ALLEN CAREER INSTITUTE
KOTA (RAJASTHAN)
path to success

PRE-MEDICAL

PHYSICS

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Wave Optics

ENGLISH MEDIUM

EXERCISE-I (Conceptual Questions)

Build Up Your Understanding

HUYGEN'S WAVE THEORY OF LIGHT

1. Which of the following phenomenon can not be explained by the Huygen's theory -
(1) Refraction
(2) Reflection
(3) Diffraction
(4) Polarization

WO0001

2. Huygen's principle is applicable to -
(1) Only light waves
(2) Only sound waves
(3) Only mechanical waves
(4) For all the above waves

WO0002

3. According to huygen's theory of secondary wavelets, following can be explained -
(1) Propagation of light in medium
(2) Reflection of light
(3) Refraction of light
(4) All of the above

WO0003

4. Huygen's theory of secondary waves can be used to find-
(1) Velocity of light
(2) The wavelength of light
(3) Wave front geometrically
(4) Magnifying power of microscope

WO0004

5. The main drawback of huygen's theory was-
(1) Failure in explanation of rectilinear propagation of lignt
(2) Failure of explain the spectrum of white light
(3) Failure to explain the formation of newton's rings
(4) A failure of experimental verification of ether medium

WO0005

6. Light has a wave nature, because-
(1) the light travel in a straight line
(2) Light exhibts phenomenon of reflection and refraction
(3) Light exhibits phenomenon of interference
(4) Light exhibits phenomenon of photo electric effect

WO0006

7. Wave nature of light is verified by-
(1) Interference
(2) Photo electric effect
(3) Reflection
(4) Refraction

WO0007

INTERFERENCE

8. The energy in the phenomenon of interference :
(1) is conserved, gets redistributed
(2) is equal at every point
(3) is destroyed in regions of dark fringes
(4) is created at the place of bright fringes

WO0008

9. The resultant amplitude in interference with two coherent sources depends upon :
(1) only amplitude
(2) only phase difference
(3) on both the above
(4) none of the above

WO0009

10. Which of following nature of light waves is supported by the phenomenon of interference :
(1) longitudinal
(2) transverse
(3) both transverse and longitudinal
(4) None of the above

WO0010

11. For distinct interference pattern to be observed, necessary condition is that ratio of intensity of light emission by both the sources should be :
(1) 2 : 1 (2) 1 : 2
(3) 1 : 1 (4) 1 : 4

WO0011

12. The phase difference corresponding to path difference of x is :
(1) $\frac{2\pi x}{\lambda}$ (2) $\frac{2\pi\lambda}{x}$ (3) $\frac{\pi x}{\lambda}$ (4) $\frac{\pi\lambda}{x}$

WO0012

13. The coherent source of light produces constructive interference when phase difference betwen them is :
(1) π (2) $\frac{1}{2}\pi$ (3) $\frac{3}{2}\pi$ (4) 2π

WO0013

14. Phenomenon of interference is not observed by two sodium lamps of same power. It is because both waves have :
(1) not constant phase difference
(2) zero phase difference
(3) different intensity
(4) different frequencies

WO0014

15. Coherent sources can be obtained :
(1) only by division of wave front
(2) only by division of amplitude
(3) both by division of amplitude and wave front
(4) none of the above

WO0015

16. In an interference of light derived from two slit apertures, if at some point on the screen, yellow light has a path difference of $\frac{3\lambda}{2}$, then the fringe at that point will be :
(1) yellow in colour (2) white in colour
(3) dark (4) bright

WO0016

17. Two beams of light having intensities I and 4I interfer to produce a fringe pattern on a screen. The phase difference between the beam is $\frac{\pi}{2}$ at point A and 2π at point B. Then find out the difference between the resultant intensities at A and B.
(1) 2I (2) 5I (3) I (4) 4I

WO0017

18. Amplitude of waves observed by two light sources of same wave length are a and 2a and have a phase difference of π between them. Then minimum intensity of light will be proportional to :
(1) 0 (2) $5a^2$ (3) a^2 (4) $9a^2$

WO0018

19. If the intensity of the waves observed by two coherent sources is I. Then the intensity of resultant wave in constructive interference will be :-
(1) 2I (2) 4I
(3) I (4) None of the above

WO0019

20. If intensity of each of the two waves is I and they are having phase difference of 120^0, when the waves are superimposed, then the resultant intensity will be :
(1) I (2) 2I (3) I/2 (4) 4I

WO0020

21. Ratio of intensity of two waves is 25 : 1. If interference occurs, then ratio of maximum and minimum intensity should be :
(1) 25 : 1 (2) 5 : 1
(3) 9 : 4 (4) 4 : 9

WO0021

22. The intensity of two waves is 2 and 3 unit, then average intensity of light in the overlapping region will have the value :
(1) 2.5 (2) 6
(3) 5 (4) 13

WO0022

23 The light waves from two independent monochromatic light sources are given by –
$y_1 = 2\sin(\omega t - kx)$ and $y_2 = 3\cos(\omega t - kx)$,
then the following statement is correct
(1) Both the waves are coherent
(2) Both the waves are incoherent
(3) Both the waves have different time periods
(4) None of the above

WO0023

24. The phenomenon of interference is shown by :
(1) Longitudinal mechanical waves only
(2) Transverse mechanical waves only
(3) Electromagnetic waves only
(4) All the above type of waves

WO0024

25. For the sustained interference of light, the necessary condition is that the two sources should :
(1) Have constant phase difference
(2) Be narrow
(3) Be close to each other
(4) Of same amplitude

