PHYSICS

BOOKS - D MUKHERJEE PHYSICS (HINGLISH)

OPTICS

Others

1. A plane mirror is placed at the bottom of the tank containing a liquid of refractive index μ. P

is a small object at a height h above the mirror. An observer O vertically above P, outside the liquid sees P and its image in the mirror. The apparent distance between these two will be

A. $2\mu h$

B. $\frac{2h}{\mu}$

C. $\frac{2h}{\mu - 1}$

D. $h\left(1 + \frac{1}{\mu}\right)$

Answer: B

Watch Video Solution

2. P is a point on the axis of a concave mirror. The image of P, formed by the mirror, coincides with P. A rectangular glass slab of thickness t and refractive index μ is now introduced between P and the mirror. For the image of P to coincide with P again, the mirror must be moved

A. towards P by $(\mu - 1)t$

B. away from P by $(\mu - 1)t$

C. towares P by $t(1-1/\mu)$

D. away from P by $(1-1/\mu)$

Answer: D

Watch Video Solution

3. A converging lens forms a real image I on its optic axis. A rectangular galss slab of refractive index μ and thickness t is introduced between the lens and I. I will move

A. away from the lens by $t(\mu - 1)$

B. towards the lens by $t(\mu - 1)$

C. away from the lens by $t(1 - 1/\mu)$

D. towards the lens by $t(1 - 1/\mu)$

Answer: C

Watch Video Solution

4. A ray of light incident on a slab of transparent material is partly reflected from the surface and partly refracted into the slab.

The reflected and refracted rays are mutually perpendicular. The incident ray makes an angle i with the normal to the slab. the refreactive index of the slab is

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

B. $\cot^{-1}(i)$

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

D. $\cos^{-1}(i)$

Answer: A

View Text Solution

5. A ray of light travels from an optically denser to rarer medium. The critical angle of the two media is C. The maximum possible deviation of the ray will be

A. $\pi - c$

B. $\pi - 2c$

C. $2c$

D. $\pi / 2 + c$

Answer: B

Watch Video Solution

6. The light reflected by a plane mirrorr may form a real image

A. if the rays incident on the mirror are converging

B. if the rays incident on the mirror are diverging

C. if the object is placed very close to the mirror

D. under no circumstances

Answer: A

Watch Video Solution

7. A transparent sphere of radius R and refractie index μ is kept in air. At what distance from the surface of the sphere shold a point object be placed so as to form a rea image at the same distance from the sphere?

A. R/μ

B. μR

C. $\frac{R}{\mu - 1}$

D. $\frac{R}{\mu + 1}$

Answer: C

Watch Video Solution

8. An air bubble is inside water. The refractive index of water is $4/3$. At the what distance from the air bubble should a point object be

placed so as to form a real image at the same distance from the bubble?

A. $2R$

B. $3R$

C. $4R$

D. The air bubble cannot from a real image.

Answer: D

View Text Solution

9. A spherical surface of radius of curvature R separates air (refractive index 1.0) from glass (refractive index 1.5). The centre of curvature is in the glass. A point object P placed in air is found to have a real image Q in the glass. The line PQ cuts the surface at a point O, and $PO = OQ$. The distance PO

A. $5R$

B. $3R$

C. $2R$

D. $1.5R$

Answer: A

 Watch Video Solution

10. A poing source of light at the surface of a sphere causes a paralel beam of light to emerge from the opposite surface of the sphere. The refractive index of the material of the sphere is

A. 1.5

B. $5/3$

C. 2

D. 2.5

Answer: C

View Text Solution

11. A thin lens of refractive index 1.5 has focal length of $15cm$ in air. When the lens is placed is a medium of refractive index (4)/(3), its focal length will become .....cm.

