DCAM classes

Dynamic Classes for Academic Mastery

wave optics :CBSE

1 Mark Question

1. 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.

3 Marks Questions

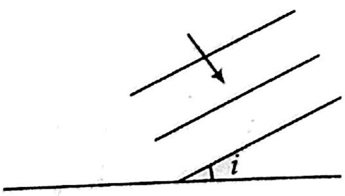
2. Define the term wavefront, Using Huygens' wave theory, verify the law of reflection.
3. Define the term refractive index of a medium. Verify Snell's law of refraction when a plane wavefront is propagating from a denser to a rarer medium.

4. Explain the following giving reasons:
   (i) When monochromatic light is incident on a surface separating two media, then both reflected and refracted light have the same frequency as the incident frequency.
   (ii) When light travels from a rarer to a denser medium, then 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?

5. Define the term wavefront. State Huygen's principle. Consider a plane wavefront incident on a thin convex lens. Draw a proper diagram to show how the incident wavefront traverses through the lens and after refraction focusses on the focal point of the lens, giving the shape of the emergent wavefront.

6. Use Huygens' principle to show how a plane wavefront propagates from a denser to rarer medium. Hence, verify Snell's law of refraction.

7. A plane wavefront propagating in a medium of refractive index 'μ_1' is incident on a plane surface making an angle of incidence i as shown in the figure. It enters into a medium of refraction of refractive index 'μ_2' ($\mu_2 > \mu_1$).



Use Huygens' construction of secondary wavelets to trace the propagation of the refracted wavefront. Hence, verify Snell's law of refraction.

8. Using Huygens' principle, draw a diagram showing how a plane wave gets refracted, when it is incident on the surface separating a rarer medium from a denser medium? Hence, verify Snell's laws of refraction.

9. Define a wavefront. Use Huygens' geometrical construction to show the propagation of plane wavefront from a rarer medium (1) to a denser medium (2) undergoing refraction, hence derive Snell's law of refraction.

10. (i) Use Huygens' geometrical construction to show the behaviour of a plane wavefront,
    (a) passing through a biconvex lens
    (b) reflected by a concave mirror.
    (ii) When monochromatic light is incident on a surface separating two media, why does the refracted light have the same frequency as that of the incident light?

11. Using Huygens' geometrical construction of wavefronts, show how a plane wave gets reflected from a surface? Hence, verify laws of reflection.

12. Use Huygens' principle to verify the laws of refraction.

5 Marks Questions

13. (i) Define a wavefront. How is it different from a ray?
    (ii) Depict the shape of a wavefront in each of the following cases.
    (a) Light diverging from point source.
    (b) Light emerging out of a convex lens when a point source is placed at its focus.
    (c) Using Huygen's construction of secondary wavelets, draw a diagram showing the passage of a plane wavefront from a denser into a rarer medium.

14. State Huygens' principle. Using this principle draw a diagram to show how a plane wavefront incident at the interface of the two media gets refracted when it propagates from a rarer to a denser medium. Hence, verify Snell's law of refraction.

15. (i) Use Huygens' geometrical construction to show how a plane wavefront at $t = 0$ propagates and produces a wavefront at a later time?

(ii) Verify, using Huygens' principle, Snell's law of refraction of a plane wave propagating from a denser to a rarer medium.

(iii) When monochromatic light is incident on a surface separation two media, the reflected and refracted light both have the same frequency. Explain why?

16. (i) A plane wavefront approaches a plane surface separating two media. If medium 1 is optically denser and medium 2 is optically rarer, using Huygens' principle, explain and show how a refracted wavefront is constructed?

(ii) Verify Snell's law.

(iii) When a light wave travels from a rarer to a denser medium, the speed decreases. Does it imply reduction in its energy? Explain.

1 Mark Questions

1. (a) If one of two identical slits producing interference in Young's experiment is covered with glass, so that the light intensity passing through it is reduced to 50%, find the ratio of the maximum and minimum intensity of the fringe in the interference pattern.

 (b) What kind of fringes do you except to observe, if white light is used instead of monochromatic light?

2. Answer the following questions:

 (i) In a double slit experiment using light of wavelength 600 nm, the angular width of the fringe formed on a distant screen is 0.1°. Find the spacing between the two slits.

 (ii) Light of wavelength 500 Å propagating in air gets partly reflected from the surface of water. How will the wavelengths and frequencies of the reflected and refracted light be affected?

3. (i) Why cannot two independent monochromatic sources produce sustained interference pattern?

