PHYSICS

BOOKS - JEEVITH PUBLICATIONS PHYSICS (KANNADA ENGLISH)

WAVE OPTICS

One Marks Questions With Answers

1. Name the person who gave the corpuscular model of light and derived Snell's law of

refraction?

Watch Video Solution

2. Why is it that corpuscular theory of light is attributed to Isaac Newton?

Watch Video Solution

3. Who proposed the wave nature of light?

Watch Video Solution

4. Who experimentally verified that the speed of light in water is less than the speed of light in air?

Watch Video Solution

5. Name the physicist who established the wave nature of light.

Watch Video Solution

6. Inspite of the wave nature of light, why is light assumed to travel in a straight line?

Watch Video Solution

7. Name the branch of optics which neglects the wavelength $(\lambda \to 0)$ of light.

Watch Video Solution

8. Who proposed the theory of electromagnetic waves ?

Watch Video Solution

9. What is a wavefront?

Watch Video Solution

10. What is the shape of a wavefront at a large distance away from a point source?

Watch Video Solution

11. What is the direction of rays with respect to plane wave fronts?

Watch Video Solution

12. What is the shape of a wavefront due to a spherical or point source?

Watch Video Solution

13. What is a primary disturbance?

Watch Video Solution

14. What are wavelets?

Watch Video Solution

15. What constitutes secondary wavefront?

Watch Video Solution

16. What is interference of light?

Watch Video Solution

17. Who demonstrated Interference of light for the first time?

Watch Video Solution

18. State the condition for destructive interference in terms of path between the two

waves.

Watch Video Solution

19. State the condition for constructive interference in terms of path difference between the two waves.

Watch Video Solution

20. State the condition for constructive interference in terms of phase difference

between the two waves.

Watch Video Solution

21. State the condition for destructive interference in terms of path between the two waves.

Watch Video Solution

22. What is fringe width?

Watch Video Solution

23. How does fringe width vary with wave length?

Watch Video Solution

24. How does fringe width vary with slit separation?

Watch Video Solution

25. How does fringe width vary with distance between the double slit and the screen?

Watch Video Solution

26. What are coherent sources of light?

Watch Video Solution

27. What is the principle behind young's double slit experiment in obtaining coherent

sources?

Watch Video Solution

28. Does the law of conservation of energy hold good at the point of destructive interference?

Watch Video Solution

29. Calculate phase difference between the two waves corresponding to a path difference

of $(\lambda/6)$.

Watch Video Solution

30. Draw intensity pattern of light in an interference of light waves.

Watch Video Solution

31. What is diffraction of light?

Watch Video Solution

32. Who discovered the phenomenon of diffraction of light?

Watch Video Solution

33. State the condition for diffraction of light to take place.

Watch Video Solution

34. Give the condition for diffraction minima.

Watch Video Solution

35. Give the condition for diffraction maxima.

Watch Video Solution

36. Express angular width of central maximum in terms of wavelength.

Watch Video Solution

37. Give the expression for linear width of central maximum.

Watch Video Solution

38. How does the width of central maximum vary with the wavelength of light used?

Watch Video Solution

39. How does width of central maximum vary with the width of the slit used?

Watch Video Solution

40. Compare the intensity of first secondary maximum with the intensity of central maximum for the single slit fraunhoffer diffraction pattern.

Watch Video Solution

41. Compare the intensity of second secondary maximum with the intensity of central maximum for the single slit Fraunhofer diffraction pattern.

Watch Video Solution

42. What type of wave front is used in Fraunhofer diffraction?

Watch Video Solution

43. What is the resolving power of an instrument?

Watch Video Solution

44. Define plane polarised light.

Watch Video Solution

45. In propagation of electromagnetic waves, what is the angle between the direction of

propagation of the wave and the plane of polarisation?

Watch Video Solution

46. What is polaroid?

Watch Video Solution

47. State Malus law.

Watch Video Solution

48. Say whether radio signals are plane polarised or circularly polarised?

Watch Video Solution

49. What properties are attributed to ether medium?

Watch Video Solution

50. What is ether?

Watch Video Solution

51. Mention any one demerit of Huygens' wave theory of light.

Watch Video Solution

52. Mention any one demerit of newton's corpuscular theory of light

Watch Video Solution

53. How did Newton account for different colours of light?

Watch Video Solution

Two Marks Questions With Answers

1. When are two identical waves said to interfere (a) constructively (b) destructively?

Watch Video Solution

2. Give any two characteristics of interference of light waves.

Watch Video Solution

3. Compare width of slits with the intensity and hence amplitude of the waves.

Watch Video Solution

4. If the apparatus used in YDSE is immersed in water then what will happen to the fringe

width.