A. $30cm$

B. $45cm$

C. $60cm$

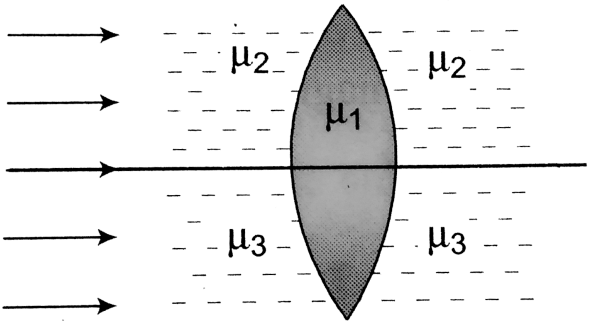
D. $75cm$

Answer: C

Watch Video Solution

12. A double convex lens, lens made of a material of refractive index μ_1, is placed inside two liquids or refractive indices μ_2 and μ_3, as

shown. $\mu_2 > \mu_1 > \mu_3$. A wide, parallel beam of light is incident on the lens from the left. The lens will give rise to



A. a single convergent beam

B. two different convergent beams

C. two different divergent beams

D. a convergent and a divergent beam

Answer: D

 Watch Video Solution

13. A convex lens of focal length 40cm is in contact with a concave lens of focal length 25cm. The power of the combination is

A. $+1.5$

B. -1.5

C. $+6.67$

D. -6.67

Answer: D

Watch Video Solution

14. A short linear object of length b lies along the axis of a concave mirror of focal length f at a distanee u from the pole of the mirror. The size of the image is approximately equal to

A. $b\left(\frac{u-f}{f}\right)^{1/2}$

B. $b\left(\frac{f}{u-f}\right)$

C. $b\left(\frac{u-f}{f}\right)$

D. $b\left(\frac{f}{u-f}\right)^2$

Answer: D

Watch Video Solution

15. Half the surface of a transparent sphere of refractive index 2 is silvered. A narrow, paralel beam of light is incident on the unsilvered surface, symmetrically with respect to the silvered part. The light finally emerging from theh sphere will be a

A. parallel beam

B. converging beam

C. slightly divrgent beam

D. widely divergent beam

Answer: A

View Text Solution

16. A body of height $1m$ stands in front of a convex mirro. His distance from the mirror is

equal to its focal length. The height of his image is

A. $0.25m$

B. $0.33m$

C. $0.5m$

D. $0.67m$

Answer: C

View Text Solution

17. A ray of light is incident normally normallyh on one of the faces of a prism of apex angle 30° and refractive index $\sqrt{2}$. The angle of deviation of the ray is _____ degrees.

A. 0°

B. 12.5°

C. 15°

D. 22.5°

Answer: C

Watch Video Solution

18. When a ray of light is incident normally on one refracting surface of an equilateral prism (Refractive index of the material of the prism $= 1.5$

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C

Watch Video Solution

19. A thin prism P_1 with angle $4degree$ and made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of the prism P_2 is

A. 5.33°

B. 4°

C. 3°

D. 2.6°

Answer: C

Watch Video Solution

20. An astronomical telescope has an angular magnification of magnitude 5 for distant object. The separation between the objective and the eyepiece is 36 cm and the final image

is formed at infinity. The focal length f_0 of the objective and the focal length f_0 of the eyepiece are

A. $45cm$ and $-9cm$ respectively

B. $50cm$ and $10cm$ respectively

C. $7.2cm$ and $5cm$ respectively

D. $30cm$ and $16cm$ respectively

Answer: D

Watch Video Solution

21. An astronomical telescope in normal adjustment receives light from a distant source S. The tube length is now decreased slightly

A. A virtual image of S will beformed at a finite distance.

B. No image will be formed.

C. a small, real image of S will be formed behind the eyepiece, close to it.

D. A large, real image of S will be formed behind the eyepeice, far away from it.

Answer: A

Watch Video Solution

22. In an astronomical telescope in normal adjustment a straight black line of length L is drawn on inside part of objective lens. The eye piece forms a real image of this line. The

length of this image is I. The magnification of the telescope is

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

B. $\frac{L}{l} + 1$

C. $\frac{L}{l} - 1$

D. $\frac{L+1}{L-l}$

Answer: A

Watch Video Solution

23. In a compound microscope, maximum magnification is obtained when the final image

A. is formed at infinity

B. is formed at the least distance of district vision

C. coincies with the object

D. coincides with the objective lens

Answer: B

View Text Solution

24. If ε_0 and μ_0 are respectively, the electric permittivity and the magnetic permeability of free space, ε and μ the corresponding quantities in a medium, the refractive index of the medium is

