

**Yashwantrao Chavan College of Science Karad**  
**B.Sc II : Semester IV : Paper VIII**  
**Subject: Wave and Optics II**  
**Question Bank**

**Q.1) Select the most correct alternative. (1 Mark each)**

- (i) ...points correspond to unit angular magnification.
- a) cardinal
  - b) principal
  - c) Nodal
  - d) focal
- (ii) A ray passing through the first focal point emerges as a....
- a) Ray parallel to the principal axis
  - b) Ray parallel to the incident ray
  - c) Ray passing through the second focal point
  - d) None of the above
- (iii) In general, the relation between first and second focal lengths is
- a)  $\frac{f_1}{f_2} = -\frac{\mu_1}{\mu_2}$
  - b)  $\frac{f_1}{f_2} = -\frac{\mu_2}{\mu_1}$
  - c)  $\frac{f_1}{f_2} = \frac{\mu_1}{\mu_2}$
  - d)  $\frac{f_1}{f_2} = \frac{\mu_2}{\mu_1}$
- (iv) For a coaxial lens system, the relation between linear ( $m$ ), axial ( $mL$ ), and angular ( $\alpha$ ) magnifications is
- a)  $\alpha = m \cdot mL$
  - b)  $mL = m \cdot \alpha$
  - c)  $m = \alpha \cdot mL$
  - d) None of the above
- (v) According to Rayleigh's criterion, the resolving power of an optical instrument is defined by
- a)  $\frac{\lambda^2}{d\lambda}$
  - b)  $\frac{d\lambda}{\lambda}$

- c)  $\lambda \cdot d\lambda$   
d)  $\frac{\lambda}{d\lambda}$
- (vi) In a telescope and microscope, the image formation is due to...
- a) Refraction  
b) Diffraction  
c) Refraction and diffraction  
d) Reflection
- (vii) According to the modified Rayleigh's criterion for resolution, the intensity at the dip should be ..... times the intensity at either maximum,
- a)  $\frac{8}{\pi^2}$   
b)  $\frac{\pi^2}{8}$   
c)  $\frac{4}{\pi^2}$   
d)  $\frac{\pi^2}{4}$
- (viii) The spectral resolving power of a prism varies with the base length (t) as
- a)  $RP \propto t^2$   
b)  $RP \propto t$   
c)  $RP \propto \frac{1}{t}$   
d)  $RP \propto \frac{1}{t^2}$
- (ix) The ordinary and extraordinary rays produced in a doubly refracting material are
- a) Plane polarised in mutually perpendicular directions  
b) Plane polarised parallel to each other  
c) Unpolarised  
d) Generally elliptically polarised
- (x) A negative crystal is one for which.
- a)  $\mu_E > \mu_o$   
b)  $\mu_E < \mu_o$   
c)  $\mu_E = \mu_o$   
d)  $\mu_E$  is negative
- (xi) Nicol prism is made up of.....
- a) Natural calcite crystal  
b) Properly cut natural calcite crystal

- c) Natural quartz crystal
  - d) Properly cut quartz crystal
- (xii) Elliptically polarised light is produced by using..
- a) A polariser
  - b) Quarter wave plate
  - c) A polariser and a quarter plate
  - d) A half wave plate and polariser
- (xiii) For better contrast of the interference fringes, the amplitudes of two waves must be
- a) Equal
  - b) Unequal
  - c) Zero
  - d) Maximum
- (xiv) In a wave getting reflected from a denser medium, the additional phase difference introduced is
- a) 0
  - b)  $\frac{\pi}{2}$
  - c)  $\pi$
  - d)  $2\pi$
- (xv) A path difference of  $\lambda/2$  is equivalent to a phase difference of.
- a)  $\pi/4$
  - b)  $\pi/2$
  - c)  $\pi$
  - d)  $2\pi$
- (xvi) The fringes obtained in a wedge-shaped thin film are of..
- a) Increasing thickness
  - b) Decreasing thickness
  - c) Varying thickness
  - d) Equal thickness
- (xvii) Corresponding to a wavelength ( $\lambda$ ), the focal length ( $f$ ) of a zone plate is a.....
- a)  $f \propto \lambda$
  - b)  $f \propto \frac{1}{\lambda}$

- c)  $f = \lambda$
  - d)  $f = 5\lambda$
- (xviii) In Fresnel diffraction with respect to the obstacle center of diffraction.
- a) Both source and screen are at finite distance
  - b) Both source and screen are at infinite distance
  - c) Source and Screen are very close to the obstacle
  - d) Source and screen are at very large distance from obstacle
- (xix) In a plane transmission grating with white light as the source
- a) The central fringe is red
  - b) The central fringe is yellow
  - c) The central fringe is violet
  - d) The central fringe is white
- (xx) In a zone plate, the radius of the  $n$ th Zone is.....
- a)  $nb\lambda$
  - b)  $(2n + 1)b\lambda$
  - c)  $nb\lambda$
  - d)  $(2n + 1)b\lambda$

**Q.2) Answer the following questions in brief**

- (i) Define linear, axial, and angular magnification of a lens system and hence obtain a relationship between them.
- (ii) Explain Rayleigh's criterion for the limit of resolution with their cases.
- (iii) Discuss the conditions to obtain interference due to the reflection of light from a thin, parallel film.
- (iv) Obtain the conditions for interference bands (bright and dark) due to light reflected from a wedge-shaped film.
- (v) Explain Fresnel diffraction at a straight edge and show how the intensity is distributed on the screen after diffraction at a straight edge.

**Q.3) Answer the following questions in short**

- (i) Derive Newton's formula for a lens system.
- (ii) Derive the expression for the resolving power of a prism.
- (iii) Write the construction and working of a Nicol prism.
- (iv) Calculate the thickness of a quarter-wave plate for light of wavelength 5890 . The refractive index for ordinary light is 1.55 and that for extraordinary light is 1.50.
- (v) State the conditions to obtain steady interference bands.