WO0025

26. If ratio of amplitude of two interfering source is 3 : 5. Then ratio of intensity of maxima and minima in interference pattern will be :
(1) 25 : 16 (2) 5 : 3
(3) 16 : 1 (4) 25 : 9

WO0026

27. Two coherent light beams of intensity I and 4I are superposed. The maximum and minimum possible intensities in the resulting beam are :
(1) 5I and 3I (2) 5I and I
(3) 9I and 3I (4) 9I and I

WO0027

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

(1) $I_1 + I_2$ (2) $I_1^2 + I_2^2$

(3) $(I_1 + I_2)^2$ (4) $\left(\sqrt{I_1} + \sqrt{I_2}\right)^2$

WO0028

29. Two wave are represented by the equations $y_1 = a \sin \omega t$ and $y_2 = a \cos \omega t$. The first wave :

(1) Leads the second by π

(2) Lags the second by π

(3) Leads the second by $\frac{\pi}{2}$

(4) Lags the second by $\frac{\pi}{2}$

WO0029

30. The resultant amplitude of a vibrating particle by the superposition of the two waves $y_1 = a\sin\left(\omega t + \frac{\pi}{3}\right)$ and $y_2 = a \sin \omega t$ is :-

(1) a (2) $\sqrt{2}$ a (3) 2a (4) $\sqrt{3}$ a

WO0030

31. Two coherent sources of different intensities send waves which interfere. If the ratio of maximum and minimum intensity in the interference pattern is 25 then find ratio of intensities of sources :

(1) 25 : 1 (2) 5 : 1

(3) 9 : 4 (4) 25 : 16

WO0031

32. What is the path difference of destructive interference :

(1) $n\lambda$ (2) $n(\lambda + 1)$

(3) $\frac{(n+1)\lambda}{2}$ (4) $\frac{(2n+1)\lambda}{2}$

WO0032

33. If an interference pattern have maximum and minimum intensities in 36 :1 ratio then what will be the ratio of amplitudes :

(1) 5 : 7 (2) 7 : 4 (3) 4 : 7 (4) 7 : 5

WO0033

34. When a thin transparent plate of thickness t and refractive index μ is placed in the path of one of the two interfering waves of light, then the path difference changes by :

(1) $(\mu + 1)t$ (2) $(\mu - 1)t$

(3) $\frac{(\mu+1)}{t}$ (4) $\frac{(\mu-1)}{t}$

WO0034

35. Due to effect of interference, floating oil layer in water is visible coloured, due to observation of this event the thickness of oil layer should be :

(1) 10 nm (2) 0.1 μm (3) 1 mm (4) 10 mm

WO0035

36. If intensity ratio of two interfering waves is 9 : 1 then ratio of maximum to minimum amplitude of resultant wave is :-

(1) 2 : 1 (2) 3 : 2 (3) 1 : 3 (4) 5 : 2

WO0036

37. For coherent sources which is essential :-

(1) colour same (2) ϕ constant

(3) ν different (4) Amplitude same

WO0037

38. When exposed to sunlight, thin films of oil on water often exhibit brilliant colors due to the phenomenon of –

(1) interference (2) diffraction

(3) dispersion (4) polarisation

WO0038

39. If $\frac{I_1}{I_2} = \frac{9}{1}$ then $\frac{I_{max}}{I_{min}} = ?$

(1) 100 : 64 (2) 64 : 100

(3) 4 : 1 (4) 1 : 4

WO0039

40. Soap bubble appears coloured due to the phenomenon of :-

(1) Total internal reflection

(2) Interference by division of amplitude

(3) Interference by division of wavefront

(4) Diffraction of light

WO0040

41. Two coherent light sources emit light of the

(1) same intensity

(2) different frequency

(3) constant phase difference but different wavelengths

(4) same frequency having constant phase difference

WO0041

YDSE

42. In Young's experiment, if the amplitude of interferring waves are unequal then the :

(1) contrast in the fringes decreases

(2) contrast in the fringes increase

(3) number of fringes will increase

(4) number of fringes will decrease

WO0042

43. Young's experiment proves that which of the following fact :

(1) light is made up of particles

(2) light is made up of waves

(3) light is made up of neither waves nor particles

(4) fringe width doesn't depend upon the spacing between slits.

WO0043

44. Which of the following statement is true, in Young's experiment, separation between the slits is gradually increased :

(1) fringe width increases and fringes disappear

(2) fringe width decreases and fringes disappear

(3) fringes become blurred

(4) fringe width remains constant and fringes are more bright

WO0044

45. In Young's double slit experiment :

(1) only interference occurs

(2) only diffraction occurs

(3) both interference and diffraction occurs

(4) none of the above

WO0045

46. In Young's double slit experiment, one of the slits is so painted that intensity of light emitted from it is half of that of the light emitted from other slit. Then:

(1) fringe system will disappear

(2) bright fringes will become brighter and dark fringes will be darker

(3) both bright and dark fringes will become darker

(4) dark fringes will become less dark and bright fringes will become less bright.

