Unit I
Interference & Diffraction

1. Interference of light is evidence that:
   a. the speed of light is very large
   b. light is a transverse wave
   c. light is electromagnetic in character
   d. light is a wave phenomenon

2. Interference occurs when two (or more) waves meet while travelling along the
   a. Different medium
   b. Same medium
   c. Two medium
   d. Many medium

3. The wave theory of light was given by
   a. Huygen
   b. Young
   c. Newton
   d. Fresnel

4. During the interference of light, energy is
   a. Created at maxima
   b. Destroyed at the minima
   c. Not conserved
   d. Redistributed

5. In Huygen's wave theory the locus of all points in same phase is
   a. A ray
   b. A half period zone
   c. A wave front
   d. A vibration

6. The wavefront originating from a rectilinear slit is called
   a. Cylindrical
   b. Spherical
   c. Circular
   d. None of these
7. The two waves are said to be coherent when the phase difference between them is
   a. Constant
   b. Zero or constant

c. 90^0
d. Continuously changing.

8. Which of the following is conserved when light waves interfere?
   a. Amplitude
   b. Intensity
   c. Energy
   d. Momentum

9. Two light sources are said to be coherent if they are obtained from
   a. A single point source
   b. A wide source
   c. Two independent point sources
   d. Two ordinary bulbs

10. To demonstrate the phenomenon of interference
    a. Two sources which emit radiation of same frequency are required.
    b. Two sources which emit radiation of same frequency and have a constant phase difference are required.
    c. Two sources which emit radiation are required of nearly same frequency are required.
    d. Two sources which emit radiation of different wavelengths

11. For sustained interference of light, the two sources should
    a. be close to each other
    b. be narrow
    c. have a same amplitude
    d. have a constant phase difference

12. For maxima and minima to be sharp
    a. The source must be narrow
    b. The source must be broad
    c. The distance between the slits and the screen should be large
    d. The interfering waves should have equal amplitudes

13. Intensity of light depends upon
    a. Wavelength
    b. Amplitude
    c. Frequency
    d. Velocity

14. Two waves of same amplitude ‘a’ and same frequency are reaching a point simultaneously. What should be the phase difference between the two waves so that the amplitude of the resultant wave be ‘2a’.
   a. 90^0
   b. 120^0
   c. 0^0
   d. 180^0

15. Two sources of intensities *I* and *4I* are used to produce interference. The resultant intensity of *5I* is obtained where phase difference is
   a. π
   b. 2π
   c. $\pi/2$
   d. 0

16. The condition that is absolutely necessary/must/unavoidable for producing a steady state interference pattern is
   a. Coherence
   b. Monochromaticity
   c. Equal amplitudes
   d. Point source

17. A complete and precise definition of interference where all the necessary conditions are satisfied is
   a. Superposition of two waves
   b. Superposition of any number of waves
   c. Superposition of waves resulting into modification of intensity
   d. Superposition of wavefronts and redistribution of intensity into alternate maxima and minima

18. Two coherent monochromatic light beams of intensities *I* and *4I* are superposed. The maximum and minimum possible intensities in the resultant beam are
   a. *5I* and *I*
   b. *5I* and *3I*
   c. *3I* and *I*
   d. *9I* and 3*I*

19. The two waves of intensity *I* and *4I* are superpose. The ratio of maximum to minimum intensity is
   a. 5:3
   b. 9:1
   c. 5:1
   d. 4:1

20. The maximum intensity produced by two coherent sources with zero phase difference having intensity I_1 and I_2 is
    a. $I_1 I_2$
    b. $I_1 + I_2$
    c. $I_1^2 + I_2^2$
    d. $I_1 + I_2 + 2\sqrt{I_1 I_2}$

21. Ratio of intensities of two waves is 25:4. Then the ratio of maximum to minimum intensity will be
    a. 5:2
    b. 4:25
    c. 25:4
    d. 49:9

22. In an interference pattern energy is
    a. Created at position of maxima
    b. Destroyed at position of maxima
    c. Conserved but redistributed
    d. Not conserved

23. Two coherent sources whose intensity ratio is 81:1 produce interference fringes. What is the ratio of their amplitudes?
    a. 10:1
    b. 9:1
    c. 8:1
    d. 9.9:1

24. For constructive interference to take place between two monochromatic light waves of wavelength λ, the path difference should be,
    a. $(2n-1)\lambda/2$
    b. $(2n-1)\lambda/4$
    c. n λ
    d. $(2n+1)\lambda/2$

25. For destructive interference to take place between two monochromatic light waves of wavelength λ, the path difference should be,
    a. $(2n-1)\lambda/2$
    b. $(2n-1)\lambda/4$

c. n λ
d. $(2n+1)\lambda/_2$

26. For destructive interference to take place between two monochromatic light waves of wavelength 2λ, the path difference should be,
a. 2nλ
b. $(2n-1)\lambda/_2$
c. $(2n-1)\lambda$
d. $(2n+1)\lambda/_2$

27. One beam of coherent light travels path P_1 in arriving at point Q and another coherent beam travels path P_2 in arriving at the same point. If these two beams are to interfere destructively, the path difference $P_1 - P_2$ must be equal to
a. an odd number of half-wavelengths.
b. zero.
c. a whole number of wavelengths.
d. a whole number of half-wavelengths.

