

REVISION TEST -04

Total Marks -30

12th Physics - WAVE OPTICS

Multiple Choice Questions

8x1 =8

- Two sources of light are coherent if they have
 - different frequency and with a constant phase relationship
 - same frequency and change phase randomly
 - different frequency and random phases
 - same frequency and with a constant phase relationship
- For what distance is ray optics a good approximation when the aperture is 3 mm wide and the wavelength is 500 nm?
 - 15 m
 - 16 m
 - 17 m
 - 18 m
- In the single slit diffraction the screen is at a large distance compared to slit width and θ is the angle by which light has bent. If the size of slit is a (given that n is not zero). The condition for maxima is given by
 - $(n + \frac{1}{2}) \frac{\lambda}{a}$
 - $(n + \frac{1}{2}) \frac{2\lambda}{a}$
 - $(n + \frac{1}{2}) \frac{\lambda}{2}$
 - $(n + \frac{1}{3}) \frac{\lambda}{a}$
- Light traveling in air is incident on the surface of a block of plastic at an angle of 62.7° to the normal and is bent so that it makes a 48.1° angle with the normal in the plastic. Find the speed of light in the plastic
 - $2.61 \times 10^8 \text{ ms}^{-1}$
 - $2.71 \times 10^8 \text{ ms}^{-1}$
 - $2.51 \times 10^8 \text{ ms}^{-1}$
 - $2.81 \times 10^8 \text{ ms}^{-1}$
- In a young's double slit experiment, the central bright fringe can be identified by
 - No fixed pattern of colours is followed after white fringe
 - Closest fringe near the centre is red
 - Farthest fringe from centre is yellow

- d. Using white light instead of monochromatic light
6. If I_0 is the intensity after the first Polaroid the intensity emerging from the second Polaroid kept at an angle θ to the first is given by
- $2I_0 \cos^2 \theta$
 - $I_0 \cos^2 \theta$
 - $I_0 \cos \theta$
 - $I_0 \cos^2 \theta / 2$
7. If we have two coherent sources S_1 and S_2 vibrating in phase, then for an arbitrary point P destructive interference is observed whenever the path difference is
- $(n + \frac{1}{2})\lambda$ where $n = 0, 1, 2, 3, \dots$
 - $(n + \frac{1}{2})\lambda$ where $n = 0, 1, 2, 3, \dots$
 - $(n + \frac{1}{3})\lambda$ where $n = 0, 1, 2, 3, \dots$
 - $n\lambda$ where $n = 0, 1, 2, 3, \dots$
8. Assume that light of wavelength 6000 \AA is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 100 inch?
- $2.9 \times 10^{-7} \text{ rad}$
 - $2.7 \times 10^{-7} \text{ rad}$
 - $2.6 \times 10^{-7} \text{ rad}$
 - $2.8 \times 10^{-7} \text{ rad}$

Short Type 1 Questions

2 x 2 = 4

9. 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.
10. 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. Find the width of the slit.

Short Type 2 Questions

2 x 3 = 6

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. How is resolving power of a microscope affected when

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- i. wavelength of illuminating radiations is decreased.
 - ii. the diameter of objective lens is decreased? Justify.

Long Type Questions

3 x4 =12

13. In a Young's double slit experiment, the two slits are kept 2 mm apart and the screen is positioned 140 cm away from the plane of the slits. The slits are illuminated with light of wavelength 600 nm. Find the distance of the third bright fringe, from the central maximum, in the interference pattern obtained on the screen. If the wavelength of the incident light were changed to 480 nm, find out the shift in the position of third bright fringe from the central maximum.
 14. 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.
 15.
 - 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 $2 \times 10^{-6} \text{ m}$. 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.
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