WO0046

47. In white light interference, nearest to the central (bright) fringe, will have which of the following colour

(1) violet (2) yellow

(3) red (4) green

WO0047

48. In Young's double slit experiment, wavelength of light is 6000Å. Then the phase difference between the light waves reaching the third bright fringe from the central fringe will be :

(1) zero (2) 2π (3) 4π (4) 6π

WO0048

49. If intensity of each wave in the observed interference pattern in Young's double slit experiment is I_0. then for some point P where the phase difference is ϕ , intensity I will be :

(1) $I = I_0 \cos\phi$ (2) $I = I_0 \cos^2 \phi$

(3) $I = I_0 (1+\cos\phi)$ (4) $I = 2I_0(1+\cos\phi)$

WO0049

50. In Young's double slit experiment, bright fringes are of :

(1) equal widths and unequal intensities

(2) unequal widths and equal intensities

(3) equal widths and equal intensities

(4) unequal widths and unequal intensities

WO0050

51. In Young's experiment, monochromatic light through a single slit S is used to illuminate the two slits S_1 and S_2. Interference fringes are obtained on a screen. The fringe width is found to be w. Now a thin sheet of mica (thickness t and refractive index μ) is placed near and in front of one of the two slits. Now the fringe width is found to be w′, then :

(1) $w' = w/\mu$ (2) $w' = w\mu$

(3) $w' = (\mu - 1)\,tw$ (4) $w' = w$

WO0051

52. In Young's double slit experiment, the two slits act as coherent sources of equal amplitude A and wavelength λ. In another experiment with the same set up the two slits are sources of equal amplitude A and wavelength λ but are incoherent. The ratio of the intensity of light at the mid-point of the screen in the first case to that in the second case is :

(1) 4 : 1 (2) 2 : 1

(3) 1 : 1 (4) None of the above

WO0052

53. In Young's double slit experiment, if the width of the slits are in the ratio 4 : 9 the ratio of the intensity of maxima to the intensity at minima will be :

(1) 169 : 25 (2) 81 : 16

(3) 25 : 1 (4) 9 : 4

WO0053

54. In an interference experiment, the spacing between successive maxima or minima is :

(1) $\frac{\lambda d}{D}$ (2) $\frac{\lambda D}{d}$

(3) $\frac{dD}{\lambda}$ (4) $\frac{\lambda d}{4D}$

WO0054

55. Young's experiment is performed in air and then performed in water, the fringe width :

(1) Will remain same
(2) Will decrease
(3) Will increase
(4) Will be infinite

WO0055

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

(1) Will be blue
(2) Will be yellow
(3) Will be green
(4) Will not be formed

WO0056

57. In Young's double slit experiment, a mica sheet of thickness t and refractive index μ is introduced in the path of ray from the first source S_1. By how much distance the fringe pattern will be displaced:-

(1) $\frac{d}{D}(\mu-1)t$ (2) $\frac{D}{d}(\mu-1)t$

(3) $\frac{d}{(\mu-1)D}$ (4) $\frac{D}{d}(\mu-1)$

WO0057

58. In Young's experiment, light of wavelength 6000Å is used to produce fringes of width 0.8 mm at a distance of 2.5 m. If the whole experiment is deep in a liquid of refractive index 1.6, then fringe width will be :

(1) 0.5 mm (2) 0.6 mm
(3) 0.4 mm (4) 0.2 mm

WO0058

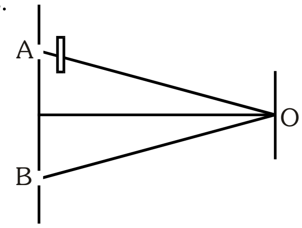
59. If a transparent medium of refractive index $\mu = 1.5$ and thickness $t = 2.5 \times 10^{-5}$ m is inserted in front of the slits of Young's Double slit experiment, how much will be the shift in the interference pattern? The distance between the slits is 0.5 mm and that between slits and screen is 100 cm :

(1) 5 cm (2) 2.5 cm
(3) 0.25 cm (4) 0.1 cm

WO0059

60. In Young's experiment, monochromatic light is used to illuminate the two slits A and B. Interference fringes are observed on a screen placed in front of the slits.

Now if a thin glass plate is placed normally in the path of the beam coming from the slit then :



(1) The fringes will disappear
(2) The fringe width will decrease
(3) The fringe width will increase
(4) There will be no change in the fringe width

WO0060

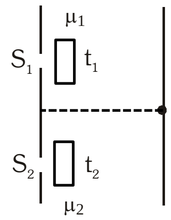
61. The central fringe of interference pattern produced by light of wavelength 6000Å is found to shift to the position of 4th bright fringe, after a glass plate of $\mu = 1.5$ is introduced. The thickness of the glass plate is :

(1) 4.8 μm (2) 8.23 μm
(3) 14.98 μm (4) 3.78 μm

WO0061

62. In a Young's double slit experiment, a slab of thickness 1.2 μm and refractive index 1.5 is placed in front of one slit and another slab of thickness t and refractive index 2.5 is placed in front of the second slit. If the position of the central fringe remains unaltered, then the thickness t is–

(1) 0.4 μm
(2) 0.8 μm
(3) 1.2 μm
(4) 7 μm



WO0062

63. In Y.D.S.E. the fringe width is 0.2 mm. If wavelength of light is increase by 10% and separation between the slits is increased by 10% then fringe width will be :

(1) 0.20 mm (2) 0.165 mm
(3) 0.401 mm (4) 0.242 mm

WO0063

64. A very thin transparent film of soap solution (thickness $\rightarrow 0$) is seen under reflection of white light. Then the colour of the film appear to be :

(1) blue (2) black
(3) red (4) yellow

WO0064

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

(1) All bright fringes become white

(2) All bright fringes have coloures between violet and red

(3) Only the central fringe is white, all other fringes are coloured

(4) No fringes are observed

WO0065

66. The fringe width in Young's double slit experiment increases when :

(1) Wavelength increases

(2) Distance between the slits increases

(3) Distance between the source and screen decreases

(4) Frequency of incident light increases

WO0066

67. Young's double slit experiment is performed with light of wavelength 550 nm. The separation between the slits is 1.10 mm and screen is placed at distance of 1m. What is the distance between the consecutive bright or dark fringes.