28. For constructive interference to take place between two monochromatic light waves of wavelength λ, the path difference should be,
a. Very large
b. Very Small
c. Integral multiple of wavelength λ
d. Odd multiple of wavelength λ

29. For destructive interference to take place between two monochromatic light waves of wavelength λ, the path difference should be,
a. Very large
b. Very Small
c. Integral multiple of wavelength λ
d. Odd multiple of half the wavelength λ

30. Two waves of same frequency and amplitude meet at a point where they are 180° out of phase. Which of the following is incorrect?
a. They superimpose, resulting in zero intensity.
b. Their amplitudes subtract, resulting in zero amplitude.
c. Destructive interference occurs.
d. Their energy at that point disappear and thus the energy of the waves after interference is half that of the original waves.

31. When interference takes place

a. Maxima is produced
b. Minima is produced
c. Maxima and Minima is produced alternatively
d. None of the above

32. For maxima and minima to be sharp
a. The source must be narrow
b. The source must be broad
c. The interfering waves should have equal amplitudes
d. The distance between the slits and the screen should be large

33. Two waves originating from sources S_1 and S_2 having zero phase difference and common wavelength λ will show completely destructive interference at a point P if (S_1P - S_2P) is
a. 5λ
b. $3\lambda/4$
c. 2λ
d. $11\lambda/2$

34. For two coherent waves $y_1 = a_1 \cos\omega$ and $y_2 = a_2 \sin\omega$ the resultant intensity due to interference is
a. $(a_1 - a_2)^2$
b. $(a_1 + a_2)^2$
c. $({a_1}^2 - {a_2}^2)$
d. $({a_1}^2 + {a_2}^2)$

35. For two interfering waves $y_1 = a\cos\omega$ and $y_2 = b\cos(\omega + \Phi)$, destructive interference at the point of observation takes place if Φ equals
a. π
b. $\pi/2$
c. 0
d. None of these

36. In which of the following the interference is produced by division of amplitude method
a. Uniform thickness film
b. Non-uniform thickness film
c. Newton's rings
d. All above

37. In which of the following the interference is produced by division of wave front method.
a. Uniform thickness film
b. Non-uniform thickness film

c. Newton's rings
d. None of these

38. The thin film interference is based on
   a. Division of wavelength
   b. Division of wavefront
   c. Division of intensity
   d. None of the above

39. The thin film interference is based on
   a. Division of amplitude
   b. Division of wavelength
   c. Division of wavefront
   d. Division of frequency

40. If the path difference between the two interfering waves is 2λ, the phase difference between them is equal to
   a. 2π
   b. π
   c. 3π
   d. $4\ \pi$

41. If the path difference between the two interfering waves is λ, the phase difference between them is equal to
   a. 2π
   b. π
   c. 3π
   d. $4\ \pi$

42. If the path difference between the two interfering waves is $^{3\lambda}/_{2}$,the phase difference between them is equal to
   a. 2π
   b. π
   c. 3π
   d. $4\ \pi$

43. If the path difference between the two interfering waves is $^{\lambda}/_{2}$,the phase difference between them is equal to
   a. 2π
   b. π
   c. 3π
   d. $4\ \pi$

44. The phase difference between two points x distance apart of a light wave of wavelength λ entering a medium of refractive index μ from air is
    a. $\mu \frac{2\pi}{\lambda} x$
    b. $(\mu - 1) \frac{2\pi}{\lambda} x$
    c. $\frac{1}{(\mu-1)} \frac{2\pi}{\lambda}$
    d. $\frac{1}{\mu} \frac{2\pi}{\lambda} x$

45. When light wave suffers reflection at the interface between glass and air incident through glass, a change of phase of the reflected wave is,
    a. Zero
    b. $\pi/2$
    c. π
    d. 2π

46. When light wave suffers reflection at the interface between glass and air incident through air, a change of phase of the reflected wave is,
    a. Zero
    b. $\pi/2$
    c. π
    d. 2π

47. According to Stokes's law the phase of the light is reversed when the light is
    a. Reflected due to a denser medium
    b. Reflected due to a rarer medium
    c. Transmitted from denser to rarer medium
    d. Transmitted from rarer to denser medium

48. According to Stoke's law the phase of the light is not reversed when
    a. Light is reflected from denser medium
    b. Light is reflected from medium from medium of very high refractive index to medium of very low refractive index
    c. Light is reflected from denser medium to relatively less denser medium
    d. Light is reflected due to a rarer medium

49. In the equation for path difference of a thin film for reflected system ($p.d. = 2\mu t cos r$) the factor $\pm\lambda/2$ will be present, when
a. If one of the ray is reflected from denser medium and another from rarer medium
b. When both the rays are reflected from denser medium
c. When both the rays are reflected from rarer medium

d. None of the above

50. In the equation for path difference of a thin film for reflected system ($p.d. = 2\mu t cosr$) the factor ±λ/2 will be present, when
a. If the medium above the film and below the film is denser than the film
b. If the medium above the film is denser and medium below the film is rarer
c. If the medium below the film is rarer and medium above the film is denser
d. None of the above

51. In the equation for path difference of a thin film for reflected system ($p.d. = 2\mu t cosr$) the factor ±λ/2 will be present, when
a. If the medium above the film is denser and medium below the film is rarer
b. If the medium above the film is rarer and medium below the film is denser
c. If the medium above the film and below the film is rarer than the film
d. None of the above

