

## OBJECTIVE QUESTIONS

1. *Diffraction of light was discovered by*  
a) Young                      b) Hertz                      c) Grimaldi                      d) Malus
2. *The penetration of waves into the regions of the geometrical shadow is called*  
a) interference    b) diffraction                      c) polarization                      d) dispersion
3. *Diffraction phenomena are usually divided into \_\_\_\_\_ classes.*  
a) four                      b) three                      c) two                      d) one
4. *To observe diffraction, the size of an obstacle*  
a) should be of the same order as wavelength  
b) should be of much larger than the wavelength  
c) has no relation to wavelength  
d) should be exactly half of the wavelength
5. *In Fraunhofer diffraction the wavefront undergoing diffraction has to be*  
a) spherical                      b) cylindrical                      c) elliptical                      d) plane
6. *Consider Fraunhofer diffraction pattern obtained with a single slit illuminated at normal incidence. At the angular position of the first diffraction minimum, the phase difference between the wavelets from the opposite edges of the slit is*  
a)  $\pi$                       b)  $2\pi$                       c)  $\pi/4$                       d)  $\pi/2$

7. In case of diffraction at single slit, if the wavelength of light becomes equal to the aperture of slit, on the screen we shall observe
  - a) image of slit
  - b) diffraction bands
  - c) uniform illumination
  - d) non-uniform illumination
8. The first diffraction minima due to a single slit diffraction is at  $\theta = 30^\circ$  for a light of wavelength  $5000 \text{ \AA}$ . The width of the slit is
  - a)  $5 \times 10^{-5} \text{ cm}$
  - b)  $10 \times 10^{-5} \text{ cm}$
  - c)  $2.5 \times 10^{-5} \text{ cm}$
  - d)  $1.25 \times 10^{-5} \text{ cm}$
9. In Fresnel diffraction the wavefront undergoing diffraction has to be
  - a) spherical
  - b) cylindrical
  - c) both (a) and (b)
  - d) plane
10. The experiment in which the source and the screen are placed at finite distance from the obstacle for producing diffraction pattern is
  - a) Fresnel's
  - b) Fraunhofer's
  - c) both (a) and (b)
  - d) none
11. The experiment in which the source and the screen are placed at infinite distance from the obstacle for producing diffraction pattern is
  - a) Fresnel's
  - b) Fraunhofer's
  - c) both (a) and (b)
  - d) none
12. The class of diffraction in which lenses required is
  - a) Fresnel's
  - b) Fraunhofer's
  - c) both (a) and (b)
  - d) none
13. In a single slit experiment if the slit width is reduced
  - a) the fringe becomes wider
  - b) the fringe becomes narrower
  - c) the fringe becomes brighter
  - d) none
14. In Fraunhofer diffraction at single slit, the width of central maxima ' $2x$ ' is equal to
  - a)  $\frac{2D\lambda}{a}$
  - b)  $\frac{2\lambda}{Da}$
  - c)  $\frac{2D}{\lambda a}$
  - d)  $\frac{\lambda}{a}$
15. In Fraunhofer single slit experiment, the diffraction pattern consists of
  - a) wider bright band at the center with alternate dark and bright bands of equal intensity on either side.
  - b) wider dark band at the center with alternate bright and dark bands on either side.
  - c) wider and brighter band at the center with alternate dark and bright bands of decreasing intensity on either side.
  - d) narrow bright band at the center with alternate dark and bright bands of equal intensity on either side

16. The expression for intensity of light in Fraunhofer diffraction at single slit is

a)  $I = I_0 \left[ \frac{\sin \beta}{\beta} \right]$

b)  $I = I_0^2 \left[ \frac{\sin \beta}{\beta} \right]^2$

c)  $I = I_0 \left[ \frac{\sin \beta}{\beta} \right]^2$

d) none

17. The expression for intensity of light in Fraunhofer diffraction for double slit is

a)  $I = 4 \left[ A \frac{\sin \beta}{\beta} \right]^2 \cos^2 (\delta/2)$

b)  $I = 4 \left[ A \frac{\sin \beta}{\beta} \right] \cos^2 (\delta/2)$

c)  $I = 4 \left[ A \frac{\sin \beta}{\beta} \right] \cos (\delta/2)$

d) none

18. The transcendental equation is

a)  $y = \beta$

b)  $y = \tan \beta$

c)  $\beta = \tan \beta$

d) none

19. In the expression for intensity in the Fraunhofer diffraction at double slit,  $\cos^2(\delta/2)$  represents

a) interference pattern    b) diffraction pattern    c) both (a) and (b)    d) none

20. In the expression for intensity in the Fraunhofer diffraction at double slit,

$\left[ A \frac{\sin \beta}{\beta} \right]^2$  represents

a) interference pattern    b) diffraction pattern    c) both (a) & (b)    d) none

21. A screen is at a distance of 2 m from a narrow slit illuminated with light of 6000 Å. The first minimum lies 5 mm on either side of the central maximum, then the width of the slit is

a) 24 mm

b) 2.4 mm

c) 0.24 mm

d) 0.024 mm

22. In double slit diffraction, if the width of the slit is equal to the spacing between the slits then

a) all interference maxima will be missing

b) all interference maxima will be present

c) even order interference maxima will be missing

d) diffraction fringes and interference fringes exactly coincide and hence totally disappear

23. A diffraction grating has

a) large number of equidistant slits

b) large number of random distant slits

c) more than two slits

d) none

- [illegible]

37. When the number of lines on the grating surface are large, the grating spectrum consists of

- a) bands                      b) continuous colours    c) lines                      d) none

38. The expression for resolving power of a grating  $R =$

- a)  $\frac{\lambda}{d\lambda}$                       b)  $nN$                       c) both (a) and (b)    d) none