A. $\frac{\varepsilon\mu}{\varepsilon_0\mu_0}$

B. $\left(\frac{\varepsilon\mu}{\varepsilon lo_0\mu_0}\right)^{1/2}$

C. $\left(\frac{\varepsilon_0\mu_0}{\varepsilon\mu}\right)$

D. $\left(\frac{\varepsilon_0\mu_0}{\varepsilon\mu}\right)^{1/2}$

Answer: B

Watch Video Solution

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

A. $\mu \frac{2\pi}{\lambda} x$

B. $\frac{1}{\mu} . \frac{2\pi}{\lambda} x$

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

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

Answer: A

Watch Video Solution

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

A. $5I$ and I

B. $5I$ and $3I$

C. $9I$ and I

D. $9I$ and $3I$

Answer: C

Watch Video Solution

27. In a Young's double-slit expriment using identical slits, the intensity at a bright fringe is

I_(0). If one of the slits is now covered, the intensity at any point on the screen will be

A. I_0

B. $I_0/2$

C. $I_0/4$

D. $I_0/(2\sqrt{2})$

Answer: C

Watch Video Solution

28. 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 s wider than the other bright 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

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

A. fringes will not be formed

B. the positions of minimum intensity will not be completely dark

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

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

Answer: B

Watch Video Solution

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

A. $\mu\beta$

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

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

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

Answer: B

Watch Video Solution

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

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

B. $\lambda\theta$

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

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

Answer: A

Watch Video Solution

32. A brid flies down vertically towards a water surface. To a fish inside the water, vertically below the bird, the bird will appear to

A. be farther away than its actual distance

B. be closer than its actual distance

C. move faster than its actual speed

D. move slower than its actual speed

Answer: A::C

Watch Video Solution

33. A swimmer S inside water is vertically above a fixed point P. A rectangular glass slab B is placed between S and P. As been by S, the position of P will appear to change, if

A. B is moved horizontally

B. B is moved vertically

C. S moves horizontally

D. S moves vertically

Answer: C

Watch Video Solution

34. A stationary swimmer S, inside a liquid of refractive index μ_1, is at a distance d from a fixed point P inside the liquid. A rectangular block of width t and refractive index $\mu_2(\mu_2 < \mu_1)$ is now placed between S and P. S will observer P to be at a distance

A. $d - t\left(\frac{\mu_1}{\mu_2} - 1\right)$

B. $d - t\left(1 - \frac{\mu_2}{\mu_1}\right)$

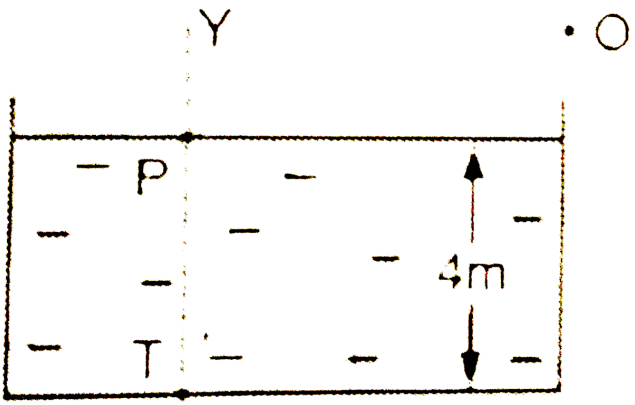
C. $d + t\left(1 - \frac{\mu_2}{\mu_1}\right)$

D. $d + t\left(\frac{\mu_1}{\mu_2} - 1\right)$

Answer: D

Watch Video Solution

35.



