



PHYSICS

BOOKS - R G PUBLICATION

WAVE OPTICS

Exercise

1. Which of the following waves can be polarised (i) X-rays (ii) sound waves. give reasons.



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2. What is the shape of the wavefront of light emitted by a long neon bulb placed at a finite distance?



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3. Choose the correct answer- accelerated electrons can show interference only

diffraction only both interference and
diffraction

- A. Accelerated electrons can show
- B. interference only
- C. Diffraction only
- D. Both interference and diffraction

Answer:



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4. Which quantity associated with light we sets the limit of ability to distinguish very close objects?



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5. Prove that ratio of the intensities at maxima and minima is

$(I_{\text{max}})/(I_{\text{min}}) = ((r+1)/(r-1))^2$, Where

$r = a_1/a_2$ is the ratio of amplitudes.



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6. Establish Brewster's Law regarding polarisation of light by reflection.



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7. Find the expression of fringe-width $\beta = \frac{\lambda D}{d}$ for Young's double slit interference pattern, where d is the separation between the two coherent sources.



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8. For refraction at spherical surface establish the following relation.

$$\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$$



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9. State two important differences between interference and diffraction.



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10. How is a wavefront defined? State Huygen's principle of propagation of light wave.



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





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12. Write the laws of reflection.



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13. Find the value of angle of minimum deviation of a prism. [Given $\mu = \sqrt{2}$, $A = 60^\circ$]



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14. Establish Brewster's law polarisation of light.



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15. What are coherent source of light? Why no interference pattern is observed when two coherent source are too close



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16. The equations of light wave from two sources are $y_1 = a_1 \sin \omega t$ and $y_2 = a_2 \sin(\omega t + \phi)$ where the symbols have their usual meaning. The individual intensities are I_1 and I_2 . Show that the minimum resultant intensity due to superposition is

$$I_{\min} = I_1 + I_2 - 2\sqrt{I_1 I_2}.$$



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17. Two slits are 1mm apart and a screen is placed at some distance. When the slits are

illuminated with light of wavelength 500nm , fringe separation obtained on the screen is 0.5mm . What is the distance between the screen and the slits?



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18. With what speed should a galaxy move with respect to the earth so that sodium line at 589nm is observed at 589.6nm ?



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19. Deduce Snell's Law of refraction for a plane wave using Huygen's principle.



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20. "When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have same frequency as the incident frequency". Is this statement true? If yes, why? If you think it is not true, why?



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21. What is the effect on the interference fringes in Young's double slit experiment when the monochromatic source is replaced by a source of white light?



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22. If you move the source slit closer to the double slit in Young's experiment, what will be effect on the fringes?



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23. Describe Young's double slit experiment and determine the conditions for obtaining bright and dark fringes.



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24. What are unpolarized and linearly polarized light waves? What is a polaroid?



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25. Establish the following relation

$$\frac{n_2}{V} - \frac{n_1}{U} = \frac{n_2 - n_1}{R}$$



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26. Explain Huygen's principle of wave optics.



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27. What is blue shift? Sodium light of wavelength $589.0\overset{\circ}{\text{A}}$ travelling from a galaxy is

observed to be $589.6\overset{\circ}{\text{A}}$. What is the speed of the galaxy?



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28. A beam of light consisting of two wavelengths 6500 \AA and 5200 \AA is used to obtain fringes in a Young's double slit experiment. Find the distance of the third bright fringe on the screen from central maximum for the wavelength 6500 \AA . The distance between the slits is 2 mm and the

distance between the plane of the slits and the screen is 120 cm



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29. What is dual character of light?



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30. Give the expression for the fringe width in Young's experiments.



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31. What is diffraction?



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32. What is oil immersion objective?



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33. Which phenomem establish the wave nature of light?



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34. Why can't we obtain interference using two independent source of light?



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35. If a wave undergoes refraction, what happens to its phase?



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36. In Young's double slit experiment, three light blue, yellow and red are used successively. For which colour , will the fringe width maximum.



