the ratio 41 : 9

d) the intensities of the individual waves will be in the ratio 81 : 1.

A. a, b and c are true

B. a, b and d are true

C. a and b are true

D. b and c are true

Answer: B

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4. If white light is used in Young's double -slit experiment

a) bright white fringe is formed at the centre of the screen

b) fringes of different colours are observed on both sides of central fringe clearly only in the first order

c) the first order violet fringes are closer to the centre of the screen than the first order red fringes

d) the first order red fringes are closer to the centre of the screen than the first order violet fringes

A. only a and d are true

B. only a and b are true

C. only a, b and c are true

D. all are true

Answer: C

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5. Both in interference and diffraction phenomena, alternate dark and bright fringes are obtained on screen

I) generally fringe width is same in interference and not same in diffraction

II) the central fringe in interference has maximum brightness and the intensity gradually decreases on either side

III) in interference the intensity of all bright fringes is same

IV) both the phenomena are produced from same coherent sources.

A. I only

B. I and II

C. I, II and IV

D. I, III and IV

Answer: D

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6. In Young.s double slit experiment, the 10th bright fringe is at a distance x from the central fringe. Then

a) the 10th dark fringe ia at a distance of $19x/20$ from the central fringe

b) the 10th dark fringe is at a distance of $21x/20$ from the central fringe.

c) the 5th dark fringe is at a distance of $x/2$ from the central fringe. d) the 5th dark fringe is at a distance of $9x/20$ from the central fringe.

A. a, b, c only

B. b, c, d only

C. a, d only

D. a, b, c, d only

Answer: C

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7. A light of wavelength 1 is incident on an object of size b. If a screen is at a distance D from the object, identify the correct condition for the obervation of different phenomena

a) if $b^2 = D1$, Fresnel diffration is obserbed

b) if $b^2 > > D1$, Fraunhofer diffraction is obserbed

c) if $b^2 < < D1$, Fraunhofer diffraction is obserbed

d) if $b^2 > > D1$, the approximation of geometrical optics is applicable

A. a, b and d are true

B. a, c and d are true

C. a and c are true

D. a and d are true

Answer: B

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

A. only ..a.. is true

B. only ..b.. and ..d.. are true

C. only ..c.. and ..d.. are true

D. only ..b.. and ..c.. are true

Answer: B

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9. In a single slit diffraction experiment, the width of the slit is made double its original width. Then the central maximum of the diffraction pattern will become

A. a, d only

B. b, c only

C. c, d only

D. b, d only

Answer: A

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10. Consider the diffraction pattern for a small pinhole. As the size of the hole is increased

A. only ..a.. and ..b.. are correct

B. only ..a.. and ..d.. are correct

C. only ..c.. and ..d.. are correct

D. all are true

Answer: A

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11. For light diverging from a point source :

a) the wavefront is spherical

b) the intensity decreases in proportion to the distance squared

c) the wavefront is parabolic

d) the intensity at the wavefront does not depend on the distance

A. only ..a.. and ..b.. are correct

B. only ..a.. and ..d.. are correct

C. only ..c.. and ..d.. are correct

D. all are true

Answer: A

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12. When light is polarised by reflection from a transparent surface.

a) reflection and refracted rays are mutually perpendicular

b) both reflected and refracted rays are plane polarised

c) refraction ray is partially polarised

d) the R.I., of transparent surface is equal to tangent of Brewster.s angle

A. only a and c are true

B. only b, c and d are true

C. only a, c and d are true

D. only a and d are true

Answer: C

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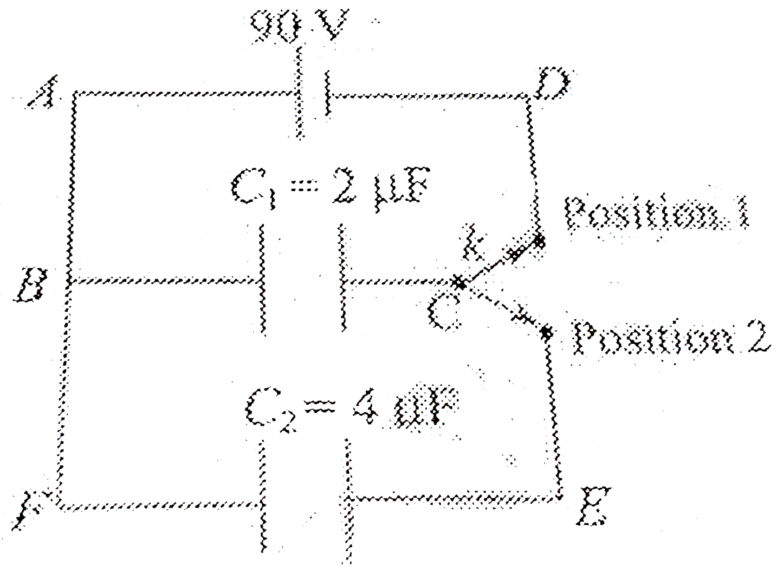
13. Figure shows two capacitors of capacitance $2\mu F$ and $4\mu F$ and a cell of 90 V. The switch 'k' is such that when it is in position 1, the circuit ABCD is closed and when it is in position 2, the circuit BCEF is closed.the resistance of both the circuits is negligible os that the capacitor gets fully charged instantly. Initially the switch is in position1. then it is turned in position 2 and then in position 1. Now two cycles are completed. Find the charge $(\text{in}\mu C)$ after two cycles.



A. only a and b are true

B. only a and c are true

C. only b and c are true

D. all are true

Answer: A

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14. Which of the following statements is/are correct?

I) a polaroid of long chain molecules aligned in a particular direction

II) electric vectors along the direction of the aligned molecules in a polaroid gets absorbed

III) an unpolarised light wave is incident on polaroid, then it will get linearly polarized.

A. only I

B. both II and III

C. only III

D. only III I, II and III

Answer: D

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Exercise Ia Matching Type Questions

1. List - I List -II

a) spherical wave front e) location of new wave front

b) plane wave front f) line source

c) cylindrical wave front g) point source at finite distance

d) Huygen's principle h) point source at infinite distance

A. $A-G, B-H, C-F, D-E$

B. $A-H, B-G, C-F, D-E$

C. $A-H, B-G, C-E, D-F$

D. $A-H, B-G, C-F, D-E$

Answer: A

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2. List-I List-II

a) Fresnel's diffraction e) Bright band

b) Fraunhofer's diffraction f) Source and screen are at finite distance

c) In interference phase difference is even multiple of π g) Dark band

d) In interference phase difference is odd multiple of π h) Source and screen are at infinite distance

A. $A - F, B - H, C - E, D - G$

B. $A - E, B - G, C - F, D - H$

C. $A - H, B - F, C - E, D - G$

D. $A - F, B - H, C - G, D - E$

Answer: A

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3. List-I List-II

a) Einstein e) velocity of light

b) Huygen f) diffraction of light

c) Focault g) wave nature of light

d) Fresnel h) particle nature of light

A. $A - H, B - G, C - F, D - E$

B. $A - G, B - H, C - E, D - F$

C. $A - H, B - G, C - E, D - F$

D. $A - G, B - H, C - F, D - E$

Answer: C

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4. List-I List-II

a) interference e) transverse nature of light

b) diffraction f) unequal absorption of ordinary and extraordinary ray

c) polarization g) bands of equal width

d) dichroism h) bands of unequal width

A. $A - F, B - G, C - H, D - E$

B. $A - H, B - G, C - F, D - E$

C. $A - E, B - F, C - G, D - H$

D. $A - G, B - H, C - E, D - F$

Answer: D

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5. List-I List-II

a) interference e) transverse nature of light

b) diffraction f) unequal absorption of ordinary and extraordinary ray

c) polarization g) bands of equal width

d) dichroism h) bands of unequal width

A. $A - G, B - H, C - F, D - E$

B. $A - H, B - G, C - E, D - F$

C. $A - G, B - E, C - F, D - H$

D. $A - E, B - F, C - H, D - G$

Answer: C

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6. Define the following with reference to refraction of light.

