WAVE OPTICS

Abhishek Gupta
Engineering Physics, IIT Delhi

MOST IMP MCQs on WAVE OPTICS for CBSE | JEE | NEET 2025

1. The idea of secondary wavelets for the propagation of a wave was first given by
a) Newton b) Huygen c) Maxwell d) Fresnel

2. If a source is transmitting electromagnetic wave of frequency $8.2 \times 10^6 Hz$, then wavelength of the electromagnetic waves transmitted from the source will be
a) $36.6\ m$ b) $40.5\ m$ c) $42.3\ m$ d) $50.9\ m$

3. Light of wavelength λ is incident on a slit of width d. The resulting diffraction pattern is observed on a screen at a distance D. The linear width of the principal maximum is equal to the width of the slit, if D equals
a) $\frac{d^2}{2\lambda}$ b) $\frac{d}{\lambda}$ c) $\frac{2\lambda^2}{d}$ d) $\frac{2\lambda}{d}$

4. Yellow light is used in single slit diffraction experiment with slit width $0.6\ mm$. If yellow light is replaced by X- rays then the pattern will reveal
a) That the central maxima is narrower b) No diffraction pattern
c) More number of fringes d) Less number of fringes

5. In Young's double slit experiment, carried out with light of wavelength $\lambda = 5000$ Å, the distance between the slits is $0.2\ mm$ and the screen is at $200\ cm$ from the slits. The central maximum is at $x = 0$. The third maximum (taking the central maximum as zeroth maximum) will be at x equal to
a) $1.67\ cm$ b) $1.5\ cm$ c) $0.5\ cm$ d) $5.0\ cm$

6. In Young's double slit experiment with monochromatic light of wavelength 600 mm, the distance between slits is 10^{-3} m. For changing fringe width by 3×10^{-5} m
a) The screen is moved away from the slits by 5 cm
b) The screen is moved by 5 cm towards the slits
c) The screen is moved by 3 cm towards the slits
d) Both (a) and (b) are correct

7. In Young's double-slit experiment the fringe width is β. If entire arrangement is placed in a liquid of refractive index n, the fringe width becomes
a) $\frac{\beta}{n+1}$ b) $n\beta$ c) $\frac{\beta}{n}$ d) $\frac{\beta}{n-1}$

8. A diffraction pattern is obtained using a beam of red light. What happens if the red light is replaced by blue light
a) No change
b) Diffraction bands become narrower and crowded together
c) Band become broader and farther apart
d) Bands disappear altogether

9. The similarity between the sound waves and light waves is

a) Both are electromagnetic waves
b) Both are longitudinal waves
c) Both have the same speed in a medium
d) They can produce interference

10. A slit of width a is illuminated by red light of wavelength 6500Å. If the first minimum falls at $\theta = 30°$, the value of a is

a) 6.5×10^{-4}mm
b) 1.3 micron
c) 3250Å
d) 2.6×10^{-4}cm

11. Two coherent sources of intensities, I_1 and I_2 produce an interference pattern. The maximum intensity in the interference pattern will be

a) $I_1 + I_2$
b) $I_1^2 + I_2^2$
c) $(I_1 + I_2)^2$
d) $\left(\sqrt{I_1} + \sqrt{I_2}\right)^2$

12. In Young's double slit experiment, when violet light of wavelength 4358 Å is used, the 84 fringe are seen in the field of view, but when sodium light of certain wavelength is used, then 62 fringes are seen in the field of view, the wavelength of sodium light is

a) 6893 Å
b) 5904 Å
c) 5523 Å
d) 6429 Å

13. Two coherent monochromatic light beams of intensities I and $4I$ are superposed. The maximum and minimum possible intensities in the resulting beam are

a) $5I$ and I
b) $5I$ and $3I$
c) $9I$ and I
d) $9I$ and $3I$

14. In the phenomenon of interference, energy is

a) Destroyed at bright fringes
b) Created at dark fringes
c) Conserved but it is redistributed
d) Same at all points

15. In Young's double slit experiment, a minimum is obtained when the phase difference of super imposing waves is

a) Zero
b) $(2n-1)\pi$
c) $n\pi$
d) $(n+1)\pi$

16. A single slit of width 0.20 mm is illuminated with light of wavelength 500 nm. The observing screen is placed 80 cm from the slit. The width of the central bright fringe will be

a) 1 mm
b) 2 mm
c) 4 mm
d) 5 mm

17. How will the diffraction pattern of single slit change when yellow light us replaced by blue light? The fringe will be

a) Wider
b) Narrower
c) Brighter
d) Fainter

18. Diffraction and interference of light suggest

a) Nature of light is electro-magnetic
b) Wave nature
c) Nature is quantum
d) Nature of light is transverse

19. Colours in thin films are due to

a) Diffraction phenomenon
b) Scattering phenomenon
c) Interference phenomenon
d) Polarization phenomenon

20. In young's experiment the wavelength of red light is 7.8×10^{-5}cm and that of blue light 5.2×10^{-2} cm. The value of n for which $(n+1)$th blue bright band coincides with n^{th}red band is

a) 4 b) 3 c) 2 d) 1

21. In Young's experiment, one slit is covered with a blue filter and the other (slit) with a yellow filter. Then the interference pattern

a) Will be blue b) Will be yellow c) Will be green d) Will not be formed

22. In a Young's double slit experiment, the fringe width is found to be 2 mm, when light of wavelength 6000 Å is used. Find the change in fringe width if the whole apparatus is immersed in water of refractive index 1.33.