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37. What is monochromatic light?



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38. When two sources are said to be coherent?



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39. What is the difference between phase and path?



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40. Width of two slit in Young's experiment are in ratio 4:1. What is the ratio of amplitude of

light wave from them?



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41. What is wave front?



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42. What is the phase difference between any two points on a wave front?



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43. What is the main condition for interference?



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44. What is the ratio of slit width when amplitude of light wave from them use in ratio 4:1?



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45. What is diffraction of light?



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46. Can two independent source of light produce interference?



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47. What happens to the energy at destructive interference?



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48. "The light waves are transverse electromagnetic waves". Explain.



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49. Draw the ray diagram to show the reflection by a plane reflecting surface.



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50. What do you mean by coherent and Incoherent waves?



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51. What is interference of light waves? Define with figures.



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52. Draw the graph of intensity distribution in Young's double-slit experiment.



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53. Two slits are made 1mm apart and is placed 0.8m away in Young's double slit experiment. What is the fringe separation when blue-green light of wavelength 500 nm is used?



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54. Write about the principle of conservation of energy in interference and diffraction.



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55. What do you mean by resolving power of optical instruments.



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56. A light of wavelength $3200\overset{\circ}{\text{A}}$ is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 86 inch?



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57. Write about unpolarised wave and plane polarised wave.



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58. What is Brewster's angle? Deduce Brewster's law.



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59. What do you mean by polarisation by reflection?



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60. What are coherent source of light? Why no interference pattern is observed when two coherent source are too close



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61. What are coherent source of light? Why no interference pattern is observed when two coherent source are too close





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62. Explain Huygen's principle of wave optics.



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63. What is a wave motion?



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64. How polarisation occurs in nicol prism?





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65. Define the condition for constructive and destructive interference.



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66. Explain three types of wave front.



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67. State and explain Malus law.



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68. State and explain Brewster' law.



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69. What is meant by plane polarised light.

What type of wave show these property?



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70. What is Huygen's principle? Show that at a large distance from the source, a small portion of the spherical wave can be approximated by a plane wave.



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71. Deduce Snell's Law of refraction for a plane wave using Huygen's principle.



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72. With what speed should a galaxy move with respect to the earth so that sodium line at 589 nm is observed at 589.6nm?



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73. Write the experimental procedure of Young's experiment.



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74. Write a short note on single slit diffraction.



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75. State two important differences between interference and diffraction.



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76. How can you determine the resolving power of your eye?



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77. Write a short note on polarisation.



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78. Explain polarisation. Show with a diagram how a light beam through two polaroids.



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79. What is the Brewster angle for air to glass transition? (Refractive index of glass is 1.5)



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80. In double slit experiment using light of wave length 320 nm the angular width of a fringe formed on a distant screen is 0.1° .
What is the spacing between the two slits?



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81. In a Young's double slit experiment, the distance between slit is halved and distance of screen is made three times. How will the fringe width change?



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82. Find the expression of fringe-width $\beta = \frac{\lambda D}{d}$ for Young's double slit interference pattern, where d is the separation between the two coherent sources.



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83. Deduce Snell's Law of refraction for a plane wave using Huygen's principle.



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84. How polarisation occurs in nicol prism?



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85. The intensity ratio in interference pattern is 4:1. Calculate the ratio of slit width.



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86. Explain an experiment to produce polarization.



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87. If the two light wave have different amplitude, then show that intensity ratio

$$\frac{I_{\max}}{I_{\min}} = \frac{(a + b)^2}{(a - b)^2}$$



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88. In young's experiment what will be the phase difference and path difference between the light waves reaching third bright fringe . take $\lambda = 5000\text{\AA}$



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89. In young's experiment what will be the phase difference and path difference between the light wave third dark fringe.



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90. A source of red light ($\mu = 7000\text{\AA}$) produces interference through two slit placed at a distanced .01cm. At what distance

should a screen be placed so that interference
band space 1 cm apart.



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