(a) incident ray, (b) refracted ray (c) normal,

(d) emergent ray, (e) angle of incidence, (br> (f)

angle of refraction.

A. $A - H, B - E, C - F, D - G$

B. $A - H, B - F, C - G, D - E$

C. $A - H, B - G, C - E, D - F$

D. $A - G, B - H, C - F, D - E$

Answer: B

Exercise Ia Ascending And Dscending Order Type Questions

1. Young.s experiment is performed in air, water and glass. The descending order of fringe width for these media is

A. water, air, glass

B. glass, water, air

C. air, water, glass

D. glass, air water

Answer: C

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2. The young.s double slit experiment is performed with four different sources. The number of fringes observed in a given region for that sources are $n_1 = 100, n_2 = 60, n_3 = 150, n_4 = 120.$ The descending order of wave lengths of sources is

A. n_4, n_2, n_3, n_1

B. n_4, n_2, n_3, n_1

C. n_4, n_2, n_3, n_1

D. n_4, n_2, n_3, n_1

Answer: B

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3. Arrange the ascending order of polarising angles for air-glass, air-water, and water-glass interfaces?

A. water-glass, air-water, air-glass

B. air-water, air-glass, water-glass

C. air-glass, air-water, water-glass

D. air-water, water-glass, air-glass

Answer: A

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4. Two beams of light having intensities 9I and 4I interfere to produce fringe pattern on a screen P, Q and R are three points on the screen at which the phase differences between the interfering beams are $30^{\circ}, 45^{\circ}$ and 60° and the intensities are I_P, I_Q and I_R respectivley. Arrange the diffrence between the intensities in ascending order

A. $\left(I_P - I_Q\right), \left(I_P - I_R\right), \left(I_Q - I_R\right)$

B. $\left(I_P - I_Q\right), \left(I_Q - I_R\right), \left(I_P - I_R\right)$

C. $\left(I_P - I_R\right), \left(I_Q - I_R\right), \left(I_P - I_Q\right)$

D. $\left(I_Q - I_R\right), \left(I_P - I_Q\right), \left(I_P - I_R\right)$

Answer: B

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5. The critical angles of three transpararent media K, L & M are $30^\circ, 60^\circ$ and 45° respectively. If K_P, L_P and M_P are their polarising angles respectively, arrange them in increasing order

A. K_P, L_P, M_P

B. M_P, L_P, K_P

C. L_P, M_P, K_P

D. K_P, M_P, L_P

Answer: C

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6. Four transparent slabs having thickness $t_1 = 2cm, t_2 = 4cm, t_3 = 3cm$ and $t_4 = 5cm$ are introduced in one of the paths of light emitted by two narrow slits the ascending order of shift of the central fringe

A. t_1, t_2, t_3, t_4

B. t_4, t_3, t_2, t_1

C. t_3, t_2, t_4, t_1

D. t_1, t_3, t_2, t_4

Answer: D

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Exercise Ib Assertion And Reason

1. A current I amperes flows through a loop abcdefgha along the edge of a cube of width l metres as shown in figure. One corner 'a' of the loop lies at origin.

Thish current path (abcdefgha) can be treated as a superposition of three square loops carrying current I. Choose the correct option?

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

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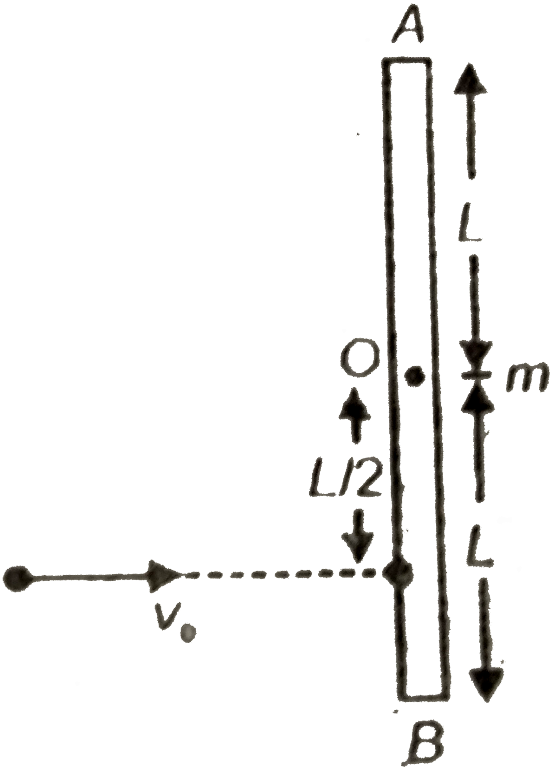
2. A rod AB of length $2L$ and mass m is lying on a horizontal frictionless surface. A particle of same mass m travelling along the surface hits the rod at distance $\frac{L}{2}$ from COM with a velocity v_0 in a direction perpendicular to rod and sticks to it.



Distance of point P on rod from B which is at rest immediately afte collision is

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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3. A : Universe is expanding

R : There is red shift in the spectra of galaxies

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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4. A : More accurate formula for the Doppler effect which is valid when the speeds close to that of light, requires the used of Einsteins special theory or relativity.

R : Doppler effect is the basis for the measurements of the raidal velocities of distant galaxies.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

5. A : The geometrical shape of the wave front when a wavefront passes through a convex lens will be again plane wave front

R : Whne a plane wave front is reflected by a concave mirror, it remains as plane wavefront.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

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6. A : The direction of a light is always perpendicular to wavefront

R : A ray of light is a line perpendicular to a wavefront in the direction of propagation.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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7. A : Light from two coherent sources is reaching the screen. If the path difference at a point on the screen for yellow light is $3\lambda/2$, then the fringe at the point will be coloured.

R : Two coherent sources always have same phase relationship at any point on the screen.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

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8. Statement-1: No interference pattern is deterceted when two coherent sources are infinitely close to each other.

Statement-2: The fringe width is inversely proportional to the distance between the two slits.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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9. A : Interference obey is the law of conservation energy.

R : The energy is redistributed in case or interference.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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10. A : In interference, the fringe obtained at the centre of the screen is known as zeroth order fringe, or the central fringe

R : In interference, path difference between the waves from S_1 and S_2, reaching the central fringe (or zero order fringe) is zero

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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11. A : If the phase difference between the light waves emerging from the slits of the Young.s experiment is π-raidan, the central fringe will be dark

R : Phase difference is equal to $(2\pi/\lambda)$ times the path difference.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

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12. A : In Young.s double slit expriment the band width for red colour is more

R : Wavelength of red is small among the colours of white light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

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13. A : In Young.s interference experiment the incident light used is white. When one slit is convered with red filter and the other with blue filter, the phase difference at any point on the screen will continuously change and producing uniform illumination.