(1) 1.5 mm (2) 1.0 mm

(3) 0.5 mm (4) None of these

WO0067

68. In the Young's double slit experiment, for which colour the fringe width is least ?

(1) Red (2) Green

(3) Blue (4) Yellow

WO0068

69. If the sodium light in Young's double slit experiment is replaced by red light, the fringe width will :

(1) Decrease

(2) Increase

(3) Remain unaffected

(4) First increase, then decrease

WO0069

70. A double slit experiment is performed with light of wavelength 500 nm. A thin film of thickness 2μm and refractive index 1.5 is introduced in the path of the upper beam. The location of the central maximum will :

(1) Remain unshifted

(2) Shift downward by nearly two fringes

(3) Shift upward by nearly two fringes

(4) Shift downward by 10 fringes

WO0070

71. In YDSE experiment, when two light waves make third minima, then they have :-

(1) Phase difference of 3π

(2) Phase difference of $\frac{5\pi}{2}$

(3) Path difference of 3λ

(4) Path difference of $\frac{5\lambda}{2}$

WO0071

72. A monochromatic beam of light is used for the formation of fringes on the screen by illuminating the two slits in the Young's double slit interference experiment. When a thin film of mica is interposed in the path of one of the interfering beams then :

(1) The fringe width increases

(2) The fringe width decreases

(3) The fringe width remains the same but the pattern shifts

(4) The fringe pattern disappears

WO0073

73. In an interference experiment, third bright fringe is obtained at a point on the screen with a light of 700 nm. What should be the wavelength of the light in order to obtain 5^{th} bright fringe at the same point?

(1) 500 nm (2) 630 nm

(3) 750 nm (4) 420 nm

WO0074

74. In a double slit experiment if light of wavelength 5000 Å is used then fringe width of 1 mm is obtained. If now light of wavelength 6000 Å is used without altering the system then new fringe width will be :

(1) 1 mm (2) 0·5 mm

(3) 1·2 mm (4) 1·5 mm

WO0075

75. Monochromatic green light has wavelength 5×10^{-7} m. The separation between slits is 1 mm. The fringe width of interference patern obtained on screen at a distance of 2 meter is :

(1) 1 mm (2) 0.5 mm
(3) 2 mm (4) 0.1 mm

WO0076

76. In Young's double slit experiment when wavelength of 700 nm is used then fringe width of 0.7 mm is obtained. If wavelength of 500nm is used then what is the fringe width?

(1) 0.35 mm (2) 0.5 mm
(3) 3.5 mm (4) 5 mm

WO0077

77. What will be the effect on fringe width, when distance between slits become doubled-

(1) 1/2 times (2) 2 times
(3) 1/4 times (4) Unchanged

WO0078

DIFFRACTION

78. The conversation going on, in some room, can be heared by the person outside the room. The reason for it is :

(1) Interference of sound (2) Reflection of sound
(3) Diffraction of sound (4) Refraction of sound

WO0079

79. Phenomenon of diffraction occurs :

(1) only in case of light and sound waves
(2) for all kinds of waves
(3) for electro-magnetic waves and not for matter waves
(4) for light waves but not is case of X rays

WO0080

80. Which of the following ray gives more distinct diffraction :

(1) X-ray (2) light ray
(3) γ –ray (4) Radio wave

WO0081

81. All fringes of diffraction are of :

(1) the same intensity (2) unequal width
(3) the same width (4) full darkness

WO0082

82. What happens, when the width of the slit aperture is increased in an experiment of single slit diffraction experiment :

(1) spread of diffraction region is increased
(2) spread of diffraction region is decreased
(3) spread of diffraction region will be decreased and mid-band becomes narrow
(4) none of the above

WO0083

83. Light waves do not travels strictly in straight line, can be best explained by :

(1) Particle nature of light
(2) Diffraction
(3) Interference
(4) Polarisation

WO0084

84. In the diffraction pattern of a single slit aperture, the width of the central fringe compared to widths of the other fringes, is :

(1) equal (2) less
(3) little more (4) double

WO0085

85. Diffracted fringes obtained from the slit aperture are of :-

(1) same width
(2) different width
(3) uniform intensity
(4) non-uniform width & non uniform intensity

WO0086

86. Central fringe obtained in diffraction pattern due to a single slit :

(1) is of minimum intensity
(2) is of maximum intensity
(3) intensity does not depend upon slit width
(4) none of the above

WO0087

87. In a single slit diffraction pattern, if the light source is used of less wavelength than previous one. Then width of the central fringe will be :

(1) less
(2) increase
(3) unchanged
(4) none of the above

WO0088

88. In the laboratory, diffraction of light by a single slit is being observed. If slit is made slightly narrow, then diffraction pattern will :

(1) be more spreaded than before

(2) be less spreaded than before

(3) be spreaded as before

(4) be disappeared

WO0089

89. For Fraunhofer single slit diffraction :

(1) width of central maxima is proportional to λ

(2) on increasing the slit width, the width of central maxima decreases

(3) on making the slit width $a = \lambda$, central fringe spreads in the range $\pm 90^0$

(4) all of the above are correct

WO0090

90. In a Fraunhofer's diffraction by a slit, if slit width is a, wavelength λ, focal length of lens is f, linear width of central maxima is :

(1) $\frac{f\lambda}{a}$ (2) $\frac{fa}{\lambda}$ (3) $\frac{2f\lambda}{a}$ (4) $\frac{f\lambda}{2a}$

WO0091

91. In a Fraunhofer's diffraction obtained by a single slit aperture, the value of path difference for n^{th} order of minima is :

(1) $n\lambda$ (2) $2n\lambda$

(3) $(2n - 1)\lambda /2$ (4) $(2n-1)\lambda$

WO0092

92. A light source of 5000Å wavelength produces a single slit diffraction. The first minima in diffraction pattern is seen, at a distance of 5mm from central maxima. The distance between screen and slit is 2 metre. The width of slit in mm will be :