Watch Video Solution

5. A thin glass plate is introduced in front of one of the double slits. What will happen to the fringe width?

Watch Video Solution

6. Draw a neat labelled diagram of diffraction image of an object.

View Text Solution

7. Draw a neat diagram of experimental set up for Fraunhoffer diffraction due to a single slit.

Watch Video Solution

8. Draw parallel and crossed polaroids neatly.

Watch Video Solution

9. Name the scientists associated with the discovery of Polarisation by reflection

Watch Video Solution

10. Name the scientists associated with the discovery of

(ii) Birefringence.

Watch Video Solution

11. What is meant by an unpolarised wave?

Watch Video Solution

12. Draw a neat labelled diagram to show the real image formed by the objective lens of the microscope.

Watch Video Solution

13. What is meant by red shift and blue shift?

Watch Video Solution

14. In what way is diffraction from each slit related to interference pattern in a double slit experiment?

Watch Video Solution

15. Answer the following questions:

(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 shadow of the obstacle. Explain why?

Watch Video Solution

16. Give the expression for limit of resolution of a microscope along with the meaning of the symbols used.

Watch Video Solution

17. Give the expression for limit of resolution of a telescope along with the explanation of the symbols used.

Watch Video Solution

Three Marks Questions With Answers

1. State any three conditions for a sustained interference of light waves.

Watch Video Solution

2. Give the formula for the linear separation of bright and dark fringes.

Watch Video Solution

3. Give the formula for angular separation of bright and dark fringes.

Watch Video Solution

4. Compare $I_{\max}$ and $I_{\min}$ with amplitudes of the interfering waves.

Watch Video Solution

5. What is Doppler effect in light? Write the expression for Doppler shift.

Watch Video Solution

6. Mention any three application of polaroids

Watch Video Solution

7. Explain the refraction of plane wavefront of light through a prism.

Watch Video Solution

8. Explain the refraction of plane wavefront of light through a convex lens.

Watch Video Solution

9. Explain the refraction of plane wavefront of light in a concave mirror.

Watch Video Solution

Five Marks Questions With Answers

1. Prove Snell's law of refraction by using Huygens's concept of plane wavefronts.

Watch Video Solution

2. Explain refraction of light from a denser to a rear medium, using the concept of wavefronts.

Watch Video Solution

3. Using Huygens principle, show that the angle of incidence is equal to angle of reflection during a plane wave front reflected by a plane surface.

Watch Video Solution

4. Describe an experimental set up to Young's double slit experiment.

Watch Video Solution

5. Obtain the expression for fringe width in the case of interference of light waves.

Watch Video Solution

6. Show that two waves interfere constructively when the path difference them is an integral multiple of wave length.

Watch Video Solution

7. Show that two waves interfere destructively when the path difference between them is an odd multiple of half wavelength.

Watch Video Solution

8. S.T. for a constructive interference of two identical and coherent light waves, the maximum intensity is four times the intensity of individual waves and zero for a destructive interference.

Watch Video Solution

9. Give an account of the analysis of Fraunhoffer diffraction due to a single slit.

View Text Solution

10. Prove Brewster's Law.

View Text Solution

11. Write any three difference between interference and diffraction.

Watch Video Solution

Numericals With Solutions

1. In young's double slit experiment using a source of light of wavelength 5000 $\mathring{A}$, the bandwidth obtained is 0.6 cm. If the distance between the screen and the slit is reduced to half, what should be the wavelength of the source to get fringes 0.003m wide?

Watch Video Solution

2. In young's double slit experiment , two slits 0.18 mm apart illuminated by a light of wavelength 589.3 nm. Calculate the distance of

(i) 5^{th} bright and (ii) 3^{rd} dark fringes from the midpoint of the interference pattern obtained on a screen kept 0.6 m away from the slits.

Watch Video Solution

3. In young's double slit experiment, the total width of 10 fringes is observed as $2 \times 10^{-3} m$ and the slits are separated by the distance of $2 \times 10^{-3} m$. Find the distance between the slits and the screen, when a light of wavelength 6000 $\overset{\circ}{A}$ is used.

Watch Video Solution

4. In young's double slit experiment, distance between the slits is `1mm. The fringe width is found to be 0.6 mm. When the screen is moved through a distance of 0.25 m, the fringe width becomes 0.75 mm. Find the wavelength of light used.

Watch Video Solution

5. Calculate the distance between the centers of 4^{th} and 7^{th} bright fringes in an interference pattern produced in young's slit experiment. Give separation between the slits $= 1.1 \times 10^{-3}$, wavelength of light used $= 589.3nm$, and distance of the screen from the double slit $= 1.3m$.

