

Department of Applied Physics
Applied Physics
Question Bank
Session – 2012-13
UNIT – IV - Wave Optics

Multiple Choice Questions

1. The sources of light are said to be coherent if the waves produced by them have the same:
 - (a) Wavelength
 - (b) Amplitude
 - (c) Wavelength and a constant phase difference
 - (d) Amplitude and the same wavelength.

2. Interference occurs in:
 - (a) Longitudinal waves only
 - (b) Transverse waves only
 - (c) Electromagnetic waves only
 - (d) All above waves

3. The phenomenon of interference is used to prove that light is:
 - (a) Longitudinal
 - (b) Transverse
 - (c) Stationary wave
 - (d) Quantized.

4. In interference with two coherent sources, the fringe width varies:
 - (a) Directly as wavelength
 - (b) Inversely as wavelength
 - (c) Directly as the separation between slits
 - (d) Inversely as the distance between the slits and screen.

5. In a Fresnel's biprism, the central fringe is:

Department of Applied Physics
Applied Physics
Question Bank
Session – 2012-13

- (a) Bright
 - (b) Dark
 - (c) First bright and then dark
 - (d) First dark and the bright
6. Fringe width in Young's double slit experiment increases when:
- (a) Separation between sources increases
 - (b) Distance between source and screen increases
 - (c) Wavelength of light decreases
 - (d) Do not change.
7. Actual shape of interference fringes is:
- (a) Parabolic
 - (b) Hyperbolic
 - (c) Straight
 - (d) None.
8. Newton's ring illustrates the phenomenon of :
- (a) Directly proportional to the refractive index between wedge film
 - (b) Directly proportional to the wavelength of light
 - (c) Directly proportional to the angle of wedge
 - (d) Inversely proportional to the thickness of the film
9. Which of the following phenomena produces the colours in soap bubble:
- (a) Interference
 - (b) Diffraction
 - (c) Polarization
 - (d) Dispersion.

Department of Applied Physics
Applied Physics
Question Bank
Session – 2012-13

10. Newton's rings are :

- (a) Locus of points of equal thickness
- (b) Locus of points of equal inclination
- (c) Locus of points of equal thickness and or equal inclination
- (d) Neither (a) nor (b)

Short Answer Questions

1. What is interference of light? Name their types
2. Why Diffraction is observed more in sound waves than for light waves in daily life?
3. Give Rayleigh criteria for resolving power.
4. State and prove Brewster's law.
5. What is diffraction of light?
6. Derive the necessary condition for the resolving power of diffraction grating?

Long Answer Questions

1. What is Fresnel biprism? Describe giving experimental details Fresnel biprism method for determining wavelength of light.
2. Explain Newton's rings method for determining the wavelength of monochromatic light why is the centre of the rings dark in reflected light?
3. Discuss the Fraunhofer's diffraction at a single slit. Derive the necessary conditions for minima and maxima produced.
4. What are Newton's Ring? Why are the rings circular? How will you find out the diameter of a ring in terms of natural number by reflected light?
5. Describe the action of plane diffraction grating. How will you use it to find wavelength (λ) of light?
6. Explain Brewster's law. Show from this law that when light is incident on the transparent substance at the polarizing angle, the reflected and refracted rays are at right angle.
7. Give the theory of Fresnel's Biprism to determine the wavelength of monochromatic light source.
8. What is Fresnel's biprism? Show that fringes width $\beta = D \lambda / 2d$. Where the symbols have their usual meanings?

Numerical Problem

1. The refractive index of glass is 1.5 Calculate the polarizing angle for it. Also calculate the angle of refraction.
2. A plane transmission grating has 16000 lines to an inch over a length of 5 inches. Find in the wavelength region of 6000\AA in the second order (a) the resolving power of the grating and (b) the smallest wavelength difference that can be resolved.
3. In Newton's rings experiment the diameters of the n^{th} and $(n+14)^{\text{th}}$ rings are 4.2mm and 7.0 mm respectively. Radius of curvature of plano-convex lens is 1m. Calculate wavelength of light.

Department of Applied Physics
Applied Physics
Question Bank
Session – 2012-13

4. A Newton's rings arrangement, if a drop of water ($n = 4/3$) be placed in between the lens and the plate, the diameter of the 10th ring is found to be 1.0 cm . Obtain the radius of curvature of the face of the lens in contact with the plate. The wavelength of light used is 6000 \AA .
5. A plane grating has 15000 lines/inch. Find the angle of separation of the first and second order lines of helium in the second order spectrum.