R : Two independent sources of light would no longer act as coherent sources.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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14. A : If the whole apparatus of Young.s experiment is immersed in liquid, the fringe width will decrease.

R : The wavelength of light in water is more than that in air.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

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15. A : In Y.D.S.E., if distance of screen (D) is very large compared to the fringe width, the fringes will be very nearly straight lies.

R : In general, the shape of fringes formed in Y.D.S.E is hyperbola.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

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16. A : Light added to light can produce darkness.

R : The destructive interference of two coherent light sources may give dark fringe.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

17. A : In Young.s double slit experiment, we observe an interference pattern on the screen if both the slits are illuminated by two bulbs of same power.

R : The interference pattern is obserbed only when source are monochromatic.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

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18. A : Young.s double slit experiment can be performed using a source of white light.

R : The wavelength of red light is less than the wavelength of other colours in white light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

19. A : For best contrast between maxima and minima in the interference pattern of Young.s double slit experiment, the intensity of light emerging out of the two slits should be equa.

R : The intensity of interference pattern is proportional to square of amplitude.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

20. A : In Young.s double slit experiment, the fringes become indistinct if one of the slits is covered with cellophane paper.

R : The cellophane paper decrease the wavelength of light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

21. A : When a light wave travels from a rarer to a denser medium, it looses speed. The reduction in speed imply a reduction in energy carried by the light wave.

R : The energy of a wave of proportional to frequency of wave.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

22. Assertion The pattern and position of fringes always remain same even after the introduction of transport medium in a path of one of the slit

Reason The central fringe is bright or dark depends upon the initial phase difference between the two coherence sources.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

23. A : Y.D.S.E, as the source slit width increases, fringe pattern gets less and less sharp.

R : When the source slit is so wide that the condition $\frac{s}{S} < \frac{\lambda}{d}$ is not satisfied, the interference pattern is appears.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

24. A : For interference fringes to be seen, the condition $\frac{s}{S} < \frac{\lambda}{d}$ should be satisfied. Where .s. be the size of source slit, S is its distance from plane of two slits and .d. is the distance between two slits.

R : In Y.D.S.E, if distance of source slit from the two slits (s) decreases, the interference pattern gets more sharp.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

25. Statement-1: In Young's double slit experiment the two slits are at distance d apart. Interference pattern is observed on a screen at distance D from the slits. At a poit on the screen when it is directly opposite to one of the slits, a dard fringe is observed then the wavelength of wave is proportional of square of distance of two slits.

Statement-2: In Young's double slit experiment, for identical slits, the intensity of a dark fringe is zero.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

26. A : When the coherent sources are far apart, interference pattern cannot be detected.

R : If two point coherent sources are infinitely close to each other, firinges appears very sharp.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

27. Assertion : When a thin transparent sheet is placed in front of both the slits of Young's experiment, the fringe width will remains same.

Reason : In Young's experiment, the fringe width is directly proportional to wavelength of the source used.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

28. A : The soap film in sun light is colourful.

R : Thin films produce interference of light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

29. A : Thin films such as soap bubble or a thin layer of oil on water show beautiful colours when illuminated by sunlight.

R : The colours are obtained by dispersion of light only.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

30. Assertion:- Newton's rings are formed in the reflected system. When the space between the lens and the glass place is filled with a liquid of regractive index greater than that of glass, the central spot of the pattern is bright.

Reason:- This is because the reflection in these cases will be from a denser to raer medium and the two interfering rays are reflected under similar conditions.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

31. Assertion (A) : The film which appears bright in reflected system will appear dark in the transmitted system and vice-versa.

Reason (R) : The conditions for film to appear bright or dark in the reflected light are just reverse to those in the transmitted light

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

32. A : If a thin soap film is arranged vertically the spectrum of coloured fringes are spread equally on the film.

R : The colours of the film is dependent on the thickness of film and wavelength of the light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

33. Radio waves diffract around building, although light waves do not. The reason is that radio waves

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

34. A : It is impossible to see an object as small as an atom regardless of the quality of light used by microscope.

R : In order to see.. an object, wave length of light in the microscope must be comparable to the size of object.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

35. A : Diffraction is common is sound but not common in light waves

R : Wavelengths of light is more than the wavelength of sound.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

36. A : There is no specific important physical difference between interference and diffraction.

R : When there are only few sources (say two), the result is usually called interference, but if there is a large number of sources, the result is diffraction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

37. A : At the first glance, the top surf Morpho butterfly.s wing appears a beautifu blue green. If the wing moves the colour changes.

R : Different pigments in the wing reflect light at different angles.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

38. A : Coloured spectrum is seen when we look through a muslin cloth.

R : The coloured spectrum is due to diffraction of white light on passing through fine slits made by fine threads in the muslin cloth.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

39. Assertion : The clouds in sky generally appear to be whitish.

Reason : Diffraction due to clouds is efficient in equal measure at all wavelengths.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

40. A : In double slit experiment, the pattern on the screen is actually a superposition of sngle-slit diffraction from each slit and the double -slit interference pattern.

R : The diffraction pattern has a central bright maximum which is twice as wide as the other maxima.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

41. Assertion : Standard optical diffraction gratings cannot be used for discriminating between different X-ray wavelengths.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

42. A : When tiny circular obstacle is placed in the path of light from some distance, a bright spot is seen at the centre of the shadow of the obastacle.

R : Destructive interference occurs at the centre of the shadow of circular obstacle.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

43. A : The resolving power of both miroscope and telescope depends on the wavelength of the light used.

R : The resolving power of a lens is the ability to resolve the two images so that they are distinctly identified.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

44. A : The resolving power of an electron microscope is higher than that of an optical microscope.

R : The wavelength of electron is less than the wavelength of visible light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

45. Assertion (A) To increase resolving power of a telescope, the aperture (a) of the object should be large.

Reason (R) Resolving power of the telescope is given by $\frac{2a}{1.22\lambda}$.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

46. A : To increase the resolving power of a microscope, .oil immersion objective. can be used.

R : Resolving power of the microscope is given by the reciprocal of the maximum separation of two objects distinctly seen.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

47. Assertion : The resolving power of a telescope is more if the diameter of the objective lens is more.

Reason : Objective lens of large diameter collects more light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

48. A : Resolving power of a microscope can be increased by choosing a medium of higher refractive index between object and objective lens.

R : To increase resolving power of microscope, usually on oil having R.I colse to that of objective glass is used.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

49. A : Spy satilight cameras use lenses with very large aperatures.

R : In general, larger the aperture in an optical instrument, the greater the resolution.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

50. A : Transverse wave nature of light is proved by polarisation.

R : According to Maxwell, light is an electromagnetic wave but not mechanical wave.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

51. A : Nicol prism is used to produce and analyse plane polarised light.

R : Nicol prism reduces the intensity of light to zero.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

52. A : When an unpolarised light is incident on a glass plate at Brewster angle, the reflected ray and refracted ray are matually perpendicular.