T is a point at the bottom of a tank filled with water, as shwon. The refractive index of water is $4/3$. YPT is the vertical line through T. To an observer at the position O, T will appear to be

A. to the left of YT

B. somewhere on YT

C. at a depth $3m$ below T

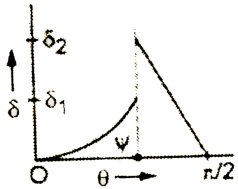
D. at a depth $< 3m$ below T

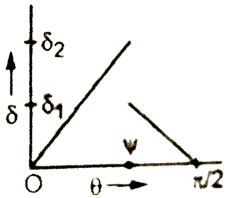
Answer: A::D

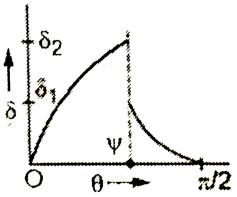
Watch Video Solution

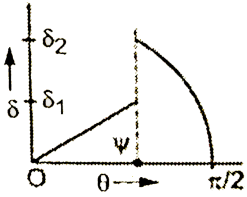
36. A ray of light travels from a medium of refractive index μ to air. Its angle of incidence in the medium is i, meansured from the normal to the boundary , and its angle of deviation is δ. δ is plotted against i. Which of

the following best represents the resulting curve ?

A. 

B. 

C. 

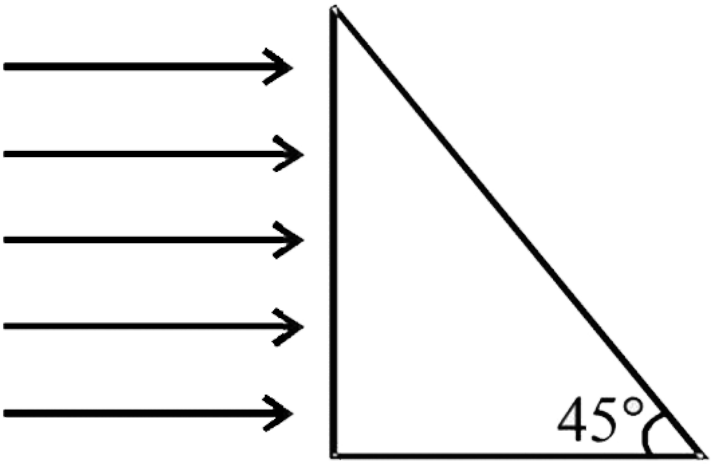
D. 

Answer: A

Watch Video Solution

37. A beam of light consisting of red, green and blue colours is incident on a right angled prism, fig. The refractive indices of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively.

The prism will `



A. separate part of the colour from the green and blue colours

B. separate part of the blue colour from the red and green colours

C. separate all the three colours from one another

D. not separate even partially any colour from the other two colours

Answer: A

 Watch Video Solution

38. A ray of light travelling in a transparant medium falls on a surface separating the medium from air at an angle of incidence of

$45degree$. The ray undergoes total internal reflection. If n is the refractive in index of the medium with respect to air, select the possible value (s) of n from the following:

A. 1.3

B. 1.4

C. 1.5

D. 1.6

Answer: C::D

Watch Video Solution

39. There is a small black dot at the centre C of a solid glass sphere of refractive index μ. When seen from outside, the dot will appear to be located

A. closer to the eye than its actual position

B. farther away from the eye than its actual position

C. the same as its actual position

D. independente of the refractive index of the sphere

Answer: C::D

 Watch Video Solution

40. A watch glass has uniform thickness, and the average radius of curvature of its two surfaces is much larger than its thickness. It is placed in the path of a beam of parallel lilght. The beam will

A. converge slightly

B. diverge slightly

C. be completely unaffected

D. converge or diverge slightly depending on whether the beam is incident from the concave or the convex side

Answer: B

Watch Video Solution

41. A thin concavo-convex lens ha two surface of radii of curvature R and $2R$. The mateial of the lens has a refractive index μ. When kept in air, the focal length of the lens