52. In the equation for path difference of a thin film for reflected system ($p.d. = 2\mu t cosr$) the factor ±λ/2 will be absent, when
a. When upper ray and lower ray is reflected from denser medium
b. When the upper ray is reflected from denser medium and lower ray is reflected from rarer medium
c. When the upper ray is reflected from rarer medium and lower ray is reflected from the denser medium
d. None of the above

53. In the equation for path difference of a thin film for reflected system ($p.d. = 2\mu t cosr$) the factor ±λ/2 will be absent, when
a. When the upper ray is reflected from denser medium and lower ray is reflected from rarer medium
b. When the upper ray is reflected from rarer medium and lower ray is reflected from the denser medium
c. When the upper ray and lower ray is reflected from rarer medium.
d. None of the above

54. In the equation for path difference of a thin film for reflected system ($p.d. = 2\mu t cosr$) the factor ±λ/2 will be absent, when
a. The medium above the film is rarer and medium below the film is denser
b. When the medium above the film denser and medium below the film is denser
c. When the medium above the film is rarer and medium below the film is rarer
d. None of the above

55. The two monochromatic and coherent interfering rays, one originated by reflection at rare medium while the other originated by reflection at denser medium then the additional path difference between them is
    a. $\pm\lambda/2$
    b. $\lambda/2$
    c. 2λ
    d. $3\lambda/2$

56. The two monochromatic and coherent interfering rays, one originated by reflection at rare medium while the other originated by reflection at denser medium then the additional phase difference between them is
    a. 2π
    b. π
    c. 3π
    d. $3\pi/2$

57. The two monochromatic and coherent interfering rays, both originated by reflection at rare medium then the additional path difference between them is
    a. $\lambda/2$
    b. λ
    c. 0
    d. $3\lambda/2$

58. The two monochromatic and coherent interfering rays, both originated by reflection at denser medium then the additional path difference between them is
    a. $\lambda/2$
    b. 0
    c. λ
    d. $3\lambda/2$

59. If light travels a distance 't' in a medium of refractive index 'μ' then its equivalent optical path travelled in that medium is given by
    a. $2\mu t$
    b. μt
    c. $\mu t/2$
    d. $3\mu t/2$

60. The optical path covered by a light wave in a particular medium depends upon
    a. Refractive index

b. Length of medium
c. Refractive index and length of medium
d. Directly proportional to refractive index and inversely proportional to length of medium

61. A light wave travels a distance '*d*' in a medium of refractive index 'μ'. When a distance is made half, then the refractive index is,
a. Remains same
b. Doubled
c. Become Half
d. None of these

62. A light wave travels a distance '*d*' in a medium of refractive index 'μ'. When a distance is reduced to $d/_2$ and the medium is replaced by a medium having refractive index '2μ' then the optical path covered by the light will
a. Remains same
b. Doubled
c. Become Half
d. None of these

63. In interference experiment monochromatic light is replaced by white light, we will see
a. uniform illumination of screen
b. uniform darkness on screen
c. equally spaced white and dark bands
d. few colour bands then general illumination

64. In rainy days the oily films spread on the rod appear colored because
a. The rays entering in the film are reflected back and interfere constructively and destructively.
b. The oily film contains various pigments which are colored
c. Certain colors are reflected and certain colors are absorbed.
d. The thin film acts as a dispersive device like a prism and hence disperses the light into spectrum.

65. If the days are not rainy then on dry roads the films are not observed colored because
a. The film is maximumly absorbed in the road and the color producing pigments are also absorbed
b. The thickness of the film becomes very much lesser than the wavelength of the light and such films can't produce interference pattern
c. On dry road the thin films becomes excessively rough and hence can't produce the interference pattern
d. The films on the dry road can't reflect the light, the light is completely absorbed in the film

66. In a uniform thickness thin film all the reflected rays are
a. Parallel

b. Anti-parallel
c. Perpendicular
d. Inclined

67. In a uniform thickness thin film all the transmitted rays are
    a. Anti-parallel
    b. Perpendicular
    c. Parallel
    d. Inclined

68. In a non-uniform thickness thin film all the reflected rays are
    a. Parallel
    b. Anti-parallel
    c. Not-parallel
    d. None of these

69. In uniform thickness thin film the reflected rays are parallel to each other. They superimpose on each other because
    a. They are parallel
    b. The film is very thin
    c. Incident light rays are parallel
    d. The film thickness is comparable with the wavelength of light.

70. In reflected light the condition for darkness for uniform thickness film is
    a. $2\mu t cos r = {2n\lambda}/{2}$
    b. $2\mu t cos r = {n\lambda}/{2}$
    c. $2\mu t cos r = (2n+1)\,{\lambda}/{2}$
    d. $2\mu t cos(r+\theta) = n\lambda$

71. In reflected light the condition for brightness for uniform thickness film is
    a. $2\mu t cos r = {2n\lambda}/{2}$
    b. $2\mu t cos r = {n\lambda}/{2}$
    c. $2\mu t cos r = (2n+1)\,{\lambda}/{2}$
    d. $2\mu t cos(r+\theta) = n\lambda$

72. In transmitted light the condition for darkness for uniform thickness film is
    a. $2\mu t cos r = {2n\lambda}/{2}$
    b. $2\mu t cos r = {n\lambda}/{2}$
    c. $2\mu t cos r = (2n+1)\,{\lambda}/{2}$

d. $2\mu t cos(r+\theta) = n\lambda$

73. In transmitted light the condition for brightness for uniform thickness film is
   a. $2\mu t cosr = {}^{2n\lambda}/_{2}$
   b. $2\mu t cosr = {}^{n\lambda}/_{2}$
   c. $2\mu t cosr = (2n+1)\,{}^{\lambda}/_{2}$
   d. $2\mu t cos(r+\theta) = n\lambda$

74. In uniform thickness film the conditions for brightness and darkness in reflected light and transmitted light are
   a. Same
   b. For brightness same but for darkness opposite.
   c. Opposite
   d. For darkness same but for brightness opposite.