(1) 0.1 (2) 0.4

(3) 0.2 (4) 2

WO0093

93. A plane wave front of wavelength 6000 Å is incident upon a slit of 0.2mm width, which enables Fraunhofer's diffraction pattern to be obtained on a screen 2 metre away. Width of the central maxima in mm will be :

(1) 10 (2) 12

(3) 8 (4) 2

WO0094

94. The waves of 600μm wave length are incident normally on a slit of 1.2mm width. The value of diffraction angle corresponding to the first minima will be (in radian) :

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$

WO0095

95. In Fraunhoffer diffraction the centre of diffraction image is :

(1) always bright

(2) always dark

(3) sometimes bright and sometimes dark

(4) bright for large wavelength and dark for low wavelength

WO0096

96. A single slit of width d is placed in the path of beam of wavelength λ. The angular width of the principal maximum obtained is :

(1) $\frac{d}{\lambda}$ (2) $\frac{\lambda}{d}$ (3) $\frac{2\lambda}{d}$ (4) $\frac{2d}{\lambda}$

WO0097

97. Bending of light waves at the sharp edges of an opaque obstacle is known as

(1) refraction (2) reflection

(3) diffraction (4) interference

WO0098

98. Diffraction and interference of light refers to :

(1) quantum nature of light

(2) wave nature of light

(3) transverse nature of light

(4) electromagnetic nature of light

WO0099

99. The phenomenon of diffraction of light was discovered by :

(1) Huygens (2) Newton

(3) Fresnel (4) Grimaldi

WO0100

100. Angular width (θ) of central maximum of a diffraction pattern of a single slit does not depend upon :

(1) Distance between slit and source

(2) Wavelength of light used

(3) Width of the slit

(4) Frequency of light used

WO0101

101. Red light is generally used to observe diffraction pattern from single slit. If green light is used instead of red light, then diffraction pattern :

(1) Will be more clear (2) Will be contract
(3) Will be expanded (4) Will not visualize

WO0102

102. Diffraction of sound waves is more evident than light waves in daily life because :-

(1) $\lambda_{Sound} > \lambda_{light}$
(2) $\lambda_{sound} = \lambda_{light}$
(3) $\lambda_{sound} < \lambda_{light}$
(4) Sound waves are longitudinal but light waves are transverse.

WO0103

103. In single slit Fraunhoffer diffraction which type of wavefront is required :

(1) cylindrical (2) spherical
(3) elliptical (4) plane

WO0104

104. If in Fraunhofer diffraction due to a single slit, the slit width is increased, then the width of the central maximum will

(1) increase
(2) decrease
(3) not change
(4) change depends on the wavelength of light used

WO0105

POLARISATION, BREWSTER LAW AND MALUS LAW

105. A polariser is used to :

(1) Reduce intensity of light
(2) Produce polarised light
(3) Increase intensity of light
(4) Produce unpolarised light

WO0106

106. Light waves can be polarised as they are :

(1) Transverse
(2) Of high frequency
(3) Longitudinal
(4) Reflected

WO0107

107. Through which character we can distinguish the light waves from sound waves :

(1) Interference (2) Refraction
(3) Polarisation (4) Reflection

WO0108

108. Which of following can not be polarised :

(1) Radio waves
(2) Ultraviolet rays
(3) Infrared rays
(4) Ultrasonic waves

WO0109

109. The transverse nature of light is shown by

(1) Interference of light
(2) Refraction of light
(3) Polarisation of light
(4) Dispersion of light

WO0110

110. The angle of polarisation for any medium is 60°, what will be critical angle for this :

(1) $\sin^{-1}\sqrt{3}$ (2) $\tan^{-1}\sqrt{3}$
(3) $\cos^{-1}\sqrt{3}$ (4) $\sin^{-1}\dfrac{1}{\sqrt{3}}$

WO0111

111. The angle of incidence at which reflected light is totally polarized for reflection from air to glass (refractive index n)

(1) $\sin^{-1}(n)$ (2) $\sin^{-1}\left(\dfrac{1}{n}\right)$
(3) $\tan^{-1}\left(\dfrac{1}{n}\right)$ (4) $\tan^{-1}(n)$

WO0112

112. A ray of light is incident on the surface of a glass plate at an angle of incidence equal to Brewster's angle ϕ. If μ represents the refractive index of glass with respect to air, then the angle between reflected and refracted rays is :

(1) $90 + \phi$ (2) $\sin^{-1}(\mu\cos\phi)$
(3) $90°$ (4) $90° - \sin^{-1}(\sin\phi/\mu)$

WO0113

113. Refractive index of material is equal to tangent of polarizing angle. It is called.

(1) Brewster's law (2) Lambert's law
(3) Malus's law (4) Bragg's law

WO0114

114. When unpolarized light beam is incident from air onto glass (n=1.5) at the polarizing angle :

(1) Reflected beam is 100 percent polarized

(2) Reflected and refracted beams are partially polarized

(3) The reflected and refracted ray will not perpendicular to each other

(4) All of the above

WO0115

115. When the angle of incidence on a material is 60°, the reflected light is completely polarized. The velocity of the refracted ray inside the material is (in ms^{-1}) :

(1) 3×10^8 (2) $\left(\frac{3}{\sqrt{2}}\right)\times10^8$

(3) $\sqrt{3}\times10^8$ (4) 0.5×10^8

WO0116

116. A polaroid is placed at 45° to an incoming light of intensity I_0. Now the intensity of light passing through polaroid after polarisation would be:

(1) I_0 (2) $I_0/2$ (3) $I_0/4$ (4) Zero

WO0117

117. Plane polarised light is passed through a polaroid. On viewing through the polariod we find that when the polariod is given one complete rotation about the direction of the light, one of the following is observed.