A. wil depend on the direction from which light is incident on it

B. will be the same, irrespective of the direction from which light is incident on it

C. will be equal to $\frac{R}{\mu - 1}$

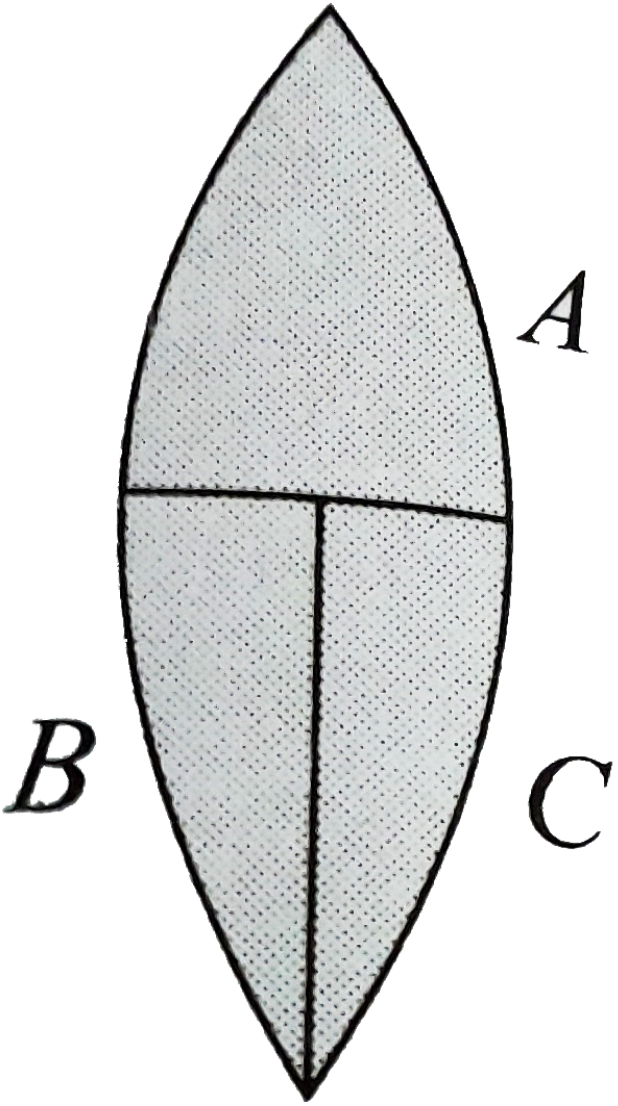
D. will be equal to $\frac{2R}{\mu - 1}$

Answer: B::D

View Text Solution

42. A thini, symmetric double convex lens of power P is cut into three parts A, B, and C as

shown in Figure. The power of



A. A is P

B. A is $2P$

C. B is $\frac{P}{2}$

D. B is $\frac{P}{4}$

Answer: A::C

Watch Video Solution

43. If a convergent beam of light passes through a diverging lens, the result

A. may be a convergent beam

B. may be a divergent beam

C. may be a parallel beam

D. must be a parallel beam

Answer: A::B::C

View Text Solution

44. Which of the following form(s) a virtual and erect image for all positions of the object

A. convex lens

B. concave lens

C. convex mirror

D. concave mirror

Answer: B::C

Watch Video Solution

45. Two thin lenses, when in contact, produce a combination of power $+10$ dioptres. When they are $0.25m$ apart, the power is reduced to

$+6$ dioptres. The power of the lenses in dioptres, are

A. 1 and 9

B. 2 and 8

C. 4 and 6

D. 5 each

Answer: B

Watch Video Solution

46. A lens of focal length f is placed in between an object and screen at a distance D. The lens forms two real images of object on the screen for two of its differenct positions, a distance x apart. The two real images have magnifications m_1 and m_2, respectivelly $(m_1 > m_2)$. Then,

A. $d > 2f$

B. $d > 4gf$

C. $M_1 M_2 = 1$

D. $|M_1 - |M_2|| = 1$

Answer: B::C

Watch Video Solution

47.

Two points P and Q lie on either side of an axis XY as shown. It is desired to produce an image of P at Q using a spherical mirror, with XY as the optic axis. The mirror must be

A. converging

B. diverging

C. positoined to the left of P

D. positioned to the right of Q

Answer: A::C

View Text Solution

48. A concave mirror is placed on a horizontal table, with its axis directed vertically upwards. Let O be the pole of the mirror and C its

centre of curvature. A point object is placed at C. It has a real image, also located at C. If the mirror is now filled with water, the image will be.