R : The refractive index of glass is equal to sine of the angle of polarisation.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

53. A : The unpolarised light and polarised light can be distinguished from each other by using polaroid.

R : A polaroid is capable of producing plane polarised beams of light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

54. A : Light coming from numbers of calculator.s L.C.D display is polarised.

R : The reflected light cannot be polarized when light is incident normal to the plane surface.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

55. A : One of the images in double refraction doesn't obey the principles of refraction.

R : Extraordinary image in double refraction doesn't obey the principles of refraction because its velocity changes with direction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

56. Assertion (A): Skiers uses air glasses.

Reason(R) : Light reflected by snow is partially polarised.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

57. A : 3-D movies are produced by pojecting two images onto a screen, with polarizing dissections that are 90° relative to one another.

R : When your eyes view 3D wearing 3D glasses, your right eye sees one view and left eye sees the other view, these views combines in the brain and produce 3D effect.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

58. Assertion:- Newton's rings are formed in the reflected system. When the space between the lens and the glass place is filled with a liquid of regractive index greater than that of glass, the central spot of the pattern is bright.

Reason:- This is because the reflection in these cases will be from a denser to raer medium and the two interfering rays are reflected under similar conditions.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

59. A : In a movie ordinary 24 frames are projected per second from one end to the other of the complete film.

R : The image formed on the retina of the eye is sustained upto $(1/10)$s after the removed of the stimulus.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

60. A : A famous painting was painted by not using brush strokes in the usual manner, but rather a myriad of small colour dots. The colour you see it any given place on the painting, changes as you move away.

R : The angular separation of adjacent dots changes with the distance between them in the painting.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

61. Assetion To observe diffraction of light the size of obstacle/aperture should be of the order of $10^{-7}m$

Reason $10^{-7}m$ is the order of wavelength of visible light

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

62. Assertion (A) : The film which appears bright in reflected system will appear dark in the transmitted system and vice-versa.

Reason (R) : The conditions for film to appear bright or dark in the reflected light are just reverse to those in the transmitted light

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

63. Statement-1 : On viewing the clear blue portion of the sky through a Calcite Crystal, the intensity of transmitted light varies as the crystal is rotated.

Statement - 2 : The light coming from the sky is polarized due to scattering of sun light by particles in the atmosphere. The scattering is largest for blue light

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

64. A : Diffraction determines the limitations of the concept of light rays.

R : A beam of width α starts to spread out due to diffraction after it has travelled a diatance

$(2\alpha^{\circ}/\lambda)$.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

65. A : When tiny circular obstacle is placed in the path of light from some distance, a bright spot is seen at the centre of the shadow of the obastacle.

R : Destructive interference occurs at the centre of the shadow of circular obstacle.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

66. A : At the first glance, the top surf Morpho butterfly.s wing appears a beautifu blue green. If the wing moves the colour changes.

R : Different pigments in the wing reflect light at different angles.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

67. Assertion : Standard optical diffraction gratings cannot be used for discriminating between different X-ray wavelengths.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

Exercise Ii Interference

1. The wavelength of light received from a galaxy is 10% greater than that received from identical source on the earth. The velocity of the galaxy relative to the earth is

A. A) $3 \times 10^8 ms^{-1}$

B. B) $3 \times 10^7 ms^{-1}$

C. C) $3 \times 10^6 ms^{-1}$

D. D) $3 \times 10^5 ms^{-1}$

Answer: B

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2. Lesch Nyhan disease is an X-linked recessive disorder that causes neurological damage in human beings. A survey of 500 males from a caucasion population revealed that 20 were effected with this disorder. What is the frequency of the normal allele in this population ?

A. A) 3KHz

B. B) 30KHz

C. C) 3MHz

D. D) 30MHz

Answer: A

Watch Video Solution

3. What speed should a galaxy move with respect to us so that the sodium line at 589.0 nm is observed at 589.6 nm?

A. A) $306km/s$

B. B) $306km/\min$

C. C) $306km/h$

D. D) $306m/s$

Answer: A

Watch Video Solution

4. The displacement of two interfering light waves are $y_1 = 4 \sin \omega t$ and $y_2 = 3 \cos(\omega t)$. The amplitude of the resultant waves is (y_1 and y_2 are in CGS system)

A. A. 5 cm

B. B. 7 cm

C. C. 1 cm

D. D. zero

Answer: A

Watch Video Solution

5. Light waves of wave length λ propagate in a medium. If M end N are two points on the wave front and they are separated by a distance $\lambda/4$, the phase difference between them will be (in radian)

A. $\pi/2$

B. $\pi/8$

C. $\pi/4$

D. zero

Answer: D

Watch Video Solution

6. When two coherent monochromatic light beams of intensities I and 4I are superimposed, the ratio between maximum and minimum intensities in the resultant beam is

A. A. $9:1$

B. B. $1:9$

C. C. $4:1$

D. D. $1:9$

Answer: A

Watch Video Solution

7. In an interference experiment, the ratio of the intensities of the bright and dark fringes is 16:1. The ratio of the amplitudes due to the two slits is

A. A) $3:1$

B. B) $4:1$

C. C) $5:1$

D. D) $5:3$

Answer: D

Watch Video Solution

8. A screen is at a distance of 2m from narrow slits that are illuminated with light of 589 nm. The 10th minimum lies at $0.005m$ on either side of the central maximum, then the distance between the slits will be

A. $0.024mm$

B. $2.23mm$

C. $2.4mm$

D. $24mm$

Answer: B

Watch Video Solution

9. In Young's double slit experiment with a mono - chromatic light of wavelength $4000A^{\circ}$, the fringe width is found to be 0.4 mm. When the slits are now illuminated with a light of wavelength $5000A^{\circ}$ the fringe width will the

A. $0.32mm$

B. $0.5mm$

C. $0.6mm$

D. $0.8mm$

Answer: B

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10. In Young.s double slit interference experiment the wavelength of light used is $6000A^0$. If the path difference between waves reaching a point P on the screen is 1.5 microns, then at that point P

A. second bright band occurs

B. second dark band occurs

C. third dark band occurs

D. third bright band occurs

Answer: C

Watch Video Solution

11. The intensity of central fringe in the interference pattern produced by two indetical slits is I. When one of the slits is closed then the intensity at the same points is I_0. The relation between I and I_0 is

A. $I = 4I_0$

B. $I = 2I_0$

C. $I = I_0$

D. $I = I_0/2$

Answer: A

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12. In the case of interference, the maximum and minimum intensities are in the 16 : 9. Then

A. the maximum and minimum amplitudes will be in the ratio 9 : 5

B. The intensities of the individual waves will be in the ratio 4 : 3

C. The amplitudes of the individual waves will be in the ratio 7 : 1

D. The amplitudes of the individual waves will be in the ratio 4 : 1

Answer: C

Watch Video Solution

13. In a double slit experiment, the distance between two slits in 0.6 mm and these are illuminated with light of wavelength 4800Å. The angular width of first dark fringe on the screen distant 120 cm from slits will be:

A. 8×10^{-4} radian

B. 6×10^{-4} radian

C. 4×10^{-4} radian

D. 16×10^{-4} radian

Answer: C

Watch Video Solution

14. In Young.s double slit experiment, blue-green light of wavelength 500nm is used. The slits are $1.20mm$ apart, and the viewing screen is $5.40m$ away from the slits. What is the fringe width.