 (ii) Deduce, with the help of Young's arrangement to produce interference pattern, an expression for the fringe width.

4. The ratio of the widths of two slits in Young's double slit experiment is 4:1. Evaluate the ratio of intensities at maxima and minima in the interference pattern.

5. (i) Two monochromatic waves emanating from two coherent sources have the displacements represented by, $y_1 = a \cos\omega t$ and $y_2 = a \cos(\omega t + \phi)$, where, ϕ is the phase difference between the two waves. Show that the resultant intensity at a point due to their superposition is given by $I = 4I_0 \cos^2 \phi / 2$, where $I_0 = a^2$.

 (ii) Hence, obtain the conditions for constructive and destructive interference.

6. For a single slit of width a the first minimum of the interference pattern of a monochromatic light of wavelength λ occurs at an angle of λ / a. At the same angle of λ / a, we get a maximum for two narrow slits separated by a distance a. Explain.

7. Define the term 'coherent sources' which are required to produce interference pattern in Young's double slit experiment.

8. (i) Write the conditions under which light sources can be said to be coherent.

 (ii) Why is it necessary to have coherent sources in order to produce an interference pattern?

9. How does the fringe width in Young's double slit experiment, change when the distance of separation between the slits and screen is doubled?

10. How will the interference pattern in Young's double slit experiment get affected, when

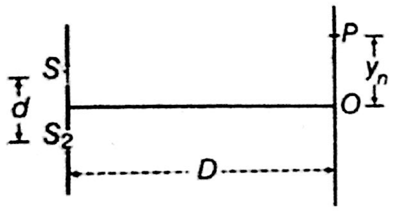
 (i) distance between the slits S_1 and S_2 reduced and

 (ii) the entire set up is immersed in water? Justify your answer in each case.

11. Laser light of wavelength 630 nm incident on a pair of slits produces an interference pattern in which the bright fringes are separated by 7.2 mm. Calculate the wavelength of another source of laser light which produce interference fringes separated by 8.1 mm using same pair of slits.

12. Describe Young's double slit experiment to produce interference pattern due to a monochromatic source of light. Deduce the expression for the fringe width.

13. The intensity at the central maxima (O) in a Young's double slit experiment is I_0. If the distance OP equals one-third of fringe width of the pattern, then show that the intensity at point P would be $I_0/4$.



14. In Young's double slit experiment, the two slits 0.15 mm apart are illuminated by monochromatic light of wavelength 450 nm. The screen is 1.0 m away from the slits.

(i) Find the distance of the second

(a) bright fringe

(b) dark fringe from the central maximum.

(ii) How will the fringe pattern change if the screen is moved away from the slits?

15. A beam of light consisting of two wavelengths 560 nm and 420 nm is used to obtain interference fringes in a Young's double slit experiment.

Find the least distance from the central maximum, where the bright fringes, due to both the wavelengths coincide. The distance between the two slits is 4.0 mm and the screen is at a distance of 1.0 m from the slits.

5 Marks Questions

16. (i) Consider two coherent sources S_1 and S_2 producing monochromatic waves to produce interference pattern. Let, the displacement of the wave produced by S_1 be given by $y_1 = a\cos\omega t$ and the displacement by S_2 be $y_2 = a\cos(\omega t + \phi)$

Find out the expression for the amplitude of the resultant displacement at a point and show that the intensity at that point will be $I = 4a^2\cos^2\frac{\phi}{2}$

Hence, establish the conditions for constructive and destructive interference.

(ii) What is the effect on the interference fringes in Young's double slit experiment when (a) the width of the source slit is increased; (b) the monochromatic source is replaced by a source of white light?

17. (i) In Young's double slit experiment, describe briefly how bright and dark fringes are obtained on the screen kept in front of a double slit. Hence, obtain the expression for the fringe width.

(ii) The ratio of the intensities at minima to the maxima in the Young's double slit experiment is 9:25.Find the ratio of the widths of the two slits.

18. (i) (a) 'Two independent monochromatic sources of light cannot produce a sustained interference pattern'. Give reason.

(b) Light waves each of amplitude a and frequency ω emanating from two coherent light sources superpose at a point. If the displacements due to these waves is given by $y_1 = a\cos\omega t$ and $y_2 = a\cos(\omega t + \phi)$ where ϕ is the phase difference between the two, obtain the expression for the resultant intensity at the point.

(ii) 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. Find out the intensity of light at a point where path difference is $\lambda/3$.

