PHYSICS

BOOKS - MODERN PUBLICATION

Polarisation of Light

Example

1. The polarising angle of a medium is 60°.

What is refractive index of the medium?

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2. A ray of light is incident on the surface of a glass plate of refractive index 1.536 at the polarising angle.Calculate the angle of refraction.

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3. For a given medium, the polarising angle is 45°. What will be the critical angle for this medium?

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4. The critical angle between a given trasparent medium and air is denoted by C.A ray of light in air medium enters this transprent meidum at an angle of incidence equal to polarising angle p.Deduce a relation for the angle of refraction in terms of C.

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5. If the angle between the planes of the polariser and analyser is 60°, by what factor does the intensity of the transmitted light change when passing through the analyser.

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6. A beam of plane polarised light falls normally on a polariser (cross-sectional area $3 \times 10^{-4} m^2$),which rotates about the axis of the ray with an angular velcity of $31.4 rads^{-1}$

.Find the energy of light passing through the polariser per revolution and the intensity of emergent beam,if flux of energy of the incident ray is $10^{-3})W$.

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

transmission axis of the first two,polarisers?At what angle will the inensity of transmitted light be maximum?

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8. Explain Polarisation.

Explain the difference between polarised and unpolarised lights.

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9. What do you mean by polarisationof light?

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10. Sound waves in air cannot be. polarised because they are:

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11. What evidence is there that sound is not electromagnetic in nature?

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12. Will ultrasonic waves show any polarization? Give reasons for your answer.

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13. Light waves are transverse, because they:

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14. What information do we get about the nature of light by polarisation?

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15. Can electromagnetic waves be polarised?

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16. Does the value of wavelength of light have any role in polarisation?

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17. Experimental observations have shown that X-rays travel in vacuum with a speed of $3 \times 10^8 ms^{-1}$. What conclusion can be drawn about the nature of X-rays from this observation?

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18. Experimental observations have shown that X-rays

exhibit the phenomenon of diffraction and can be polarised.What conclusion can be drawn about the nature of X-rays from this observation?

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19. What is a plane polarised e.m. wave?

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20. What is linearly polarised light?

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21. How does an unpolarised ligth get polarised,when it is pased through a polariod?

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22. What are plane of polarisation and plane of vibration?

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23. Can our eye distinguish polarised light from unpolarised light?

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24. How can you detect a polarised light?

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25. A paritally plane polarised bem of light is passed through a polaroid.Show graphically thervriation of the trnsmitted ligth intensity with angle of rotation of the polaroid.

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26. Define the polarisation angle for polarisation by reflection.

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27. State Brewster's law. Obtain the relation between the Brewster angle and refractive index for medium which produces Plane Polarized light.

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28. Write relation between refractive ndex and angle of polarisation.

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29. State Brester's law of polarisation of light.

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30. A ray of light is incident on a medium at polarising angle .What is the angle betweeen the relfected and refracted rays?

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31. When unpolarized ligth passes from air to a transparent mediu,under what condition does the refleced ligth get polarize?

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32. 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?

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33. When light is polarised by reflection,what is the plane of vibration of the electric field vector in polarised light?

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34. 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?

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35. What is the value of refractive index of a medium of polarising angle 60°?

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36. The polarising angle of a medium is 60°. What is refractive index of the medium?

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37. At what angle of incidence should light beam strike a glass slab of refractive index $(\mu = \sqrt{3})$, such that the reflected and refracted rays are perpendicular to each other?

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38. What is the polarising anle of a medium of refractive index $\sqrt{3}$?

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39. A ray is incident on the surface of glass plate of refractive index $\sqrt{3}$. What is the value of angle of incidence, if reflected light is completely polarised?

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40. Does the value of polarising angle depend on the wavelength of light?

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41. The value of the Bewster angle for a trnsparent medium is different for lights of different colours.

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42. What is a polaroid?

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43. A paritally plane polarised bem of light is passed through a polaroid.Show graphically thervriation of the trnsmitted ligth intensity with angle of rotation of the polaroid.

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44. Write simple uses of polaroids.

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45. What do you mean by the term crossed polaroids?

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46. What is the basic differnece between source of light and a source of radiowaves?

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47. What do we understand by polarisation of a wave?How does this phenomenon heolp us to decide,whether a given wave is trnsverse or longitudinl in nature?

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48. Defien a linearly polarised or plane polarised light.Why is the phenomenon of

polarisation not observed by sound waves?