(1) The intensity of light gradually decreases to zero and remains at zero

(2) The intensity of light gradually increases to a maximum and remains at maximum

(3) There is no change in intensity

(4) The intensity of light is twice maximum and twice zero

WO0118

118. Polarised glass is used in sun glasses because :

(1) It reduces the light intensity to half on account of polarisation

(2) It is fashionable

(3) It has good colour

(4) It is cheaper

WO0119

119. When a plane polarised light is passed through an analyser and analyser is rotated from 0 to 90°, the intensity of the emerging light :

(1) Varies between a maximum and minimum

(2) Becomes zero

(3) Does not vary

(4) Varies between a maximum and zero

WO0120

120. When an unpolarized light of intensity I_0 is incident on a polarizing sheet, the intensity of the light which does not get transmitted is :

(1) Zero (2) I_0 (3) $\frac{1}{2}I_0$ (4) $\frac{1}{4}I_0$

WO0121

EXERCISE-I (Conceptual Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**4**	**4**	**4**	**3**	**4**	**3**	**1**	**1**	**3**	**4**	**3**	**1**	**4**	**1**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**3**	**4**	**3**	**2**	**1**	**3**	**3**	**2**	**4**	**1**	**3**	**4**	**4**	**4**	**4**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	**3**	**4**	**4**	**2**	**2**	**1**	**2**	**1**	**3**	**2**	**4**	**1**	**2**	**2**	**3**
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	**4**	**3**	**4**	**4**	**3**	**4**	**2**	**3**	**2**	**2**	**4**	**2**	**1**	**2**	**4**
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	**1**	**1**	**1**	**2**	**3**	**1**	**3**	**3**	**2**	**3**	**4**	**3**	**4**	**3**	**1**
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans.	**2**	**1**	**3**	**2**	**4**	**2**	**3**	**2**	**4**	**4**	**2**	**1**	**1**	**4**	**3**
Que.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Ans.	**1**	**3**	**2**	**2**	**1**	**3**	**3**	**2**	**4**	**1**	**2**	**1**	**4**	**2**	**2**
Que.	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans.	**1**	**3**	**4**	**3**	**4**	**4**	**3**	**1**	**1**	**3**	**2**	**4**	**1**	**4**	**3**

EXERCISE-II (Previous Year Questions) AIPMT/NEET

NEET-UG 2013

1. In Young's double slit experiment, the slits are 2mm apart and are illuminated by photons of two wavelengths λ_1 = 12000Å and λ_2 = 10000Å. At what minimum distance from the common central bright fringe on the screen 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other ?

(1) 3 mm (2) 8 mm

(3) 6 mm (4) 4 mm

WO0125

2. A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct ?

(1) The angular width of central maximum will be unaffacted.

(2) Diffraction pattern is not observed on the screen in the case of electrons.

(3) The angular width of the central maximum of the diffraction pattern will increase.

(4) The angular width of the central maximum will decrease.

WO0126

AIPMT 2014

3. In the Young's double-slit experiment, the intensity of light at a point on the screen where the path difference is λ is K, (λ being the wave length of light used). The intensity at a point where the path difference is $\lambda/4$, will be :-

(1) K (2) K/4 (3) K/2 (4) Zero

WO0129

4. A beam of light of λ = 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between first dark fringes on either side of the central bright fringe is :-

(1) 1.2 cm (2) 1.2 mm

(3) 2.4 cm (4) 2.4 mm

WO0130

AIPMT 2015

5. In a double slit experiment, the two slits are 1 mm apart and the screen is placed 1 m away. A monochromatic light of wavelength 500 nm is used. What will be the width of each slit for obtaining ten maxima of double slit within the central maxima of single slit pattern ?

(1) 0.1 mm (2) 0.5 mm

(3) 0.02 mm (4) 0.2 mm

WO0131

6. For a parallel beam of monochromatic light of wavelength 'λ', diffraction is produced by a single slit whose width 'a' is of the order of the wavelength of the light. If 'D' is the distance of the screen from the slit, the width of the central maxima will be :

(1) $\frac{D\lambda}{a}$ (2) $\frac{Da}{\lambda}$ (3) $\frac{2Da}{\lambda}$ (4) $\frac{2D\lambda}{a}$

WO0132

Re-AIPMT 2015

7. At the first minimum adjacent to the central maximum of a single-slit diffraction pattern the phase difference between the Huygen's wavelet from the edge of the slit and the wavelet from the mid point of the slit is :-

(1) $\frac{\pi}{8}$ radian (2) $\frac{\pi}{4}$ radian

(3) $\frac{\pi}{2}$ radian (4) π radian

WO0133

8. Two slits in Young's experiment have widths in the ratio 1 : 25. The ratio of intensity at the maxima and minima in the interference pattern, $\frac{I_{max}}{I_{min}}$ is :

(1) $\frac{4}{9}$ (2) $\frac{9}{4}$

(3) $\frac{121}{49}$ (4) $\frac{49}{121}$

WO0134

NEET-I 2016

9. In a diffraction pattern due to a single slit of width 'a', the first minimum is observed at an angle 30° when light of wavelength 5000 Å is incident on the slit. The first secondary maximum is observed at an angle of :

(1) $\sin^{-1}\left(\frac{1}{4}\right)$ (2) $\sin^{-1}\left(\frac{2}{3}\right)$

(3) $\sin^{-1}\left(\frac{1}{2}\right)$ (4) $\sin^{-1}\left(\frac{3}{4}\right)$

WO0139

10. The intensity at the maximum in a Young's double slit experiment is I_0. Distance between two slits is d = 5λ, where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance D = 10 d ?