19. (i) In Young's double slit experiment, derive the condition for

(a) constructive interference and

(b) destructive interference at a point on the screen.

(ii) A beam of light consisting of two wavelengths, 800 nm and 600 nm is used to obtain the interference fringes on a screen placed 1.4 m away in a Young's double slit experiment. If the two slits are separated by 0.28 mm, calculate the least distance from the central bright maximum where the bright fringes of the two wavelengths coincide.

20. (i) What is the effect on the interference fringes to a Young's double slit experiment when

(a) the separation between the two slits is decreased?

(b) the width of the source slit is increased?

(c) the monochromatic source is replaced by a source of white light? Justify your answer in each case.

(ii) The intensity at the central maxima in Young's double slit experimental set up is I_0.

Show that the intensity at a point where the path difference is $\lambda/3$ is $I_0/4$.

1. State the importance of coherent sources in the phenomenon of interference. In Young's double slit experiment to produce interference pattern, obtain the conditions for constructive and destructive interference. Hence, deduce the expression for the fringe width. How does the fringe width get affected, if the entire experimental apparatus of YDSE is immersed in water?

22. (i) What are coherent sources? Why are they necessary for observing a sustained interference pattern? How are the two coherent sources obtained in the Young's double slit experiment?

(ii) Show that the superposition of the waves originating from the two coherent sources, S_1 and S_2 having displacement, $y_1 = a\cos\omega t$ and $y_2 = a\cos(\omega t + \phi)$ at a point produce a resultant intensity,

$$I = 4a^2\cos^2\phi/2$$

Hence, write the conditions for the appearance of dark and bright fringes.

1 Mark Questions

1. What is the speed of light in a denser medium of polarising angle 30°?
2. When unpolarised light is incident on the interface separating the rarer medium

and the denser medium, Brewster angle is found to be 60°. Determine the refractive index of the denser medium.

3. Distinguish between unpolarised and linearly polarised light.

4. In what way is plane polarised light different from an unpolarised light?

5. Which of the following waves can be polarised (i) Heat waves (ii) Sound waves? Give reason to support your answer.

6. How does the angular separation between fringes in single slit diffraction experiment change when the distance of separation between the slit and screen is doubled?

7. State Huygens' principle of diffraction of light?

8. For a given single slit, the diffraction pattern is obtained on a fixed screen, first by using red light and then with blue light. In which case, will the central maxima, in the observed diffraction pattern, have a larger angular width?

2 Marks Questions

9. Show using a proper diagram how unpolarised light can be linearly polarised by reflection from a transparent glass surface.

10. Draw the intensity pattern for single slit diffraction and double slit interference. Hence, state two differences between interference and diffraction patterns.

11. Unpolarised light is passed through a polaroid P_1. When this polarised beam passes through another polaroid P_2 and if the pass axis of P_2 makes an angle θ with the pass axis of P_1, then write the expression for the polarised beam passing through P_2. Draw a plot showing the variation of intensity, when θ varies from 0 to 2π.

12. State Brewster's law.
The value of Brewster angle for a transparent medium is different for light of different colours. Give reason.

13. (i) Distinguish between polarised and unpolarised light. Does the intensity of polarised light emitted by a polaroid depend on its orientation ? Explain briefly.

(ii) The vibration in beam of polarised light makes an angle of 60° with the axis of the polaroid sheet. What percentage of light is transmitted through the sheet?

14. Find an expression for intensity of transmitted light, when a polaroid sheet is rotated between two crossed polaroids. In which position of the polaroid sheet will the transmitted intensity be maximum?

15. For a single slit of width a, the first minimum of the interference pattern of a monochromatic light of wavelength λ occurs at an angle of λ / d. At the same angle of λ / d, we get a maximum for two narrow slits separated by a distance a. Explain.

16. A parallel beam of light of wavelength 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

17. Compare the interference pattern observed in Young's double slit experiment with single slit diffraction pattern, pointing out two distinguishing features.

18. Yellow light ($\lambda = 6000$ Å) illuminates a single slit of width 1×10^{-4} m. Calculate the distance between two dark lines on either side to the central maximum, when the diffraction pattern is viewed on a screen kept 1.5 m away from the slit.

19. Two convex lenses of same focal length but of aperture A_1 and A_2 ($A_2 < A_1$), are used as the objective lenses in two astronomical telescope having identical eyepieces. What is the ratio of their resolving power ? Which telescope will you prefer and why ? Give reason.