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49. In light waves,the vibrations are perpendicular to the direction of propagation of light.but it is said that light requires no material medium for its propagation,then what vibrates transversely in light waves?

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50. Differentiate betwen polarised an unpolarised light .How are these represented?

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51. What is a plane polarised e.m. wave?

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52. Explain what is meant by:

polarising angle.

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53. How does an unpolarised ligth get polarised,when it is pased through a polariod?

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54. Light from an ordianry source(say a sodium lamp) is passed through a polaroid sheet P_1.The transmitted light is then made to pass through a second polaroid sheet P_2

,which can be rotated so that the angle (θ) betwen the two polaroid sheets varies from 0° to 90°.Show graphically the variation of he intensity of light transmitted by P_1 and P_2 as a function of the angle θ.Take the incident beam intensity asI_0.

Why does the light from a cleear blue portion of the sky,show a rise and fall on intesnity,when viewed through a polaroid ,which is rotated?

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55. What is elliptically polarised light?

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56. Define the polarisation angle for polarisation by reflection.

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57. What is the angle of reflection when a ray of light is incident normally to the mirror?

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58. For a given medium, the polarising angle is 45°. What will be the critical angle for this medium?

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59. Define critical angle.

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60. Define critical angle and polarising angle.What is the relation between the two?

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61. Does the value of polarising angle depend on the wavelength of light?

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62. Draw a graph showing the variation of intensity of polarized light transmitted by an analyser.

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63. Draw a graph showing the variation of intensity of polarized light transmitted by an analyser.

Watch Video Solution

64. Draw a graph showing the variation of intensity of polarized light transmitted by an analyser.

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65. What are polaroids? Explain their one use.

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66. how do sunglasses reduce the glare of intense light?

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67. Two polaroids are aligned,so that the intentsity of light emerging out of them is maximum.Through what angle one of them should be rotated ,so that the intensity of light emerging out of them is reduced to half.

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68. If the angle between the pass axis of a polariser and the analyser is 45°,write the ratio off the intensitties of original light and the transmitted ligth after pasing through the analyser.

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69. Two polaroids P_1 and P_2 are placed with their pass axes perpendicular to each other.An unpolarised ligth 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 tranjsmitted throug P_1, P_2 and P_3.

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70. An unpolarised beam of light of intensity I_0 is incident on a combination of two polaroids.Find the net intesity of light of intensity transmitted by the combinatin,when

the pass axis of the two polaroids are inclined to each other at an angle of 60°.

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71. Three polaroids are placed insuch a manner that the third polaroid is crossed with the first.When a beam of unpolarised light of intenstiy $24Wm^{-2}$ falls on the first polaroid,the intensity of light reduces to $3Wm^{-2}$ on emerging fromo the thrid polariod.Find the angle between the

trnasmission axes of the second and third polaroid.

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72. Two polaroids are placed at 90° to each other.What happens,when(N-1) more polaroids are inserted between them?Their axis are equally spaced.How does the trnsitted intensity behave ffor large N?

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Exercise

1. What do you understand by polarisation of light ?Describe an experiment to demonstrate transverse nature of light.

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2. Prove that electromagnetic waves are transverse in nature.

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3. What information do we get about the nature of light by polarisation?

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4. Describe briefly,with the help of suitable diagram,how the transverse natrure of light can be demonstrated by the phenomenon of polarisation.

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5. Describe briefly,with the help of suitable diagram,how the transverse natrure of light can be demonstrated by the phenomenon of polarisation.

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6. Which type of waves show the property of polarisation?

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7. How does an unpolarised ligth get polarised,when it is pased through a polariod?

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8. What is a plane polarised e.m. wave?

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9. What is linearly polarised light?

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10. Show ,with the help of diagram,how unpolarised sunnlight gets polarised due to scattering.

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11. The polarising angle of a medium is 60°. What is refractive index of the medium?

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12. Polarised light can be produced by

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13. What is polarisation of light? Explain polarisation of light by reflecting with the suitable diagram and hence derive Brewter's Law.

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14. State Brester's law of polarisation of light.

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15. State Brewter's law.Show that the reflected ray and the refracted ray are perpendicular to each other,when the angle of incidene is equal to polarising angle.

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16. State Brewster's law. Obtain the relation between the Brewster angle and refractive index for medium which produces Plane Polarized light.

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17. A ray of light is incident on a medium at polarising angle .What is the angle betweeen the relfected and refracted rays?

