CHAPTER-10
Wave Optics
ASSIGNMENT-3
1 MARK QUESTIONS

Q1. Draw the type of wave front that corresponds to a beam of light diverging from a point source.

Q2. When monochromatic light is incident on a surface separating two media the reflected and refracted light both have same frequency as the incident frequency. Explain why. [CBSE 2011,13,16]

Q3. Draw intensity distribution curve for interference.

Q4. Sketch the wave front emerging from (a) a point source of a light and (b) linear source of light like a slit. [CBSE2000,09]

Q5. When a light travel from a rare to a denser medium, it loses some speed does the reduction in speed imply a reduction in the energy carried by the light wave? [CBSE 2013,16,17]

Q6. In the wave picture of light, intensity of light is determined by the square of amplitude of the wave. What determines the intensity of light in the photon picture of light? [CBSE 16]

Q7. How will the intensity of maxima and minima in the young's double slit experiment change if one of the two slits is covered by a transparent paper which transmits only half of the light intensity?

MCQ

Q8. In a Young's double slit experiment the distance between the slit is 1 mm and the distance of screen from the slit is 1 m. If light of wavelength 6000 A is used then the fringe width is:
A) 0.4 mm B) 0.5 mm C) 0.6 mm D) 0.8 mm

Q9. A phase difference of 5π corresponds to a path difference (in terms of λ) of:
A) 5λ B) 10λ. C) $5\lambda/2$ D) 2λ

Q10. Images of a distant lamp seen through a fire cloth rotate on rotating the cloth. This is due to the phenomenon of:
A) interference B) diffraction C) polarization D) scattering

Q11. The phenomenon of interference of light is based on the principle of
A) Polarisation of light waves B) Dispersion of light waves
C) Principle of superposition D) Huygens principle

Q12. The locus of all points which oscillates in phase is called as
A) Waves B) Wave front C) Wavelets D) Both b and c

Q13. The energy of the wave travels in a direction___to the wavefront.
A) Parallel B) Perpendicular C) Both a and b D) None

Q14. Each point of the wave front is the source of secondary disturbance and the wavelets originating from these points spread out
A) In only one direction
B) In all directions with the speed of wave
C) In all directions
D) None

Q15. Each point of the wave front is the source of secondary disturbance and the wavelets originating from these points spread out in all directions with the speed of wave, this is called as
A) Principle of superposition B) Huygens principle
C) Polarization D) None

Q16. At particular point in the medium, the resultant displacement produced by a number of waves is the___of all the displacement produced by each of the waves.
A) Algebraic sum B) Vector sum C) Both a and b D) None

Q17. When the phase difference between the displacement produced by the waves does not change with time then that two sources are called as
A) Incoherent sources B) Coherent sources C) Collinear sources D) None

2 MARKS QUESTIONS

Q18. State the condition for diffraction of light to occur in the diffraction of single slit experiment, how would the width an intensity of central maxima changes if
(i) slit with is halved and
(ii) visible light of longer wavelength is used

Q19. How will the angular separation and visibility of fringes in Young's double slit experiment change when (i) screen is moved away from the plane of the slits, and (ii) width of the source slit is increased

Q20. What two main changes in diffraction pattern of single slit will you observe when the monochromatic source of light is replaced by a source of white light?

Q21. Find the ratio of the intensity of two points P and Q on the screen in young's double slit experiment when waves from source S_1 and S_2 have phase difference of $\pi/3$ and $\pi/2$ respectively.

Q22. Show that the central maximum is twice as wide as the other maxima and the pattern becomes narrower as the width of the slit is increased. [CBSE2006]

3 MARKS QUESTIONS

Q23. A parallel beam of light of wavelength 600nm is incident normally on a slit of width 'a'. If the distance between the slit and the screen is 0.8m and the distance of second order maximum from the centre of the screen is15mm, calculate the width of the slit.

Q24. A beam of light consisting of two wavelengths 6500 A^o and 5200 A^o is used to obtain interference fringes. The distance between the slits is 2.0 mm and the distance between the plane of the slits and the screen is 120 cm.

(a) Find the distance of the third bright fringe on the screen from the central maxima for the wavelength 6500A^o

(b) What is the least distance from the central maxima where the bright fringes due to both the wavelengths coincide?

Q25. (a) Distinguish between interference and diffraction.

(b)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 central maximum obtained on screen.

5 MARKS QUESTION

Q26. State the essential condition for diffraction of light to take place. Use Huygens's principle to explain diffraction of light due to a narrow single slit and the formation of a pattern of fringes obtained on the screen. Sketch the pattern of fringes formed due to diffraction at a single slit showing variation of intensity with angle θ.

Q27. Red colour of light of wavelength λ is passed from two narrow slits which are distance d apart and interference pattern is obtained on the screen distance D apart from the plane of two slits. Then find the answer to following parts assuming that slit widths are equal to produce intensity I0 from each slit.

(a) Intensity at a point on the screen, situated at a distance 1/4 th of fringe separation from centre.
(b) Intensity in the screen, if the sources become incoherent by using two different lamps behind lamps S_1 and S_2.
(c) Angular position of 10th maxima, and the angular width of that fringe.
(d) Find the distance between 5th maxima and 3rd minima, at same side of central maxima.
(e) If the phase difference between the two waves reaching two slits from the source slit is (i) 5π and (ii) 2π, then what will be the colour of central fringe?