3 Marks Questions

20. (a) When an unpolarised light of intensity I_0 is passed through a polaroid, what is the intensity of the linearly polarised light? Does it depend on the orientation of the polaroid? Explain your answer.
(b) A plane polarised beam of light is passed through a polaroid. Show graphically the variation of the intensity of the transmitted light with angle of rotation of the polaroid in complete one rotation.

21. (i) State law of Malus.
(ii) Draw a graph showing the variation of intensity (I) of polarised light transmitted by an analyser with angle (θ) between polariser and analyser.
(iii) What is the value of refractive index of a medium of polarising angle 60°?

22. State clearly how an unpolarised light get linearly polarised, when passed through a polaroid.
(i) Unpolarised light of intensity I_0 is incident on a polaroid P_1 which is kept near polaroid P_2 whose pass axis is parallel to that of P_1. How will the intensities of light, I_1 and I_2 transmitted by the polaroids P_1 and P_2, respectively, change on rotating P_1 without disturbing P_2?
(ii) Write the relation between the intensities I_1 and I_2.

23. (i) Using Huygens' construction of secondary wavelets explain how a diffraction pattern is obtained on a screen due to a narrow slit on which a monochromatic beam of light is incident normally.
(ii) Show that the angular width of the first diffraction fringe is half that of the central fringe.
(iii) Explain why the maxima at $\theta = \left(n + \frac{1}{2}\right)\frac{\lambda}{d}$ become weaker and weaker with increasing n.

24. (i) Using the phenomenon of polarisation, show how transverse nature of light can be demonstrated.
(ii) Two polaroids P_1 and P_2 are placed with their pass axes perpendicular to each other. Unpolarised light of intensity I_0 is incident on P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its pass axis makes an angle of 30° with that of P_1. Determine the intensity of light transmitted through P_1, P_2 and P_3.

25. A parallel beam of monochromatic light falls normally on a narrow slit of width 'a' to produce a diffraction pattern on the screen placed parallel to the plane of the slit. Use Huygens' principle to explain that
(i) the central bright maxima is twice as wide as the other maxima.
(ii) the intensity falls as we move to successive maxima away from the centre on either side.

26. (i) Show with the help of a diagram how unpolarised sunlight gets polarised due to scattering.
(ii) Two polaroids P_1 and P_2 are placed with their pass axes perpendicular to each other. Unpolarised light of intensity I_0 is incident on P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its pass axis makes an angle of 45° with that of P_1. Determine the intensity of light transmitted through P_1, P_2 and P_3.

27. (i) Distinguish between unpolarised and linearly polarised light.
(ii) What does a polaroid consist of? How does it produce a linearly polarised light?

(iii) Explain briefly how sunlight is polarised by scattering through atmospheric particles.

28. (i) Unpolarised light of intensity I_0 passes through two polaroids P_1 and P_2 such that pass axis of P_2 makes an angle θ with the pass axis of P_1. Plot a graph showing the variation of intensity of light transmitted through P_2 as the angle θ varies from 0° to 180°.

(ii) A third polaroid P_3 is placed between P_1 and P_2 with pass axis of P_3 making an angle β with that of P_1 and the angle between P_1 and P_2 is θ. If I_1, I_2 and I_3 represents the intensities of light transmitted by P_1, P_2 and P_3, then determine the values of angle θ and β for which $I_1 = I_2 = I_3$.

29. (i) What is linearly polarised light? Describe briefly using a diagram how sunlight is polarised.

(ii) Unpolarised light is incident on a polaroid. How would the intensity of transmitted light change when the polaroid rotated?

30. (i) In what way is diffraction from each slit related to the interference pattern in a double slit experiment.

(ii) Two wavelengths of sodium light 590 nm and 596 nm are used, in turn to study the diffraction taking place at single slit of aperture 2×10^{-4}m. The distance between the slit and the screen is 1.5 m. Calculate the separation between the positions of the first maxima of the diffraction pattern obtained in the two cases.

31. (i) Describe briefly, with the help of suitable diagram, how the transverse nature of light can be demonstrated by the phenomenon of polarisation?

(ii) When unpolarised light passes from air to a transparent medium, under what condition does the reflected light get polarised?

32. The velocity of a certain monochromatic light in a given transparent medium is 2.25×10^8 m/s. What is the (a) critical angle of incidence, (b) polarising angle for this medium?

33. (i) Light passes through two polaroids P_1 and P_2 with pass axis of P_2 making an angle θ with the pass axis of P_1. For what value of θ is the intensity of emergent light zero?