75. In uniform thickness film the conditions for brightness in reflected light and darkness in transmitted light are
   a. Same for all wavelengths
   b. Same but only for monochromatic light
   c. Opposite for all wavelengths
   d. Opposite but only for monochromatic light

76. The uniform thickness film which appears bright for a light of particular wavelength in reflected light will appear ___________ in transmitted light for the same wavelength.
   a. Dark
   b. Bright
   c. Blue
   d. Red

77. When white light is incident normally on a soap film of thickness $5 \times 10^{-5} cm$ (μ=1.33), the wavelength/s of maximum intensity which are reflected are
   a. 26600 A^0
   b. 3800 A^0
   c. Both a and b
   d. Neither a nor b

78. When white light is incident normally on a soap film of thickness $5 \times 10^{-5} cm$ (μ=1.33), the wavelength/s of maximum intensity which are reflected in visible region are
   a. 26600 A^0
   b. 3800 A^0
   c. 5320 A^0
   d. All above.

79. When white light is incident normally on a soap film of thickness $5 \times 10^{-5} cm$ (μ=1.33), the longest wavelength of maximum intensity which is reflected is
   a. 26600 A^0
   b. 3800 A^0
   c. 5320 A^0
   d. None of above

80. In uniform thickness film the conditions of brightness and darkness for reflected and transmitted light are
   a. Same
   b. Different
   c. Opposite
   d. None of these

81. To view colours or fringes on the whole thin film it is necessary to have
   a. clean source of light
   b. broad source of light
   c. point source of light
   d. all above

82. If monochromatic light is incident on the uniform thickness thin film, in the reflected light on the film we can see
   a. Dark bands
   b. Bright bands
   c. Alternate Dark and bright bands
   d. Half film dark and half film bright.

83. A thin slice is cut out of a glass cylinder along a plane parallel to its axis. The slice is placed on a flat glass plate. The observed interference fringes from this combination shall be
   a. Circular
   b. Straight
   c. Equally spaced
   d. None of these

84. A thin optically flat slice is cut out of a glass cylinder along a plane parallel to its axis. The slice is placed on a optically flat glass plate and a piece of paper is inserted from one side between them. The observed interference fringes from this combination shall be
   a. Circular
   b. Circular and equally spaced
   c. Straight
   d. Straight and equally spaced

85. The interfering fringes are formed by a thin film of oil on water are seen in yellow light from a sodium light. The fringes are
   a. Black and white
   b. Yellow and black
   c. Coloured
   d. Coloured but without yellow

86. Oil floating on water looks coloured due to interference of light. The approximate thickness of oil for such effect to be visible is
   a. 1000 A^0
   b. 10000 A^0
   c. 1 mm
   d. 1 cm

87. A very thin film in reflected light appears
   a. Coloured
   b. Black
   c. White
   d. Yellow

88. A wedge shape film is illuminated by monochromatic light then in the pattern observed in the reflected light the fringe width depend upon,
   a. Wavelength of light
   b. Refractive index of the film
   c. Angle of wedge
   d. All above

89. In case of wedge shaped film, the fringes are produced in a plane defined by
   a. Edge of the film and the lower surface of the film
   b. Edge of the film and upper surface of the film
   c. Upper and lower surface of the film
   d. None of the above

90. A wedge shape film is illuminated by monochromatic light then in the pattern observed in the reflected light the fringe width does not depend upon,
   a. Wavelength of light
   b. Refractive index of the film
   c. Thickness of the film
   d. Angle of wedge

91. A wedge shaped film can produce distinct fringes only if the wedge angle is in

a. Degrees
b. Minutes
c. Seconds
d. There is no such condition necessary

92. A wedge shape film observed in reflected sunlight first through a red glass and then through a blue glass. The number of fringes in later case is
a. Less
b. More
c. Equal in both cases
d. None of these

93. When illuminated by monochromatic light the interference pattern of non uniform thickness film in reflected light is alternate bright and dark fringes having same fringe width because
a. Each fringe is the locus of the points at which the thickness of the film has a constant value.
b. Fringe width does not depend on the thickness of the film.
c. Both a and b
d. None of these

94. A thin layer of colourless oil having refractive index 1.4 is spread over water in a container. If the light of wavelength 6400 A^0 is absent in the reflected light, what is the minimum thickness of the oil layer?
a. 2100 A^0
b. 1900 A^0
c. 2143 A^0
d. 100 A^0

95. When a light of wavelength λ falls on a thin film of air of varying thickness, the essential condition for constructive interference by the two interfering rays in the reflected system is
a. $2\mu t cos(r+\theta) = 2n\lambda/2$
b. $2\mu t cos(r+\theta) = (2n-1)\lambda/2$
c. $2\mu t cos r = n\lambda$
d. $2\mu t cos r = (2n-1)\lambda/2$