Watch Video Solution

6. Light of wavelength 6000 $\overset{\circ}{A}$ is used to obtain interference fringe of width 6 mm in a young's double slit experiment. Calculate the wavelength of light required to obtain fringe of width 4 mm if the distance between the screen and slits is reduced to half of its initial value.

Watch Video Solution

7. Calculate the fringe width of the interference pattern. Given wavelength of light used $= 678$ nm, distance between the slits $= 0.35$mm, distance between the screen and the double slit = 1 m.

Watch Video Solution

8. A beam of light consisting of two wavelengths 500 nm and 400 nm is used to obtain interference fringes in Young's double

slit experiment. The distance between the slits is 0.3 mm and the distance between the slits and the screen is 1.5 m. Compute the least distance of the point from the central maximum, where the bright fringes due to both the wavelengths coincide.

Watch Video Solution

9. Two towers on top of the two hills are 40 km part. The line joining them passes 50 m above the hill half way between the towers. What is

the longest wavelength of radio waves, which can be sent between the towers without appreciable diffraction effects?

Watch Video Solution

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

Watch Video Solution

11. The diameter of the objective of a telescope is 1.2m. Ig the wavelength of light used is 546 nm, then calculate the limit of resolution of the telescope.

Watch Video Solution

12. Calculate the resolving power of a telescope whose limit of resolution is 2.44×10^{-6} rad.

Watch Video Solution

13. In an experiment with a microscope, light of wave length 4240 $\overset{\circ}{A}$ is used. The limit of resolution is found to be $3 \times 10^{-7} m$. What is the semi vertical angle?

Watch Video Solution

14. Calculate the resolving power of a microscope, whose limit of resolution is

$2.4 \times 10^{-4} m.$

Watch Video Solution

15. The semi vertical angle subtended by two points of an object at the objective of a microscope is 30°. The object is illuminated using light of wavelength 589.3 nm. Calculate the minimum distance between the two points if these are just resolved. If a medium of $R.I 1.48$ is used between the object and the objective, then calculate the new limit of

resolution. Comment on the improvement in the limit of resolution.

Watch Video Solution

16. If the limit of resolution of the eye is 1' of an arc then calculate its resolving power.

Watch Video Solution

17. A telescope of aperture 0.02 m is used to focus the two head lamps 1.2m apart. If the

wavelength of light emitted by the automobile is 589.6 nm then calculate the resolving power of the telescope. If the R.P of the eye is $3.436 \times 10^3 \mathrm{rad}^{-1}$, then calculate the magnifying power of the telescope.

Watch Video Solution

18. A telescope of aperture 0.15 m is used to view two heavenly separated by a certain linear distance. If the distance of these two is 1 million light years from the earth and the

wavelength of light emitted is 449 nm, the calculate the linear separation between them.

Watch Video Solution

19. The angular width of central maximum is 0.1° If the width of the single slit is 10^{-5} m, then calculate the wavelength of light used.

Watch Video Solution

20. Calculate the angular width of 2^{nd} secondary maximum and fourth dark fringe in the diffraction pattern obtained due to a single slit of width $10^{-5}m$ illuminated by a wavelength of light 541 nm.

Watch Video Solution

21. Refractive index of glass is 1.5. Find the polarising angle for air-glass interface.

Watch Video Solution

22. Polarising angle for water is 53 8'. Find the critical angle for air-water interface.

Watch Video Solution

23. Refractive index of glass is 1.5 and of diamond is 2.42. Calculate the polarising angle for glass-diamond interface.

Watch Video Solution

24. A ray of light is incident on the surface of a glass plate of R.I 1.55, at the polarising angle of incidence. Calculate the angle of refractions.

Watch Video Solution

25. If three fringes are missing in front of the double slit then express $'\lambda'$ in terms of $'d'$ and $'D'$

Watch Video Solution

26. Calculate the semi angular width of the fifth bright fringe from the central fringe.

Watch Video Solution

27. If the distance between the double slit and the screen is doubled and width of the double slit is halved then what will be the new fringe width.

Watch Video Solution

28. A bright fringe is formed in front of one of the double slits. What will be the fringe width of the interference pattern?

Watch Video Solution

29. A light of intensity 100 Wm^{-2} strikes a film at 57°. Find the intensity of transmitted light.

Watch Video Solution

30. Two polaroid sheets are placed in such way that one is inclined at an angle of 47° and the second at 63°. If the intensity of incident light is $1000 Wm^{-2}$, then find the intensity of light at the transmitted ends of the sheets.

Watch Video Solution

31. A ray of light is incident on the surface of a glass plate of R.I 1.55, at the polarising angle of incidence. Calculate the angle of refractions.

Watch Video Solution

32. 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.

Watch Video Solution