A. $6.2mm$

B. $4.2mm$

C. $2.25mm$

D. $1.25mm$

Answer: C

Watch Video Solution

15. A double slit experiment is performed with light of wavelength 500 nm. A thin film of thickness 2 mm and refractive index 1.5 is introduced in the path of the upper beam. The location of the central maximum will:

A. remain unshifted

B. shift downward by nearly two fringes

C. shift upward by nearly two fringes

D. shift downward by 10 fringes

Answer: C

Watch Video Solution

16. When a mica plate of thickness $0.1mm$ is introduced in one of the interfering beams, the central fringe is displaced by a distance equal to

10 fringes. If the wavelength of the light is $6000 A^0$, the refractive index of the mica is

A. 1.06

B. 1.6

C. 2.4

D. 1.2

Answer: A

Watch Video Solution

17. The maximum numbers 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

Watch Video Solution

18. An electromagnetic wave emitted by source travels 21 km to arrive at a receiver. The wave while travelling in another path is reflected from a surface at 19 km away and further travels 12 km to reach the same receiver. If destructive interference occurs at the receiving end, the mximum wavelength of the wave is

A. $0.5km$

B. $1km$

C. $5km$

D. $10km$

Answer: D

Watch Video Solution

19. Four light sources produce the following four waves :

i. $y_1 = a' \sin(\omega t + \phi_1)$

ii. $y_2 = a' \sin(2\omega t)$

iii. $y^3 = a' \sin(\omega t + \phi_2)$

iv $y_4 = a' \sin(3\omega + \phi)$

Superposition of which two waves give rise to interfernce ?

A. I and II

B. II and III

C. I and III

D. III and IV

Answer: C

Watch Video Solution

20. In Young's double slit experiment, the 10^{th} maximum of wavelength λ_1 is at a distance y_1 from its central maximum and the 5^{th} maximum of wavelength λ_2 is at a distance y_2 from its central maximum. The ratio y_1 / y_2 will be

A. $\frac{2\lambda_1}{\lambda_2}$

B. $\frac{2\lambda_2}{\lambda_1}$

C. $\frac{\lambda_1}{2\lambda_2}$

D. $\frac{\lambda_2}{2\lambda_1}$

Answer: A

Watch Video Solution

21. The path difference between two interfering waves at a point on the screen is $\lambda/6$from central maximum. The ratio of intensity at this point and that at the central fringe will be

A. 0.75

B. 7.5

C. 85.3

D. 853

Answer: A

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22. In Young.s double slit experiment with monochromatic source of light of wavelength $6000A^2$, if the path difference at a point on the screen is $6 \times 10^{-6}m$, the number of the bright band formed at that point is

A. 2

B. 4

C. 6

D. 10

Answer: D

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23. A mixture of light, consisting of wavelength 590 nm and an 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.

Further, it is observed that the third bright fringe of known light coincides with the 4^{th} bright fringe of the unknown light. From this data, the wavelength of the unknown light is

A. $885.0nm$

B. $442.5nm$

C. $776.8nm$

D. $393.4nm$

Answer: B

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24. A monochromatice light beam of wavelength $5896 A^0$ is used in double slit experiment to get interference pattern on a screen 9th bright fringe is seen at a particular position on the screen. At the same point on the screen, if 11th bright fringe is to be seen, teh wavelength of the light that is needed is (nearly)

A. $7014 A^0$

B. $3525 A^0$

C. $6780 A^0$

D. $4824A^0$

Answer: D

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

A. I_0

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

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

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

Answer: D

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26. Young's double slit experiment is first performed in air and then in a medium other than air. It is found than 8th bright fringe in the medium lies where 5th dark fringe lies in air. The refractive index of the medium is nearly

A. 1.78

B. 1.25

C. 1.59

D. 1.69

Answer: A

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Exercise Ii Diffraction

1. A slit of width a is illuminiated by white light. The first diffraction minimum for light of $\lambda = 6500\text{Å}$ is formed at $\theta = 30^{\circ}$, then the width a of the slit is

A. $3250A^0$

B. 1.3 micron

C. 6.5×10^{-4} mm

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

Answer: B

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2. If I_0 is the intensity of the pricipal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled ?

A. I_0

B. $I_0/2$

C. $2I_0$

D. $4I_0$

Answer: D

Watch Video Solution

3. The ratio of radii of Fresnel.s fourth and ninth zone is

A. $1:4$

B. $4:9$

C. $9:4$

D. $2:3$

Answer: D

Watch Video Solution

4. Light of wavelength $5000A^0$ is incident on a slit. The first minimum of the diffraction pattern is observed to lie at a distance of 5 mm from the central maximum on a screen placed at a distance of 3 m from the slit. Then the width of the slit is

A. $3cm$

B. $0.3cm$

C. $0.03cm$

D. $0.06cm$

Answer: C

Watch Video Solution

5. A small aperture is illuminated with a parallel beam of $\lambda = 628nm$. The emergent beam has an angular divergence of 2^0. The size of the aperture is

A. $9\mu m$

B. $18\mu m$

C. $27\mu m$

D. $36\mu m$

Answer: B

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6. In single slit diffraction $a = 0.14mm, D = 2m$ and distance of second dark band from central maxima is $1.6cm$. The wavelength of light is

A. $6500A^0$

B. $7500A^0$

C. $5600A^0$

D. $8500A^0$

Answer: C

Watch Video Solution

7. The width of a slit is $0.012mm$. Monochromatic light is incident on it. The

angular position of first bright line is 5.2^0. The wavelength of the light incident is

A. $6040A^0$

B. $4026A^0$

C. $5890A^0$

D. $7248A^0$

Answer: D

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8. The distace between the first and the sixth minima in the diffraction pattern of a single slit is $0.5mm$. The screen is $0.5m$ away from the slit. If wavelength of the light used is $5000A^0$, then the slit width will be

A. $5mm$

B. $2.5mm$

C. $1.25mm$

D. $1.0mm$

Answer: B

Watch Video Solution

9. The angular resolution of a 10 cm diameter telescope at a wavelength of $5000a^0$ is of the order of

A. $10^6 rad$

B. $10^{-2} rad$

C. $10^{-4} rad$

D. $10^{-6} rad$

Answer: D

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10. In a double slit experiment, the two slits are $1mm$ apart and the screen is placed $1m$ away. A monochromatic light of wavelength $500nm$ is used. What will be the width of each slit for obtaining ten maxima of double slit within the central maxima of single-slit pattern?

A. $0.5mm$

B. $0.02mm$

C. $0.2mm$

D. $0.1mm$

Answer: C

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

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

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

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

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

Answer: D

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12. The hale telescope of mount Polamor has a diameter of 200 inches. What is its limiting angle of resolution for 600 nm light?