96. When a light of wavelength λ falls on a thin film of air of varying thickness, the essential condition for constructive interference by the two interfering rays in the transmitted system is
a. $2\mu t cos(r+\theta) = 2n\lambda/2$
b. $2\mu t cos(r+\theta) = (2n-1)\lambda/2$
c. $2\mu t cos r = n\lambda$
d. $2\mu t cos r = (2n-1)\lambda/2$

97. When a light of wavelength λ falls on a thin film of air of varying thickness, the essential condition for destructive interference by the two interfering rays in the reflected system is

a. $2\mu tcos(r+\theta) = 2n\lambda/2$
b. $2\mu tcos(r+\theta) = (2n-1)\lambda/2$
c. $2\mu tcosr = n\lambda$
d. $2\mu tcosr = (2n-1)\lambda/2$

98. When a light of wavelength λ falls on a thin film of air of varying thickness, the essential condition for destructive interference by the two interfering rays in the transmitted system is
a. $2\mu tcos(r+\theta) = 2n\lambda/2$
b. $2\mu tcos(r+\theta) = (2n-1)\lambda/2$
c. $2\mu tcosr = n\lambda$
d. $2\mu tcosr = (2n-1)\lambda/2$

99. Light of wavelength 6000 A^0 falls normally on a thin wedge shaped film of refractive index 1.35 forming fringes that are 2.0 mm apart. The angle of wedge will be,
a. $1.14 \times 10^{-4}\ rad$
b. 0.0063^0
c. $0.378'$
d. All of the above

100. A parallel beam of white light falls on a thin film whose refractive index is 1.33. if the angle of incidence is 52^0 then the thickness of the film for the reflected light to be coloured yellow (λ=6000 A^0) most intensively will be
a. $14(2n+1)\ \mu m$
b. $1.4(2n+1)\ \mu m$
c. $0.14(2n+1)\ \mu m$
d. $142(2n+1)\ \mu m$

101. What is the least thickness of the soap film of refractive index 1.38 which will appear black when viewed with sodium light of wavelength 589.3 nm reflected perpendicular to the film?
a. 10000 A^0.
b. 617 nm
c. 428 nm
d. 213.5 nm

102. When monochromatic light is incident normally on a non uniform thickness air film having very small angle of wedge then the condition of darkness in reflected light is
a. $2\mu tcos\ r = n\lambda$
b. $2t = n\lambda$
c. $2\mu t = n\lambda$
d. $2\mu t + \frac{\lambda}{2} = n\lambda$

103. When monochromatic light is incident normally on a non uniform thickness film having very small angle of wedge and refractive index μ then the condition of darkness in reflected light is

a. $2\mu t\cos r = n\lambda$
b. $2t = n\lambda$
c. $2\mu t = n\lambda$
d. $2\mu t + \frac{\lambda}{2} = n\lambda$

104. When monochromatic light is incident normally on a non uniform thickness film having very small angle of wedge and refractive index μ then the condition of brightness in reflected light is

a. $2\mu t\cos r = n\lambda$
b. $2t = n\lambda$
c. $2\mu t = n\lambda$
d. $2\mu t + \frac{\lambda}{2} = n\lambda$

105. When the wedge angle of the film increases, the fringe width is

a. Decreased
b. Increased
c. There is no change
d. Increased and then decreased

106. When the wedge angle of the film decreases, the fringe width is

a. Decreased
b. Increased
c. There is no change
d. Increased and then decreased

107. Which of the following light would produce an interference pattern with the largest separation between the bright fringes?

a. Red
b. Orange
c. Green
d. Blue

108. A wedge shaped film produces an interference pattern. It is immersed in a medium of higher refractive index. Then the fringe width will

a. Decrease
b. Increase
c. There will not be any noticeable change
d. The fringes will become invisible and undefined

109. A wedge shaped film is a convenient tool for measuring the diameters of thin wires because

a. The fringe width is directly proportional to the thickness of the wire
b. The fringe width is inversely proportional to the thickness of the wire
c. The fringe width is inversely proportional to thinness of the wire
d. None of the above

110. In case of wedge shaped film, the fringes are produced in a plane defined by
a. Edge of the film and the lower surface of the film
b. Edge of the film and upper surface of the film
c. Upper and lower surface of the film
d. None of the above

111. Colours in the thin films are because of
a. Dispersion
b. Diffraction
c. Interference
d. None of them.

112. When viewed in white light, soap bubbles shows colours because of
a. Scattering
b. Dispersion
c. Interference
d. Diffraction

113. A thin film observed in white light. The colour of thin film seen at a particular point depends upon the
a. Width of the source
b. Distance of the source
c. Location of the observer
d. None of the above

114. Oil floating on water shows coloured fringes due to interference of light. The order of magnitude of thickness of oil film such effect to be visible is
a. 100 A^0
b. 1 mm
c. 1 m
d. 10000 A^0

115. When a monochromatic light falls normally on a thin air film of thickness 5000 A^0. In the interference pattern of reflected light, which wavelength of light will be absent for second order?
a. 5500 A^0
b. 5000 A^0
c. 4000 A^0

d. 5005 A^0

116. When a monochromatic light falls normally on a thin air film of thickness 5000 A^0. In the interference pattern of transmitted light, which wavelength of light will be present for second order?
   a. 4000 A^0
   b. 5000 A^0
   c. 6000 A^0
   d. 7000 A^0