A. real, and will remain at C

B. real, and will be located above C

C. virtual, and will be located below O

D. real, and will be located between C and O

Answer: D

Watch Video Solution

49. A diverging lens of focal length f_1 is placed in front of and coaxially with a concave mirror of foacl length f_2. Their separation is d. A parallel beam of light incident on the lens returns as a parallel beam from the arrangement. Then,

A. The beam diameters of the incident and reflected beams must be the same.

B. $d = 2 \mid f_2 \mid - \mid f_1 \mid$

C. $d = |f_2| - |f_1|$

D. If the entire arrangement is immersed in water, the conditions, will remain unaltered.

Answer: A::B::C

Watch Video Solution

50. A converging lens of focal length f_1 is placed in front of and coaxially with a convex mirror of focal length f_2. Their separation is d.

A parallel beam of light incident on the lens returns as a parallel beam from the arrangement, Then,

A. The beam diameters of the incident and reflected beams must be the same.

B. $d = f_1 - 2 \mid f_2|$

C. $d = f_1 - \mid f_2|$

D. If the entire arrangement is immersed in water, the conditions, will remain unaltered.

Answer: A::B

Watch Video Solution

51. A coverging beam of light is incident on the concave mirror. Then the reflected light :

A. may form a real imae

B. must form a real image

C. may form a virtual image

D. may be a parallel beam

Answer: A::C::D

Watch Video Solution

52. A Point object P moves towards a convex mirror with a constant speed V, along its optic axis. The speed of the image

A. is always $< V$

B. may be $\geq$ or $< V$ depending on the position of P

C. increases as P comes clser to the mirror

D. decreases as P comes closer to the mirror

Answer: A::C

View Text Solution

53. A ray of white light passes through a rectantular glass slab, entering and emerging at parallel faces. The angle of incidence, measured from the normal to the glaass surface, is large.

A. White light will emerge from the slab.

B. The light emerging from the slab will have a number of parallel, coloured rays

C. The emergent rays wil not form a spectrum on a screen.

D. Colours will be seen if the emergent rays enter the eye directly.

Answer: A::B::C

View Text Solution

54. As astronomical telescope and a Galilean telescope use identical objective lenses. They have the same magnification, when both are in normal adjustment. The eyepeice of the astronomical telescope has a focal length f.

A. The tube lengths of the two telescopes differ by f

B. The tube lengths of the two telescope differ by $2f$

C. The Galilean telescope has shorter tube length.

D. The Galilean telescope has longer tube length.

Answer: B::C

View Text Solution

55. A single converging lens is used as a simple mocroscope. In the position of maximum magnification

A. the object is placed at the focus of the lens

B. the object is placed between the lens and its focus

C. the image is formed at infinity

D. the object and the image subtend the same angle at the eye

Answer: B::D

Watch Video Solution

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

A. $v = 5 \times 10^{14} Hz$

B. $v = 7.5 \times 10^{14} Hz$

C. $\lambda = 4000\text{Å}$

D. $\lambda = 9000\text{Å}$

Answer: A::C

Watch Video Solution

57. When lights of different colours move through water, they must have different

A. wavelengths

B. frequencies

C. velocities

D. amplitudes

Answer: A::B::C

View Text Solution

58. In Young's double-slit experiment, let A and B be the two slit. A thin film of thickness t and refractive index μ is placed in front of A. Let $\beta =$ fringe width. Then the central maxima will shift

A. towards A

B. towards B

C. by $t(\mu - 1)\frac{\beta}{\lambda}$

D. by $\mu t\frac{\beta}{\lambda}$

Answer: A::C

Watch Video Solution

59. If white light is used in a Young's double slit experiment,

A. bright white fringe is formed at the centre of the screen

B. fringes of different colours are observed 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

Answer: A::B::C

Watch Video Solution

60. In YDSE, having slits of equal width, let β be the fringe width and I_0 be the maximum intensity. At a distance x from the central brigth fringe, the intensity will be

A. $I_0 \cos\left(\frac{x}{\beta}\right)$

B. $I_0 \cos^2\left(\frac{x}{\beta}\right)$

C. $I_0 \cos^2\left(\frac{\pi x}{\beta}\right)$

D. $\left(\frac{I_0}{4}\right)\cos^2\left(\frac{\pi x}{\beta}\right)$

Answer: C

Watch Video Solution

Watch video solution