A. $7.2 \times 10^{-8} rad$

B. $7.2 \times 10^{-4} rad$

C. $1.44 \times 10^{-7} rad$

D. $14.4 \times 10^{-10} rad$

Answer: C

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13. Two stars distant two light years are just resolved by a telescope. The diameter of the telescope lens is $0.25 m$. If the wavelength of light used is $5000A^0$, then the minimum distance between the stars is

A. $1.22 \times 10^{11} m$

B. $2.44 \times 10^{11} m$

C. $3.66 \times 10^{10} m$

D. $4.88 \times 10^{10} m$

Answer: D

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14. The diameter of an eye lens is $2.5 \times 10^{-3} m$ and the refractive index of the eye lid is 1.44. The resolving power of the eye for light of wavelength $5000 A^0$ will be (in minute^{-1})

A. 1.07

B. 0.86

C. 1.71

D. 1.14

Answer: C

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15. The diameter of an object of a telescope, which can just resolve two stars situated an angular displacement of 10^{-4} degree, should be (λ=5000 A°)

A. $35mm$

B. $35cm$

C. $35m$

D. $24cm$

Answer: B

Watch Video Solution

16. Assuming human pupil to have a radius of 0.25 cm and a comfortable viewing distance of 25 cm, the minimum separation between two objects that human eye can resolve at 500 nm wavelength is :

A. $1\mu m$

B. $30\mu m$

C. $100\mu m$

D. $300\mu m$

Answer: B

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17. The ratio of resolving powsers of an optical microscope for two wavelengths $\lambda_1 = 4000A$ and $\lambda_1 = 6000A$ is

A. $16 : 81$

B. $8:27$

C. $9:4$

D. $3:2$

Answer: D

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Exercise Ii Polarisation

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

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

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

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

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

Answer: D

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2. The amplitude of polarised light transmitted through a polariser is A. The amplitude of unpolarised light incident on it is

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

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

C. $2A$

D. $\sqrt{2}A$

Answer: D

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3. Unpolarised light of intensity $32Wm^{-2}$ passes through three polarisers such that the transmission axis of the last polariser is crossed with first. If the intensity of the emerging light is $3Wm^{-2}$, the angle between the axes of the first two polarisers is

A. 45°

B. 60°

C. 30°

D. zero

Answer: C

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4. The axes of the polariser and analyser are inclined to each other at 60°. If the amplitude of the polarised light emergent through analyser is A. The amplitude of unpolarised light incident on polariser is

A. $A/2$

B. A

C. $2A$

D. $2\sqrt{2}A$

Answer: D

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5. An analyser is inclined to a polariser at an angle of 30°. The intensity of light emerging from the analyser is $1/n$th of that is incident on the polariser. Then n is equal to

A. 4

B. $4/3$

C. $8/3$

D. $1/4$

Answer: C

Watch Video Solution

6. Unpolarised ligh of intensity $32W/m^2$ passes through a polariser and analyer which are at ain angle of 30° with respect to each other. The intensity of the light coming from analyser is

A. $16\sqrt{3}W/m^2$

B. $12W/m^2$

C. $16W/m^2$

D. none

Answer: B

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7. Wave theory cannot explain the phenomena of

A. Polarization , B.Diffraction

C. Compton effect , D. Photoelectric effect

Which of the following is correct ?

A. A and B

B. B and D

C. C and D

D. D and A

Answer: C

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8. The critical angle of a transparent crystal is 45°. Then its polarizing angle is

A. $\theta = \tan^{-1}(\sqrt{2})$

B. $\theta = \sin^{-1}(\sqrt{2})$

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

D. $\theta = \cot^{-1}(\sqrt{2})$

Answer: A

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9. A container made of glass $(\mu = 1.5)$ contains a liquid. A ray of light passing through the liquid falls on the bottom of the container at an angle of incidence $\theta = \tan^{-1}(0.9)$ and completely polarized. The ray should strike the bottom of the container at an angle of incidences so that it undergoes total internal reflection

A. $\tan^{-1}(1.5)$

B. $\sin^{-1}(0.9)$

C. $\tan^{-1}(0.75)$

D. $\sin^{-1}(0.45)$

Answer: B

Watch Video Solution

10. Two polaroids P_1 and P_2 are placed with their axis perpendicular to each other. Unpolarised light I_0 is incident of P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1. The intensity of transmitted light through P_2 is :

A. $I_0/16$

B. $I_0/2$

C. $I_0/4$

D. $I_0/8$

Answer: D

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Exercise Iii Doppler Effect In Light Interference

1. The frequency of waves emitted from a radar is 750 MHz. The frequency of reflected wave from the aeroplane as observed at the radar station is incrased by 2.5 KHz. The speed of aeroplane is.

A. $4 Kms^{-1}$

B. $2 Kms^{-1}$

C. $1 Kms^{-1}$

D. $0.5 Kms^{-1}$

Answer: D

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2. The spectral line of a given element in the light received from a distant star is shifted towards the longer wavelength by 0.032%. Duduce the velocity of star in the line of sight.

A. $96km/\sec$

B. $64km/\sec$

C. $115km/\sec$

D. $30km/\sec$

Answer: A

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3. 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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4. Waves of same amplitude and same frequency from two coherent source overlap at a point. The ratio of the resultant intensity when they arrive in phase to that when they arrive with 90° phase difference is

A. $1:1$

B. $\sqrt{2}:1$

C. $2:1$

D. $4:1$

Answer: C

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5. If interference is complete or cent percent then the frequency of observed crossover will be

A. $\frac{\sqrt{b}}{(b+1)}$

B. $\frac{2\sqrt{b}}{(b+1)}$

C. $\frac{\sqrt{b}}{(b+1)^2}$

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

Answer: B

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6. The distance between the tew slits in a Young's double slit experiment is d and the distance of the screen from the plane of the slits is b, P is a point on the screen directly infront of one of the slits. The path difference between the waves arriving at P from the two slits is

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

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

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

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

Answer: B

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7. Light from two coherent sources of same amplitude and same wavelength illuminates the screen. The intensity of the central maximum is I. If the sources were noncoherent, the intensity at the same point will be

A. $I/2$

B. I

C. $I/\sqrt{2}$

D. $3I/4$

Answer: A

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8. In Young's double slit experiment an interference pattern is obtained for $\lambda = 6000\text{Å}$ coming from two coherent sources S_1 and S_2 At certain point P on the screen third dark fringe is formed. Then the path difference $S_1P - S_2P$ in microns is

A. 0.75

B. 1.5

C. 3.0

D. 4.5

Answer: B

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9. In young's double slit experiment the n^{th} red bright band coincides with $(n+1)^{th}$ blue bright band. If the wavelength of red and blue lights are $7500A^{\circ}$ and $5000A^{\circ}$, the value of 'n' is

A. 1

B. 2

C. 5

D. 4

Answer: B

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10. In Young's double slit experiment, 12 fringes are observed to be formed in a certain segment of the screen, when light of wavelength 600 nm is used. If the wavelength of light is changed to

400 nm, number of fringes observed in the same segment of the screen is given by

A. 12

B. 18

C. 24

D. 4

Answer: B

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11. In Young.s double slit experiment the distance between the sources is $7.7 \mu m$. If the wavelength of light used is 500 nanometre, the angular position of the third dark ringe from the centre fringe is

A. 10.9^{0}

B. 0.15^{0}

C. 11.3^{0}

D. 9.4^{0}

Answer: D

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12. In Young's experiment interference bands are produced on the screen placed at $1.5m$ from the slits $0.15mm$ apart and illuminated by light of wavelength 6000Å. If the screen is now taken away from the slit by 50 cm the change in the fringe width will be

A. $2 \times 10^{-4}m$

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

C. $6 \times 10^{-3}m$

D. none

Answer: B

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13. The two coherent sources of equal intensity produce maximum intensity of 100 units at a point. If the intensity of one of the sources is reduced by 50% by reducing its width then the intensity of light at the same point will be

A. 90

B. 89

C. 67

D. 72.85

Answer: D

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14. The ratio of the intensities at minima to maxima in the interference pattern is 9 : 25. What will be the ratio of the widths of the two slits in the young's double slit experiment ?