117. When a monochromatic light falls normally on a thin air film of thickness 5000 A^0. In the interference pattern of reflected light, which wavelength of light will be present for second order?
   a. 5500 A^0
   b. 5000 A^0
   c. 4000 A^0
   d. 5005 A^0

118. When a monochromatic light falls normally on a thin air film of thickness 5000 A^0. In the interference pattern of transmitted light, which wavelength of light will be absent for second order?
   a. 4000 A^0
   b. 5000 A^0
   c. 6000 A^0
   d. 7000 A^0

119. When monochromatic light falls on a excessively thin film the in the reflected light the film will appear
   a. Yellow
   b. Dark
   c. White
   d. Blue

120. A thin film having thickness t << λ is seen in white light. It will appear
   a. White
   b. Red
   c. Violet
   d. Black

121. The loss of intensity due to reflection can be reduced substantially by coating the glass surface with a uniform film of optical thickness
   a. $\lambda/2$ and μ less than that of glass

b. $\lambda/_2$ and μ greater than that of glass.
c. $\lambda/_4$ and μ less than that of glass
d. $\lambda/_4$ and μ greater than that of glass.

122. The reflectivity of the glass surface can be enhanced by coating it with a uniform film of optical thickness
a. $\lambda/_2$ and μ less than that of glass
b. $\lambda/_2$ and μ greater than that of glass.
c. $\lambda/_4$ and μ less than that of glass
d. $\lambda/_4$ and μ greater than that of glass.

123. When we test the optical flatness of a glass plate by interference, it is said to be optically flat when
a. Fringe widths are same
b. Fringe widths reduce gradually towards edge of wedge.
c. Fringe widths increase gradually towards edge of wedge.
d. None of above

124. The glass surface can be made completely reflecting for a light of particular wavelength when a thin uniform thickness film is coated on it having refractive index
a. Greater than glass plate
b. Less than glass plate
c. Less than glass plate but greater than air
d. Greater than glass plate but less than air.

125. A thin film of M_gF_2 of refractive index 1.38 is coated on a glass plate. For what thickness of the film the glass surface will become completely reflecting for the light of wavelength 5890 A^0
a. $1.31 \times 10^{-7}m$
b. $2.13 \times 10^{-7}m$
c. $3.21 \times 10^{-7}m$
d. $2.31 \times 10^{-7}m$

126. A thin film of M_gF_2 of refractive index 1.38 is coated on a glass plate. For what thickness of the film the glass surface will become completely non-reflecting for the light of wavelength 5890 A^0
a. $6.012 \times 10^{-7}m$
b. $7.016 \times 10^{-7}m$
c. $1.067 \times 10^{-7}m$
d. $0.076 \times 10^{-7}m$

127. A thin film of M_gF_2 of thickness $1.067 \times 10^{-7} m$ and refractive index 1.38 is coated on a glass plate. The wavelength of
128. light for which the glass plate surface will become completely non-reflective is
   a. 5089 A^0
   b. 5098 A^0
   c. 5980 A^0
   d. 5890 A^0

129. A thin film of M_gF_2 of thickness $2.13 \times 10^{-7} m$ and refractive index 1.38 is coated on a glass plate. The wavelength of light for which the glass plate surface will become completely reflective is
   a. 5089 A^0
   b. 5980 A^0
   c. 5890 A^0
   d. 5098 A^0

130. A thin film of M_gF_2 of thickness $1.083 \times 10^{-7} m$ and refractive index 1.38 is coated on a glass plate. The wavelength of light for which the glass plate surface will become completely reflective is
   a. 5089 A^0
   b. 5980 A^0
   c. 5890 A^0
   d. 5098 A^0

131. In order to see the brightest reflection of light after passing through the film, which of the following must be true?
   a. the thickness of the film must be greater than the wavelength.
   b. the wavelength must be equal to half the thickness of the film
   c. the wavelength must be equal to 4 times the thickness of the film.
   d. the wavelength must be a multiple of twice the thickness of the film.

132. In order to see no reflection of light after passing through the film, which of the following must be true?
   a. the thickness of the film must be greater than the wavelength.
   b. the wavelength must be equal to half the thickness of the film
   c. the wavelength must be equal to quarter the thickness of the film.
   d. the wavelength must be a multiple of twice the thickness of the film.

Qu. No.	Ans	Qu. No.	Ans	Qu. No.	Ans	Qu. No.	Ans	Qu. No.	Ans	Qu. No.	Ans
1	d	26	c	51	c	76	a	101	d	126	c
2	b	27	a	52	a	77	c	102	b	127	d
3	c	28	c	53	c	78	c	103	c	128	c
4	d	29	d	54	c	79	a	104	d	129	b
5	c	30	d	55	a	80	c	105	a	130	b
6	a	31	d	56	b	81	b	106	b	131	c
7	b	32	c	57	c	82	c	107	a	132	
8	c	33	d	58	b	83	b	108	a		
9	a	34	d	59	b	84	d	109	b		
10	b	35	a	60	c	85	a	110	a		
11	d	36	d	61	a	86	b	111	c		
12	d	37	d	62	a	87	b	112	c		
13	b	38	c	63	d	88	d	113	c		
14	c	39	a	64	a	89	a	114	d		
15	d	40	d	65	b	90	c	115	b		
16	a	41	a	66	a	91	c	116	b		
17	d	42	c	67	c	92	b	117	c		
18	b	43	b	68	c	93	c	118	a		
19	b	44	a	69	d	94	c	119	b		
20	d	45	a	70	a	95	b	120	d		
21	d	46	c	71	c	96	a	121	a		
22	c	47	a	72	c	97	a	122	c		
23	b	48	d	73	a	98	b	123	a		
24	c	49	a	74	c	99	d	124	c		
25	d	50	a	75	a	100	c	125	b		