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18. A beam of unpolarised ligth is incident on a glass-air interface. Showing 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.

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19. A ray of light is incident on a medium at polarising angle .What is the angle betweeen

the relfected and refracted rays?

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20. A beam of unpolarised ligth is made to fall,from air ,on its boundary with another transparent medium of refrective index μ.The reflected beam is viewed through a rotating analyser.Show on a graph,the variation of intensity of light trasmitted through the analyser with the angel between the pass axis

of the analyser and the direction of the reflected beam.

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21. How does an unpolarised ligth get polarised,when it is pased through a polariod?

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22. What is an unpolarised ligth ?Explain with the help of a suitable ray diagram,how an

unpolarised light can be polarised by reflection from a transparent medium.Write the expression for Brewster angle in terms of the refractive index of the denser medium.

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23. Give a method for producing a beam of plane polarised light.Show how you will detect the presence of plane polarised light.Give one practical use of polarised light.

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24. Can sound waves in air be polarised?

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25. What is a polaroid?

Watch Video Solution

26. What is linearly polarised light?

Watch Video Solution

27. What is linearly polarised light?

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28. What are polariods?Write their four uses.

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29. Two polaroids are set in corossed positions.A third polaroid is placed between

the two making an angle θ with the pass axis of the first polaroid.Write the expession for the intensity of light trnasmitted from the second polaroid .In what orientations will the transmitted intenesity be

minimum adn

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30. Two polaroids are set in corossed positions.A third polaroid is placed between the two making an angle θ with the pass axis

of the first polaroid.Write the expession for the intensity of light trnasmitted from the second polaroid .In what orientations will the transmitted intenesity be

maximum.

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31. What do you understand by polarisation of light ?Describe an experiment to demonstrate transverse nature of light.

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32. Explain Polarisation.

Explain the difference between polarised and unpolarised lights.

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33. What do you understand by polarsation of light?What information you get about the nature of ligth from the study of polarisation? How would you obtain place polarised light by reflection?

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34. What is meant by plane polarised ligth ? Which type f waves show the property of polarisation ?Briefly discuss:

polarisation by scattering and

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35. Define the polarisation angle for polarisation by reflection.

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36. What do you mean by polarisationof light?

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37. Differentiate betwen polarised an unpolarised light .How are these represented?

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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?

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39. Which special characteristic of ligth is demonstrated only by the phenomenon of

polarisation?Distinguihs clearly between linearly polarised light and unpolarised light.

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40. State Brewster's law. Obtain the relation between the Brewster angle and refractive index for medium which produces Plane Polarized light.

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41. Refractive index of waer is 1.33.Calculate the angle of polarisation for light reflected from the suruface of a lake.

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42. The refractive index of a material is $\sqrt{3}$. What is the angle of refraction if the unpolarised light is incident on it at the polarising angle of the medium.

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43. A ray of light is incident on the surface of a glass plate of refractive index 1.536 at the polarising angle.Calculate the angle of refraction.

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44. A ray of lght strikes a glass plate at an angle of incidence 57°.If the reflected and refracted rays are perpendicular to each other,find the refractive index of glass.

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45. Two polaroids P_1 and P_2 are placed with their pass axees perpendiculat to each otehr.An unpolarised ligth 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 tha tof P_1 .Dtermine the intensity of light transmitted through P_1, P_2 and P_3.

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46. Two polaroids P_1 adn P_2 are placed with their pass xes perpendicular to each other.An unpolarised ligth of intensity I_0 is incident on P_1.a thid polaroid P_3 is kept in betwen P_1 and P_2 such that its axis makes an angle of 60° with that of P_1.determine the intensity of light transited through P_1, P_2 and P_3.

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47. Two polaroids are placed at 90° to each other and the transmitted intensity is zero .What happens,when one more polaroid is placed betwen these two,bisectiing the angle between them.How will the intensity of transmitted light vary on further rotatint the third polaroid?

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48. Two polaroids A and B are kept in crossed poisiton.How should a third polariod C be placed between them so that the intensity of polarised ligth transmitted by polaroid B reduces to $1/8th$ of the intensity of unpolarised light incident on A?

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49. Two polaroids ar oriented with their planes of trnasmission making an angle of 30° with

that of precceeding sheet.What fraction of incident unpolarised light is transmitted?

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50. Two polaroids ar oriented with their planes of trnasmission making an angle of 30° with that of precceeding sheet.What fraction of incident unpolarised light is transmitted?

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