A. $8:1$

B. $16:1$

C. $4:1$

D. $9:1$

Answer: B

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15. Two coherent monochromatic light sources are located at two vertices of an equilateral triangle if the intensity due to each of the sources independently is $1 W / m^2$ at the third vertex, the resultant intensity due to both the sources at that point (i.e at the third vertex) is

A. zero

B. $\sqrt{2}$

C. 2

D. 4

Answer: D

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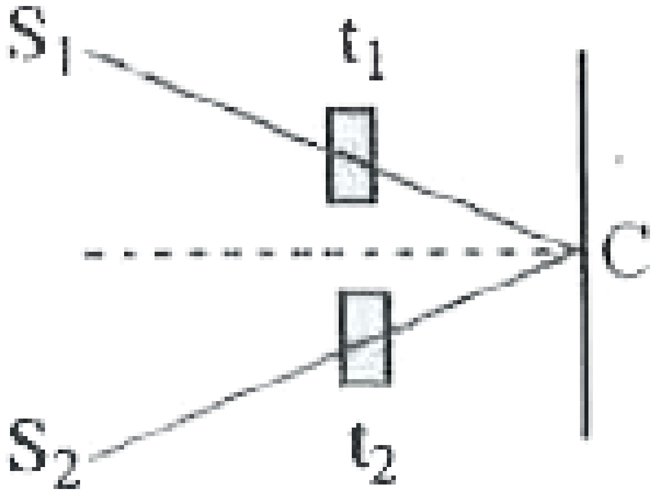
16. In Young's double slit experiment S_1 and S_2 are two slits. Films of thickness t_1 and t_2 and refractive indices μ_1 and μ_2 are placed in front of S_1 and S_2 respectively. If $\mu_1 t_1 = \mu_2 t_2$, then the central maximum will :



A. not shift

B. shift towards S_2 irrespective of amounts of

t_1 and t_2

C. shift towards S_2 irrespective of amounts of

t_1 and t_2

D. shift towards S_1 if $t_2 > t_1$ and towards

S_2 if $t_2 < t_1$.

Answer: D

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17. In a Young's double slit experiment using monochromatic light, the fringe pattern shifts by a certain distance on the screen when a mica sheet of refractive index 1.6 and thickness 1.964 microns is introduced in the path of one of the interfering waves. The mica sheet is then removed and the distance between the slits and screen is doubled. It is found that the distance between successive maxima now is the same as observed fringe shift upon the introduced of the mica sheet . Calculate the wavelength of the monochromatic light used in the experiment .

A. $5762A^0$

B. $5825A^0$

C. $6000A^0$

D. $6500A^0$

Answer: C

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18. When a thin transparent plate of Refractive Index 1.5 is introduced in one of the interfearing becomes, 20 fringes shift. If it is replaced by another thin plate of half the thickness and of R.I 1.7 the number of fringes that undergo displacement is

A. 23

B. 14

C. 28

D. 7

Answer: B

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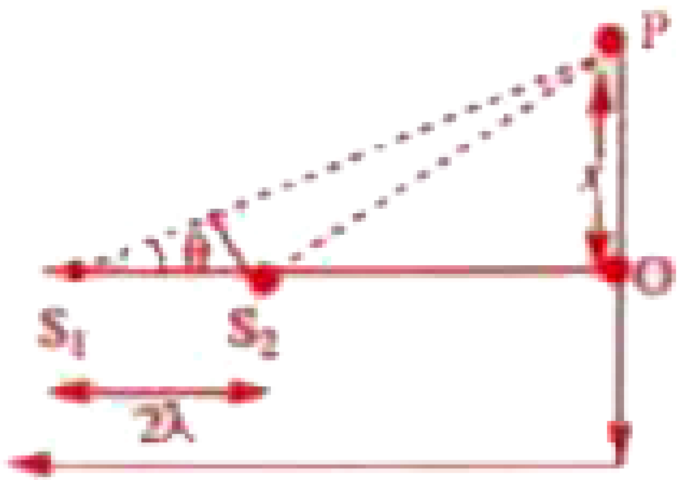
19. Two coherent point sources S_1 and S_2 vibrating in phase light of wavelength λ. The separation between them is 2λ as shown in figure. The first bright fringe is formed at .P. due to interference on a screen placed at a distance .D. from S_1 $(D > > \lambda)$, then OP is



A. $\sqrt{2}D$

B. $1.5D$

C. $\sqrt{3}D$

D. $2D$

Answer: C

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20. A transparent glass plate of thickness 0.5 mm and refractive index 1.5 is placed infront of one of the slits in a double slit experiment. If the wavelength of light used is $6000A^{\circ}$, the ratio of maximum to minimum intensity in the interference pattern is 25/4. Then the ratio of light intensity transmitted to incident on thin transparent glass plate is

A. $9:7$

B. $9:49$

C. $3:7$

D. $7:3$

Answer: B

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

A. $(2n+1)\lambda/2$

B. $(2n+1)\lambda/4$

C. $(2n+1)\lambda/8$

D. $(2n+1)\lambda/16$

Answer: B

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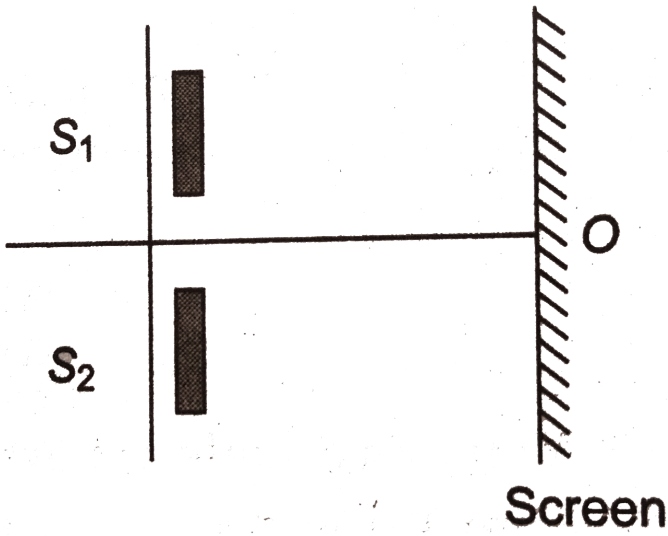
22. YDSE is carried with two thin sheets of thickness 10.4μ m each and refractive index $\mu_1 = 1.52$ and $\mu_2 = 1.40$ covering the slits S_1 and S_2 respectively. If white light of range 400nm to 780 nm is used, then which wavelength will form maxima exactly at point O, the centre of the screen



A. $4200 A^0$ only

B. $7000 A^0$ only

C. $5250 A^0$ only

D. $4200 A^0$ and $7000 A^0$

Answer: D

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23. In the Young's double slit experiment, the intensity of light at a point on the screen where the path difference is λ is K, (λ being the wave length of light used). The intensity at a point where the path difference is $\lambda/4$, will be

A. K

B. $K/4$

C. $K/2$

D. zero

Answer: C

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24. In Young.s double slit experiment, the slits are 2mm apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000A^0$ and $\lambda_2 = 10,000A^0$. At what minimum distance from the common central bright fringe on the screen 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other?