(ii) A third polaroid is placed between P_1 and P_2 with its pass axis making an angle β with the pass axis of P_1. Find the value of β for which the intensity of light from P_2 is $I_0/8$, where I_0 is the intensity of light on the polaroid P_1. ($\theta = 90°$)

34. (i) Explain with the help of diagram, how plane polarised light is obtained by scattering?

(ii) Between two polaroids placed in crossed position, a third polaroid is introduced. The axis of the third polaroid makes an angle of 30° with the axis of the first polaroid. Find intensity of transmitted light from the system assuming I_0 to be the intensity of polarised light on the first polaroid.

35. Explain the following giving reason for each.

(i) How does a polaroid work to produce a linearly polarised light from an unpolarised beam of light?

(ii) Why does the light waves can be polarised but sound waves cannot be?

(iii) Why are sun goggles made of polaroids preferred over those using coloured glasses?

36. How does an unpolarised light gets polarised when passed through a polaroid? Two polaroids are set in crossed positions. A third polaroid is placed between the two making an angle θ with the pass axis of the first polaroid.

Write the expression for the intensity of light transmitted from the second polaroid. In what orientations will the transmitted intensity be
(i) minimum (ii) maximum?

37. What is an unpolarised light? Explain with the help of suitable ray diagram, how an unpolarised light can be polarised by reflection from a transparent medium? Write an expression for Brewster's angle in terms of the refractive index of denser medium.

38. A beam of unpolarised light is incident on the boundary between two transparent media. If the reflected light is completely plane polarised, how is its direction related to the direction of the corresponding refracted light? Define Brewster's angle. Obtain the relation between this angle and the refractive index for the given pair of media.

5 Marks Questions

39. Explain with the help of a diagram, how plane polarised light can be produced by scattering of light from the Sun.

Two polaroids P_1 and P_2 are placed with their pass axes perpendicular to each other. Unpolarised light of intensity I is incident on P_1. A third polaroid P_3 is kept between P_1 and P_2 such that its pass axis makes an angle of 45° with that of P_1. Calculate the intensity of light transmitted through P_1, P_2 and P_3.

40. (a) Why cannot the phenomenon of interference be observed by illuminating two pin holes with two sodium lamps?

(b) Two monochromatic waves having displacements $y_1 = a\cos\omega t$ and $y_2 = a\cos(\omega t + \phi)$ from two coherent sources interfere to produce an interference pattern. Derive the expression for the resultant intensity and obtain the conditions for constructive and destructive interference.

(c) Two wavelengths of sodium light of 590 nm and 596 nm are used in turn to study the diffraction taking place at a single slit of aperture 2×10^{-6} m. If the distance between the slit and the screen is 1.5 m, calculate the separation between the positions of the second maxima of diffraction pattern obtained in the two cases.

41. (a) Describe any two characteristic features which distinguish between interference and diffraction phenomena. Derive the expression for the intensity at a point of the interference pattern in Young's double slit experiment.

(b) In the diffraction due to a single slit experiment, the aperture of the slit is 3 mm. If monochromatic light of wavelength 620 nm is incident normally on the slit, calculate the separation between the first order minima and the third order maxima on one side of the screen. The distance between the slit and the screen is 1.5 m.

42. (a) Define a wavefront. Using Huygens' principle, verify the laws of reflection at a plane surface.

(b) In a single slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band? Explain.

(c) When a tiny circular obstacle is placed in the path of light from a distant source, a bright spot is seen at the centre of the obstacle. Explain, why?

43. Differentiate between unpolarised and polarised light. How is linearly polarised light obtained by the process of scattering of light? Find the Brewster angle for air-glass interface, when the refractive index of glass = 1.5.

44. (i) Distinguish between unpolarised light and linearly polarised light. How does one get linearly polarised light with the help of a polaroid?

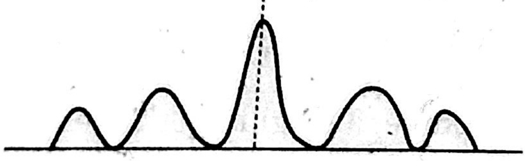
(ii) A narrow beam of unpolarised light of intensity I_0 is incident on a polaroid P_1. The light transmitted by it is then incident on a second polaroid P_2 with its pass axis making an angle of 60° relative to the pass axis of P_1. Find the intensity of the light transmitted by P_2.

45. (i) Explain two features to distinguish between the interference pattern in Young's double slit experiment with the diffraction pattern obtained due to a single slit.