(1) I_0 (2) $\frac{I_0}{4}$ (3) $\frac{3}{4}I_0$ (4) $\frac{I_0}{2}$

WO0140

NEET-II 2016

11. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio $\frac{I_{max}-I_{min}}{I_{max}+I_{min}}$ will be:-

(1) $\frac{\sqrt{n}}{(n+1)^2}$ (2) $\frac{2\sqrt{n}}{(n+1)^2}$ (3) $\frac{\sqrt{n}}{n+1}$ (4) $\frac{2\sqrt{n}}{n+1}$

WO0141

12. A linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength 5 × 10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is :-

(1) 0.20 cm (2) 0.15 cm (3) 0.10 cm (4)0.25 cm

WO0142

NEET(UG) 2017

13. The ratio of resolving powers of an optical microscope for two wavelengths λ_1 = 4000 Å and λ_2 = 6000 Å is :-

(1) 9 : 4 (2) 3 : 2 (3) 16 : 81 (4) 8 : 27

WO0146

14. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 8^{th} bright fringe in the medium lies where 5^{th} dark fringe lies in air. The refractive index of the medium is nearly :-

(1) 1.59 (2) 1.69 (3) 1.78 (4) 1.25

WO0147

15. Two Polaroids P_1 and P_2 are placed with their axis perpendicular to each other. Unpolarised light I_0 is incident on P_1 . A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1 . The intensity of transmitted light through P_2 is :-

(1) $\frac{I_0}{4}$ (2) $\frac{I_0}{8}$ (3) $\frac{I_0}{16}$ (4) $\frac{I_0}{2}$

WO0148

NEET(UG) 2018

16. Unpolarised light is incident from air on a plane surface of a material of refractive index 'μ'. At a particular angle of incidence 'i', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation?

(1) Reflected light is polarised with its electric vector parallel to the plane of incidence

(2) Reflected light is polarised with its electric vector perpendicular to the plane of incidence

(3) $i=\sin^{-1}\left(\frac{1}{\mu}\right)$

(4) $i=\tan^{-1}\left(\frac{1}{\mu}\right)$

WO0152

17. In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20°. To increase the fringe angular width to 0.21° (with same λ and D) the separation between the slits needs to be changed to :-

(1) 1.8 mm (2) 1.9 mm

(3) 2.1 mm (4) 1.7 mm

WO0153

18. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of :-

(1) small focal length and large diameter

(2) large focal length and small diameter

(3) large focal length and large diameter

(4) small focal length and small diameter

WO0154

NEET(UG) 2019

19. In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1m away, was found to be 0.2°. What will be the angular width of the first minima, if the entire experimental apparatus is immersed in water ($\mu_{water} = 4/3$)

(1) 0.266° (2) 0.15°

(3) 0.05° (4) 0.1°

WO0188

NEET(UG) 2019 (Odisha)

20. In a Young's double slit experiment if there is no initial phase difference between the light from the two slits, a point on the screen corresponding to the fifth minimum has path difference.

(1) $5\frac{\lambda}{2}$ (2) $10\frac{\lambda}{2}$

(3) $9\frac{\lambda}{2}$ (4) $11\frac{\lambda}{2}$

WO0189

21. Angular width of the central maxima in the Fraunhofer diffraction for λ = 6000 Å is θ_0. When the same slit is illuminated by another monochromatic light, the angular width decreases by 30%. The wavelength of this light is,

(1) 1800 Å (2) 4200 Å

(3) 6000 Å (4) 420 Å

WO0190

NEET(UG) 2020

22. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1) 6.00×10^{-7} rad (2) 3.66×10^{-7} rad

(3) 1.83×10^{-7} rad (4) 7.32×10^{-7} rad

WO0191

23. The Brewsters angle i_b for an interface should be:

(1) $i_b = 90°$ (2) $0° < i_b < 30°$

(3) $30° < i_b < 45°$ (4) $45° < i_b < 90°$

WO0192

24. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

(1) one-fourth (2) double

(3) half (4) four times

WO0193

NEET(UG) 2020 (COVID-19)

25. Two coherent sources of light interfere and produce fringe pattern on a screen. For central maximum, the phase difference between the two waves will be

(1) zero (2) π (3) $3\pi/2$ (4) $\pi/2$

WO0194

NEET(UG) 2021

26. A lens of large focal length and large aperture is best suited as an objective of an astronomical telescope since :

(1) a large aperture contributes to the quality and visibility of the images.

(2) a large area of the objective ensures better light gathering power.

(3) a large aperture provides a better resolution.

(4) all of the above.

WO0195

NEET(UG) 2021 (Paper-2)

27. In Young's double slit experiment, the ratio of amplitude of light coming from two slits is 2:3. If I_0 be the maximum intensity the resultant intensity I when they interfere at path difference $\lambda/3$ (λ = wavelength of light) will be

(1) $\frac{3I_0}{25}$ (2) $\frac{6I_0}{25}$

(3) $\frac{7I_0}{25}$ (4) $\frac{9I_0}{25}$

WO0198

28. Angular width of central maximum of a diffraction pattern on a single slit depends on

I. Distance between slit and source

II. Wavelength of light used

III. Width of the slit

(1) I, II (2) II, III (3) I, III (4) I, II, III

WO0199

29. Resolving power of a microscope depends on
(1) The focal length and aperture of the eye lens
(2) The focal length of the objective and eye lens
(3) The apertures of the objective and the eye lens
(4) The wavelength of light illuminating the object

WO0200

NEET(UG) 2022

30. In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is :
(1) 8 (2) 9 (3) 12 (4) 6

WO0201

NEET(UG) 2022 (Overseas)