Engineering Physics

Unit - I

MCQs on Polarization of light

1 **The transverse nature of light is shown by**
- A Interference
- B Refraction
- C Polarization
- D Dispersion

2 **Plane polarized light has vibrations of electric vector**
- A In one plane perpendicular to direction of propagation
- B In one plane along the direction of propagation
- C In all planes perpendicular to direction of propagation
- D In two planes perpendicular to direction of propagation

3 **Which of the following cannot be polarized?**
- A Radio waves
- B Sound waves
- C Light waves
- D X-rays

4 **When unpolarized light is converted to polarized light its intensity**
- A is increased
- B remains same
- C is decreased
- D None of these

5 **For complete polarization, light should be**
- A Monochromatic
- B Dichromatic
- C From mercury vapour source
- D None of these

6 **We use sun glasses in the summer season, which acts as a**
- A Polarizer
- B Analyzer
- C Bothe A and B are correct
- D None of these

7 **The device used to produce the polarized light is called as**
- A Analyzer

B Polarizer

C Prism

D None of these

8 In the electromagnetic wave the electric field vibrates in _______________ possible plane/planes perpendicular to the direction of propagation of light.

A one

B two

C three

D all

9 A plane in which, the vibrations of electric vector of a plane polarized light comes is called as

A Plane of polarization

B Plane of vibration

C Plane of polarized vibration

D None of these

10 A plane perpendicular to the plane of vibration is called as

A Plane of polarization

B Plane of vibration

C Plane of polarized vibration

D None of these

11 A plane perpendicular to the vibrations of electric vector of a plane polarized light is called as

A Plane of polarization

B Plane of vibration

C Plane of polarized vibration

D None of these

12 What is the angle between the plane of vibration/oscillation and plane of polarization of the polarized light?

A 0

B $\pi/2$

C $\pi/4$

D π

13 When un-polarized light is incident on the reflecting surface with angle of incident other than polarizing angle, the reflected

light is

A Un-polarized
B Plane polarized
C Partially polarized
D Circularly polarized

14 **When a polaroid is rotated, the intensity of light varies but never reduces to zero. It shows that the incident light is**

A Plane polarized
B Partially polarized
C Unpolarized

15 **The angle of incidence at which maximum polarization occurs is known as**

A Angle of polarization
B Angle of reflection
C Angle of refraction
D Critical angle

16 **When un-polarized light is incident on the reflecting surface with polarizing angle, the reflected light is**

A Un-polarized
B Plane polarized
C Partially polarized
D Circularly polarized

17 **Polarizing angle is,**

A Same for different reflecting surfaces.
B Different for same reflecting surface.
C Different for different reflecting surfaces.
D Circularly polarized

18 **The plane polarized light obtained by reflection has vibrations of electric vector __________ to the reflecting surface.**

A Perpendicular
B Inclined
C Parallel
D None of these

19 **The plane polarized light obtained by reflection has vibrations of electric vector parallel to**

A Plane of paper

B Plane of incident light

C Reflecting surface

D None of these

20 When the light is incident at the polarizing angle on the refracting surface, which of the following is completely polarized?

A Reflected light

B Refracted light

C Both reflected and refracted light

D Neither reflected nor refracted light

21 When un-polarized light is incident on the refracting surface with polarizing angle the reflected light and refracted light are _______________ to each other.

A Perpendicular

B Inclined

C Parallel

22 According to Brewester's law, when un-polarized light is incident on the refracting surface with polarizing angle then the angle between the reflected light and refracted light is,

A 15^0

B 45^0

C 180^0

D 90^0

23 When un-polarized light is incident on the refracting surface with polarizing angle then the reflected light and refracted light is___________ and ___________ respectively.

A Partially and plane polarized

B Plane and partially polarized

C Plane and plane polarize

D Partially and partially polarized

24 The mathematical statement of Brewster's law is

A $\mu = \sin i_p$

B $\mu = \sin r_p$

C $\mu = \tan i_p$

D $\mu = \cos i_p$

25 The refractive index for plastic is 1.25. Calculate the angle of refraction for a light inclined at polarizing angle.

A 36.8

B 38.6

C 34.6

D None of these

26 The refractive index for water is 1.33. The polarizing angle for water is

A 53.06

B 56^0

C 57^0

D 52.06

27 A ray of light strikes a glass plate at an angle of 60°. If the reflected and refracted rays are perpendicular to each other, the index of refraction of glass is

A $\sqrt{(3/2)}$

B 03-Feb

C 01-Feb

D $\sqrt{3}$

28 The method of obtaining plane polarized light by refraction is

A Brewester method

B Malus method

C Piles of plates method

D None of these

29 In the method of obtaining plane polarized light by piles of plates the ____________ beam is converted into plane polarized.

A Refracted

B Reflected

C Diffracted

D Scattered

30 Polarization of natural light by reflection from the surface of glass was discovered in 1808 by

A E. L. Malus

B Sir David Brewster

C Biot

D Erasmus Bartholinus

31 The intensity of the polarized light transmitted by the analyzer varies as a _____________of angle between plane of transmission of polarizer and analyzer".