(ii) A monochromatic light of wavelength 500 nm is incident normally on a single slit of width 0.2 mm to produce a diffraction pattern. Find the angular width of the central maximum obtained on the screen.

Estimate the number of fringes obtained in Young's double slit experiment with fringe width 0.5 mm, which can be accommodated within the region of total angular spread of the central maximum due to single slit.

46. When a plane wavefront of light of wavelength λ, is incident on a narrow slit, an intensity distribution pattern, of the form shown is observed on a screen, suitably kept behind the slit.
Name the phenomenon observed.



(i) Obtain the conditions for the formation of central maximum and secondary maxima and the minima.

(ii) Why is there significant fall in intensity of the secondary maxima compared to the central maximum, whereas in double slit experiment all the bright fringes are of the same intensity ?

(iii) When the width of the slit is made double the original width, how is the size of the central band affected?

47. (i) Describe briefly how a diffraction pattern is obtained on a screen due to a single narrow slit illuminated by a monochromatic source of light. Hence, obtain the conditions for the angular width of secondary maxima and secondary minima.

(ii) Two wavelengths of sodium light of 590 nm and 596 nm are used in turn to study the diffraction taking place at a single slit of aperture 2×10^{-6}m. The distance between the slit and the screen is 1.5m. Calculate the separation between the positions of first maxima of the diffraction pattern obtained in the two cases.

48. (i) How does one demonstrate, using a suitable diagram,that unpolarised light when passed through a polaroid gets polarised?

(ii) A beam of unpolarised light is incident on a glass air interface. Show, using a suitable ray diagram that light reflected from the interface is totally polarised, when $\mu = \tan i_B$, where μ is the refractive index of glass with respect to air and i_B is the Brewster's angle.

49. (i) Distinguish between linearly polarised and unpolarised light.

(ii) Show that the light waves are transverse in nature.

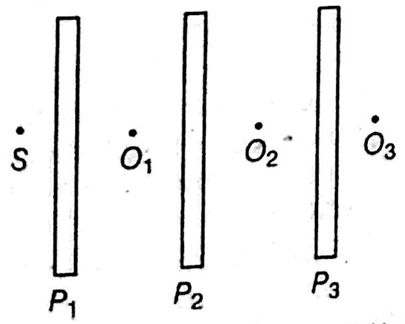
(iii) Why does light from a clear blue portion of the sky show a rise and fall of intensity when viewed through a polaroid which is rotated?
Explain by drawing the necessary diagram.

50. (i) Write three characteristic features to distinguish between the interference fringe in Young's double slit experiment and the diffraction pattern obtained due to a narrow single slit.

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

51. (i) Describe briefly how an unpolarised light gets linearly polarised when it passes through a polaroid.

(ii) Three identical polaroid sheets P_1, P_2 and P_3 are oriented so that the pass axis of P_2 and P_3 are inclined at an angles of 60° and 90°, respectively, with respect to the pass axis of P_1. A monochromatic source S of unpolarised light of intensity I_0 is kept in front of the polaroid sheet P_1 as shown in the figure. Determine the intensities of light as observed by the observers O_1, O_2 and O_3 as shown in figure below.



52. (i) How does an unpolarised light incident on a polaroid gets polarised? Describe briefly, with the help of a necessary diagram, the polarisation of light by reflection from a transparent medium.

(ii) Two polaroids A and B are kept in crossed position. How should a third polaroid, C be placed between them so that the intensity of polarised light transmitted by polaroid, B reduces to 1/8th of the intensity of unpolarised light incident on A?

53. (i) Obtain the conditions for the bright and dark fringes in diffraction pattern due to a single narrow slit illuminated by a monochromatic source.
Explain clearly, why the secondary maxima go on becoming weaker with increasing?

(ii) When the width of the slit is made double, how would this affect the size and intensity of the central diffraction band? Justify your answer.

54. (i) State Huygens' principle. Using this principle explain how a diffraction pattern is obtained on a screen due to a narrow slit on which a narrow beam coming from a monochromatic source of light is incident normally.

(ii) Show that the angular width of the first diffraction fringe is half of that of the central fringe.

(iii) If a monochromatic source of light is replaced by white light, what change would you observe in the diffraction pattern?

55. (i) In a single narrow slit (illuminated by a monochromatic source) diffraction experiment, deduce the conditions for the central maximum and secondary maxima and minima observed in the diffraction pattern. Also explain why the secondary maxima go on becoming weaker in intensity as the order increases.

(ii) How does the width of the slit affect the size of the central diffraction band?