31. A linearly polarised monochromatic light of intensity 10 lumen is incident on a polarizer. The angle between the direction of polarisation of the light and that of the polariser such that the intensity of output light is 2.5 lumen is:
(1) 75° (2) 30° (3) 45° (4) 60°

WO0202

32. A monochromatic light of frequency 500 THz is incident on the slits of a Young's double slit experiment. If the distance between the slits is 0.2 mm and the screen is placed at a distance 1 m from the slits, the width of 10 fringes will be: [THz = 10^{12} Hz]
(1) 15 mm (2) 30 mm
(3) 3 mm (4) 1.5 mm

WO0203

Re-NEET(UG) 2022

33. After passing through a polariser a linearly polarised light of intensity I is incident on an analyser making an angle of 30° with that of the polariser. The intensity of light emitted from the analyser will be :
(1) $\frac{I}{2}$ (2) $\frac{I}{3}$ (3) $\frac{3I}{4}$ (4) $\frac{2I}{3}$

WO0204

34. If the screen is moved away from the plane of the slits in a Young's double slit experiment, then the :
(1) angular separation of the fringes increases
(2) angular separation of the fringes decreases
(3) linear separation of the fringes increases
(4) linear separation of the fringes decreases

WO0205

EXERCISE-II (Previous Year Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	3	4	3	4	4	4	4	2	4	4	4	2	2	3	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	2	2	3	2	3	2	2	4	4	1	4	3	2	4	3
Que.	31	32	33	34											
Ans.	4	2	3	3											

EXERCISE-III (Analytical Questions) Master Your Understanding

1. Two coherent sources of equal intensities produce a maximum of 100 units. If the amplitude of one of the sources is reduced by 20%, then the maximum intensity produced will be :

(1) 100 (2) 81 (3) 89 (4) 60

WO0161

2. In an interference pattern of two waves fringe width is β . If the frequency of source is doubled then fringe width will become :

(1) $\frac{1}{2}\beta$ (2) β (3) 2β (4) $\frac{3}{2}\beta$

WO0162

3. In an interference pattern the $(n+4)^{th}$ blue bright fringe and n^{th} red bright fringe are formed at the same spot. If red and blue light have the wavelength of 7800 Å and 5200 Å then value of n should be :

(1) 2 (2) 4 (3) 6 (4) 8

WO0163

4. The intensity of the central fringe obtained in the interference pattern due to two indentical slit sources is I. When one of the slits is closed then the intensity at the same point is I_0. Then the correct relation between I and I_0 is :

(1) $I = I_0$ (2) $I = 2I_0$ (3) $I = 4I_0$ (4) $I = I_0/4$

WO0164

5. In double slit experiment, the angular width of the fringes is 0.20° for the sodium light (λ = 5890Å). In order to increase the angular width of the fringes by 10%, the necessary change in the wavelength is :

(1) Increase of 589Å (2) Decrease of 589Å
(3) Increase of 6479Å (4) Zero

WO0165

6. In YDSE d = 1mm, λ = 500 nm D = 1.0 m. How many Bright fringes are formed in one cm of screen.

(1) 20 (2) 25 (3) 10 (4) 15

WO196

7. In YDSE, λ = 500 nm, d = 1.00 mm and D = 1.0 m. Find minimum distance from the central maxima for which the intensity is half of the maximum intensity.

(1) 2.5×10^{-4} m (2) 1.25×10^{-4} m
(3) 3×10^{-6} m (4) 4.3×10^{-5} m

WO197

8. Direction of the first secondary maximum in the Fraunhofer diffraction pattern at a single slit is given by (a is the width of the slit) :

(1) $a\sin\theta = \frac{\lambda}{2}$ (2) $a\cos\theta = \frac{3\lambda}{2}$
(3) $a\sin\theta = \lambda$ (4) $a\sin\theta = \frac{3\lambda}{2}$

WO0166

9. A light has amplitude A and angle between analyser and polariser is 60°. Light is transmitted by analyser has amplitude.

(1) $A\sqrt{2}$ (2) $\frac{A}{\sqrt{2}}$ (3) $\frac{\sqrt{3}A}{2}$ (4) $\frac{A}{2\sqrt{2}}$

WO0167

10. Two Nicols are oriented with their principal planes making an angle of 60°. The percentage of incident unpolarized light which passes through the system is :

(1) 50% (2) 100%
(3) 12.5% (4) 37.5%

WO0168

11. Two waves $Y_1 = a\sin\omega t$ and $Y_2 = a\sin(\omega t+\delta)$ are producing interference, then resultant intensity is proportional to –

(1) $a\cos^2 \delta/2$ (2) $a^2\cos \delta/2$

(3) $a^2\cos \delta$ (4) $a^2\cos^2 \delta/2$

WO0169

12. In the Young's double slit experiment the central maxima is observed to be I_0. If one of the slits is covered, then intensity at the central maxima will become :

(1) $I_0/2$ (2) $I_0/\sqrt{2}$

(3) $I_0/4$ (4) I_0

WO0170

13. Calculate angular width in a single slit diffration of central maxima if λ = 6000 Å, a = 18×10^{-5} cm : $\left[\sin^{-1}\left(\frac{1}{3}\right) = 19.47°\right]$

(1) 28.4° (2) 38.94°

(3) 30° (4) 260°

WO0171

14. If diffraction occurs through a single slit then intensity of first secondary maxima become .... % of central maxima :-

(1) 4% (2) 25%

(3) 75% (4) 50%

WO0172

EXERCISE-III (Analytical Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ans.	2	1	4	3	1	1	2	4	4	3	4	3	2	1