39. According to the Rayleigh's criterion, the minimum angle of resolution provided by a lens of diameter 'D' and a light of wavelength  $\lambda$  is

- a)  $\theta_{\min} = \frac{1.22D}{\lambda}$                       b)  $\theta_{\min} = \frac{1.22\lambda}{D}$                       c)  $\theta_{\min} = 1.22D\lambda$                       d) none

40. The expression for dispersive power of grating.  $D =$

- a)  $\frac{n}{(a+d)\cos\theta}$                       b)  $\frac{nN}{\cos\theta}$   
c) both (a) and (b)                      d) none

41. The expression for the Fraunhofer diffraction due to N-slits is

- a)  $I = \left( \frac{A^2 \sin^2 \beta}{\beta^2} \right) \left( \frac{\sin^2 N\gamma}{\sin^2 \gamma} \right)$                       b)  $I = \left( \frac{A^2 \sin^2 \beta}{\beta^2} \right)$   
c)  $I = \left( \frac{A^2 \sin^2 \beta}{\beta^2} \right) \left( \frac{\sin^2 N\gamma}{\sin^2 \gamma} \right)^2$                       d)  $I = \left( \frac{A \sin \beta}{\beta} \right) \left( \frac{\sin^2 N\gamma}{\sin^2 \gamma} \right)$

42. The condition for principal maxima in the Fraunhofer diffraction due to N-slits is

- a)  $(a+d)\sin\theta = \pm n\frac{\lambda}{2}$                       b)  $(a+d)\cos\theta = \pm n\lambda$   
c)  $(a+d)\sin\theta = \pm(2n+1)\frac{\lambda}{2}$                       d)  $(a+d)\sin\theta = \pm n\lambda$

43. The grating equation is

- a)  $(a+d)\sin\theta = \pm n\frac{\lambda}{2}$                       b)  $(a+d)\sin\theta = \pm n\lambda$   
c)  $(a+d)\sin\theta = \pm(2n+1)n\lambda$                       d)  $(a+d)\sin\theta = \pm n\lambda$

44. The ratio of intensity of secondary maxima to intensity of principal maxima is equal to

- a)  $N^2$                       b)  $\frac{N^2}{1+(N^2-1)\sin^2\gamma}$                       c)  $\frac{N^2}{1+(N^2-1)}$                       d)  $\frac{N^2}{1+(N^2-1)^2\sin^2\gamma}$

45. The condition for secondary maxima is
- $N \tan \gamma = \tan N\gamma$
  - $\tan \gamma = \tan N\gamma$
  - $N^2 \tan \gamma = \tan N\gamma$
  - $N \tan N\gamma = \tan \gamma$
46. The radius of Airy's disc is given by the expression
- $x = \frac{1.22 f}{d \lambda}$
  - $x = \frac{1.22 f \lambda}{d}$
  - $x = \frac{1.22 fd}{\lambda}$
  - $x = \frac{1.22 \lambda}{fd}$
47. The radius of the Airy's disc decreases with
- increase in the diameter of the circular aperture
  - decrease in focal length of the converging lens
  - decrease of the wavelength of the light
  - all the above
48. The ability of an instrument to separate the two distinct point objects very close to each other is called as its
- resolving power
  - dispersive power
  - magnifying power
  - none
49. The expression for resolving power of a telescope is
- $\frac{\lambda}{1.22 d}$
  - $\frac{d}{1.22 \lambda}$
  - $\frac{d}{1.22 d \lambda}$
  - $\frac{1.22 \lambda}{d}$
50. The resolving power of the telescope is
- increased by increasing the diameter of the objective lens
  - decreased by increasing the diameter of the objective lens
  - does not depend upon the diameter of the lens
  - none
51. The resolving power of the telescope is
- increased by increasing the wavelength of the monochromatic light used
  - decreased by increasing the wavelength of the monochromatic light used
  - does not depend upon the wavelength of the monochromatic light used.
  - none
52. The reciprocal of the smallest angle subtended at the objective by the two distant object points which can be just seen as separate ones is called
- dispersive power
  - magnifying power
  - resolving power
  - none
53. The expression for limit of resolution is
- $d = \frac{\lambda_0}{\sin \theta}$
  - $d = \frac{2 \lambda_0}{\sin \theta}$
  - $d = \frac{\lambda_0}{4 \sin \theta}$
  - $d = \frac{\lambda_0}{2 \mu \sin \theta}$
54. The expression for numerical aperture is
- $\mu \sin \theta$
  - $\mu^2 \sin \theta$
  - $\sin \theta$
  - $\mu \sin^2 \theta$

## 2.50 APPLIED PHYSICS

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55. *The resolving power of the microscope becomes higher when*  
a) the limit of resolution is large      b) the limit of resolution is small  
c) the limit of resolution is zero      d) none
56. *The maximum resolving power of a microscope can be obtained with*  
a) blue light      b) green light      c) red light      d) violet light

## Answers

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- |       |       |       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1) c  | 2) b  | 3) c  | 4) a  | 5) d  | 6) b  | 7) d  | 8) b  | 9) c  | 10) a |
| 11) b | 12) b | 13) a | 14) a | 15) c | 16) c | 17) a | 18) c | 19) a | 20) b |
| 21) c | 22) c | 23) a | 24) d | 25) a | 26) d | 27) a | 28) a | 29) c | 30) c |
| 31) b | 32) a | 33) c | 34) c | 35) b | 36) b | 37) c | 38) c | 39) b | 40) c |
| 41) a | 42) d | 43) d | 44) b | 45) a | 46) b | 47) d | 48) a | 49) b | 50) a |
| 51) b | 52) c | 53) d | 54) a | 55) b | 56) d |       |       |       |       |
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