a) 0.5 mm b) 1 mm c) 1.5 mm d) 2 mm

23. In a YDSE bi-chromatic light of wavelengths 400 nm and 560 nm are used. The distance between the slits is 0.1 mm and the distance between the plane of the slits and the screen is $1m$. The minimum distance between two successive regions of complete darkness is

a) 4 mm b) 5.6 mm c) 14 mm d) 28 mm

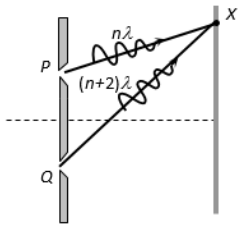
24. In Young's double alit experiment, the seventh maximum with wavelength λ_1 is at a distance d_1 and the same maximum with wavelength λ_2 is at distanced_2. Then $d_1/d_2 =$

a) $\frac{\lambda_1}{\lambda_2}$ b) $\frac{\lambda_2}{\lambda_1}$ c) $\frac{\lambda_1^2}{\lambda_2^2}$ d) $\frac{\lambda_2^2}{\lambda_1^2}$

25. In Young's double slit experiment, if monochromatic light is replaced by white light

a) All bright fringes become white
b) All bright fringes have colours between violet and red
c) Only the central fringe is white, all other fringes are coloured
d) No fringes are observed

26. The figure shows a double slit experiment where P and Q are the slits. The path lengths PX and QX are $n\lambda$ and $(n+2)\lambda$ respectively, where n is a whole number and λ is the wavelength. Taking the central fringe as zero, what is formed at X



a) First bright b) First dark c) Second bright d) Second dark

27. The two slits at a distance of 1 mm are illuminated by the light of wavelength $6.5 \times 10^{-7}m$. The interference fringes are observed on a screen placed at a distance of $1m$. The distance between third dark fringe and fifth bright fringe will be

a) 0.65 mm b) 1.63 mm c) 3.25 mm d) 4.88 mm

28. A Young's double slit experiment uses a monochromatic source. The shape of the interference fringes formed on a screen is

a) Hyperbola b) Circle c) Straight line d) Parabola

29. For the constructive interference the **path** difference between the two interfering waves must be equal to

a) $(2n+1)\lambda$ b) $2n\pi$ c) $n\lambda$ d) $(2n+1)\frac{\lambda}{2}$

30. In Young's double slit experiment, phase difference between light waves reaching 3rd bright fringe from the central fringe when $\lambda = 5000$ Åis

a) $6\,\pi$ b) $2\,\pi$ c) $4\,\pi$ d) zero

31. In a double slit interference experiment, the distance between the slits is 0.05 cm and screen is 2 m away from the slits. The wavelength of light is 8.0×10^{-5} cm. The distance between successive fringes is

a) 0.24 cm b) 3.2 cm c) 1.28 cm d) 0.32 cm

32. A light wave is incident normally over a slit of width $24 \times 10^{-5} cm$. The angular position of second dark fringe from the central maxima is 30°. What is the wavelength of light

a) 6000 Å b) 5000 Å c) 3000 Å d) 1500 Å

33. In a double slit experiment, the screen is placed at a distance of 1.25 m from the slits. When the apparatus is immersed in water $(\mu_w = 4/3)$, the angular width of a fringe is found to be 0.2°. When the experiment is performed in air with same set up, the angular width of the fringe is

a) 0.4° b) 0.27° c) 0.35° d) 0.15°

34. Two coherent sources of intensities, I_1 and I_2 produce an interference pattern. The maximum intensity in the interference pattern will be

a) $I_1 + I_2$ b) $I_1^2 + I_2^2$ c) $(I_1 + I_2)^2$ d) $\left(\sqrt{I_1} + \sqrt{I_2}\right)^2$

35. Light appears to travel in straight lines since

a) It is not absorbed by the atmosphere b) It is reflected by the atmosphere
c) Its wavelength is very small d) Its velocity is very large

Assertion and Reason questions

1 **Statement 1:** When a light wave travels from a rarer to a denser medium, it loses speed. The reduction in speed imply a reduction in energy carried by the light wave
Statement 2: The energy of a wave is proportional to velocity of wave

2 **Statement 1:** When a tiny circular obstacle is placed in the path of light from some distance, a bright spot is seen at the centre of shadow of the obstacle
Statement 2: Destructive interference occurs at the centre of the shadow

3 **Statement 1:** For best contrast between maxima and minima in the interference pattern of Young's double slit experiment, the intensity of light emerging out of the two slits should be equal
Statement 2: The intensity of interference pattern is proportional to square of amplitude

Visit the official youtube channel “Abhishek Gupta”

For any queries write to “understandingphysics@yahoo.com”

Q.No	Answer		Q.No	Answer		Q.No	Answer		Q.No	Answer
1	b		11	d		21	d		31	d
2	a		12	b		22	c		32	a
3	a		13	c		23	d		33	b
4	b		14	c		24	a		34	d
5	b		15	b		25	c		35	c
6	d		16	c		26	c		AR1	d
7	c		17	b		27	b		AR2	c
8	b		18	b		28	a		AR3	b
9	d		19	c		29	c			
10	b		20	c		30	a			