A. $3mm$

B. $8mm$

C. $6mm$

D. $4mm$

Answer: C

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25. In a Young.s interference experimental arrangement, the yellow light is composed of two wavelengths $5890A^0$ and $5895A^0$. The distance between the two slits is $10^{-3}m$ and screen is placed 1m away. Upto what order can fringes be seen?

A. 589

B. 280

C. 440

D. 339

Answer: A

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Exercise Iii Diffraction

1. Light of wavelength $6000A^{0}$ is incident on a single slit. The first minimum of the diffraction pattern is obtained at 4 mm from the centre. The screen is at a distance of 2m from the slit. The slit width will be

A. $0.3mm$

B. $0.2mm$

C. $0.15mm$

D. $0.1mm$

Answer: A

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2. Consider Fraunhoffer diffraction pattern obtained with a single slit illuminated at normal incidence. AT the angular position of the first diffraction minimum the phase difference (in radian) between the wavelengths from the opposite edges of the slit is

A. $\pi/4$

B. $\pi/2$

C. π

D. 2π

Answer: D

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3. Light of wavelength λ from a point source falls on a small circular rings around a central bright spot are formed on a screen beyond the obstacle The distance between the screen and obstacle is D. Then, the condition for the formation of rings, is

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

B. $\sqrt{\lambda} \approx \frac{d}{4D}$

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

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

Answer: C

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4. A parallel beam of fast moving electrons is incident normally on a narrow slit. A flueroscent screen is placed at a large distance from the slit. If the speed of the electron is increased, which of the following statements is correct ?

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

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

C. the angular width of central maximum will decrease

D. the angular width of central maximum will be unaffected

Answer: C

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5. Two point sources distant $0.1m$ away viewed by a telescope. The objective is covered by a screen having a hole of 1mm width. If the wavelength fo the light used is $6550A^0$, then the maximum distance at which the two sources are seen just resolved, will be nearly

A. $125.0m$

B. $164m$

C. $131m$

D. $163m$

Answer: A

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6. The numerical aperture of an objective of a microscope is 0.5 and the wavelength of light used is $5000A^0$. Its limit of resolution will be

A. $6.1 \times 10^7 m$

B. $6.1 \times 10^{-7} m$

C. $6.1 \times 10^{-4} m$

D. $6.1 \times 10^4 m$

Answer: B

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7. The human eye has an approximate angluar resolution of $\phi = 5.8 \times 10^{-4}$ rad and a typical photoprinter prints a minimum of 300 dpi (dots per inches, 1 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. 37.3

B. 44.1

C. 25

D. 14.7

Answer: D

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8. In an experiment of single slit diffraction pattern first minimum for red light coincides with first maximum of some other wavelength. If wavelength of red light is $6600 A^0$, then wavelength of first maximum will be :

A. $55000 A^0$

B. $4400 A^0$

C. $3300 A^0$

D. $6600 A^0$

Answer: B

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

A. $40m$

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

C. $100nm$

D. $10mm$

Answer: A

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10. Find the maximum magnifying power of a compound microscope having a 25 diopter lens as the objective, a 5 diopter lens as the eyepiece and the separation 30 cm between the two lenses. The least distance for clear vision is 25 cm.

A. 250

B. 400

C. 220

D. 100

Answer: C

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11. Calculate the least value of the angular separation of two stars which can be resolved by a telescope of 200 cm aperture. If the aperture of the human eye be 2mm and if the focal length of the eyepiece be 1 inch, what must be the minimum focal length of the objective if full resolving power of the telescope is to be utilized. Take $\lambda = 5500A^0$.

A. $6.7 \times 10^{-7} rad$, 500 inches

B. $1.65 \times 10^{-7} rad$, 1000 inches

C. $3.35 \times 10^{-7} rad$, 1000 inches

D. none

Answer: C

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Exercise Iii Polarisition

1. A ray of light is incident on the surface of a glass plate of refractive index $\sqrt{3}$ at the polarising angle . The angle of incidence and angle of refraction of the ray is

A. $60^{\circ}, 30^{\circ}$

B. $30^{\circ}, 60^{\circ}$

C. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right), 45^{\circ}$

D. $\tan^{-1}\left(\frac{\sqrt{3}}{1}\right), 30^{\circ}$

Answer: A

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2. A beam of unpolarised light is incident on a tourmaline crystal C_1. The intensity of the emergent light is I_0 and it is incident on another tourmaline crystal C_2. It is found that no light emerges from C_2. If now C_1 is rotated through 45° towards C_2, the intensity of the light emerging from C_2 is

A. zero

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

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

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

Answer: C

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3. Two polaroids are kept crossed to each other . If one of them is rotated an angle 60° , the percentage of incident light now transmitted through the system is

A. $30\ \%$

B. $37.5\ \%$

C. $40\ \%$

D. $60\ \%$

Answer: B

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4. Two nicol prisms are inclined to each other at an angle 30°. If I is the intensity of ordinary light incident on the first prism, then the intensity of light emerges from the second prism will be

A. $3I/4$

B. $I/2$

C. $I/4$

D. $3I/8$

Answer: D

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5. Two polarising plates have polarising directions parallel score to trasmit maxmum intensity of light through what angle most either plate be turned in the intensites of the transmitted beam is to drop by half?

A. 60° or 120°

B. 45° or 135°

C. 30° or 150°

D. 0° or 180°

Answer: B

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6. Two polaroids are kept crossed to each other. Now one of them is rotated through an angle of 45°. The percentage of unpolarized incident light now transmitted through the system is :

A. 30%

B. 25%

C. 40%

D. 62.5%

Answer: B

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7. Unpolarized light of intensity I_0 is incident on surface of a block of glass of Brewster's angle. In that case, which one of the following statements is true?

A. transmitted light is partially polarized with intensity $I_0/2$

B. reflected light is partially polarized with intensity $I_0/2$

C. reflected light is completely polarized with intensity less then $I_0/2$

D. transmitted light is completely polarized with intensity less then $I_0/2$

Answer: C

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8. In Young.s double slit experiment the separation d between the slits is 2mm, the wavelength λ of the light used is $5896A^{0}$ and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20^{0}. To increase the fringe angular width to 0.21^{0} (with same λ and D) the separation between the slits needs to be changed to

A. $1.8mm$

B. $1.9mm$

C. $1.7mm$

D. $2.1mm$

Answer: B

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

A. small focal length and large diameter

B. large focal length and small diameter

C. small focal length and small diameter

D. large focal length and large diameter

Answer: D

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10. Unpolarised light is incident from air on a plane surface of a material of refractive index . μ. . At a particular angle of incidence .I., it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation?

A. reflected light is polarized with its electric vector parallel to the plane of incidence

B. reflected light is polarized with its electric vector perpendicular to the plane of incidence

C. $i = \tan^{-1}\left(\frac{1}{\mu}\right)$

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

Answer: B

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