A Square root of cosine

B Square of sine

C square of cosine

D Square root of sine

32 According to the Malus law, the intensity of polarized light emerging through the analyzer varies as _______ where θ is angle between plane of transmission of polarizer and analyzer.

A $\sin^2\theta$

B $\cos^2\theta$

C $\tan^2\theta$

D $\sec^2\theta$

33 According to the Malus law, the intensity of polarized light emerging through the analyzer is equal to _______ where, I_m is maximum intensity and θ is angle between plane of transmission of polarizer and analyzer.

A $I_m \sin^2\theta$

B $I_m \cos^2\theta$

C $I_m \tan^2\theta$

D $I_m \sec^2\theta$

34 When the crystals are perpendicular to each other, the intensity of the emergent beam from the second crystal is

A Maximum

B Minimum

C Zero

35 When the analyzer is rotated through 360°, one observes

A One extinction and two brightness

B one brightness and two extinctions

C two extinctions and two brightness

D none of the above

36 If the angle between a polarizer and analyzer is 60°. Then the intensity of transmitted light for original intensity of incident light as I is

A 0.25 I_m

B 0.50 I_m

C 0.75 I_m

D 0.125 I_m

37 Two polaroid are adjusted so as to obtain maximum intensity. Through what angle should polaroid be rotated to reduce the intensity to half of its original value?

OR

Two polarizing sheets have polarizing directions parallel so that the intensity of the transmitted light is maximum. Through what angle must either sheet be turned if the intensity is to drop by half ?

A 360

B 180

C 90

D 45

38 Two polarizing sheets have polarizing directions parallel so that the intensity of the transmitted light is maximum. If one of them is turned through angle of 315^0, the intensity of transmitted light reduces to,

A Does not reduces

B Half

C One fourth

D None of these

39 Two polaroids are adjusted so as to obtain maximum intensity. Through what angle should polaroid be rotated to reduce the intensity to one fourth of its original value?

A 360

B 180

C 60

D 45

40 The ratio of intensity of the polarized light transmitted by the analyzer to square of cosine of angle between plane of transmission of polarizer and analyzer is always ,

A Constant

B Not constant

C Less than 1

D None of these

41 In Malus law the intensity of the polarized light transmitted by the analyzer is proportional to square of cosine of angle between plane of transmission of polarizer and analyzer because,

A the cosine component of the intensity of polarized light comes in the plane of analyzer

B the cosine component of the intensity of polarized light comes in the plane of polarizer

C the sine component of the intensity of polarized light comes in the plane of analyzer

D None of these

42 The intensity of light incident on a polarizer is I, and that of the light emerging from it is also I. What is the nature of light incident on the polarizer?

A Polarized

B Unpolarized

C Partially polarized

D Circularly polarized

43 When a beam of un-polarized light is incident upon a crystal such as calcite then the beam on entering the crystal get split up into two components, both are

A unpolarized

B Plane polarized

C Partially polarized

D Circularly polarized

44 **When a beam of un-polarized light is incident upon a crystal such as calcite then the beam on entering the crystal get split up into _______ plane polarized beam of light.**

A one

B two

C three

D four

45 **When a beam of un-polarized light is incident upon a crystal such as calcite then the beam on entering the crystal get split up into two plane polarized beam of light having their planes of vibrations_____________ to each other**

A parallel

B anti-parallel

C perpendicular

D not parallel

46 **When a beam of un-polarized light is incident upon a crystal such as calcite, then the beam on entering the crystal get split up into two plane polarized beam of light having their planes of vibrations mutually perpendicular to each other . This phenomenon is known as**

A Polarization by refraction

B Polarization by double reflection

C Polarization by reflection

D Polarization by double refraction

47 **The chemical name of the calcite crystal is**

A hydrated calcium carbonate

B hydrated sodium carbonate

C hydrated aluminium carbonate

D none of tthese

48 **The structure of calcite-crystal is**

A Rectangular

B Rhombohedra

C Triangular

D parallelepiped

49 **In the structure of calcite the line joining**

the two blunt corners of the crystal gives

A Direction of its central axis

B Direction of its optic axis

C Direction of its principle axis

D None of these

50 In the calcite crystal the number of optic axis is

A one

B two

C three

D infinite

51 At blunt corner all the sides are making ____________angle with each other.

A acute

B obtuse

C right

D None of these

52 In calcite structure all acute and obtuse angles are _____ and _____ respectively.

A 71^0 and 109^0

B 109^0 and 71^0

C 68^0 and 112^0

D 69^0 and 111^0

53 A plane containing the optic axis and perpendicular to the opposite faces of the crystal is called the

A vibration plane

B principle plane

C optic axis

D None of these

54 A rotating calcite crystal is placed over an ink dot. On seeing through the crystal, one finds

A two stationary dots

B two dots moving along straight lines

C one dot rotating about the other

55 The examples of double refracting crystals are

A Calcite

B quartz

C Tourmaline

56 In case of positive crystals,

A The velocity of ordinary ray is less than velocity of extraordinary ray

B The velocity of ordinary ray is equal to velocity of extraordinary ray

C The velocity of ordinary ray is greater than velocity of extraordinary ray

D The velocity of extraordinary ray is greater than velocity of ordinary ray

57 In case of negative crystals,

A The velocity of ordinary ray is less than velocity of extraordinary ray

B The velocity of ordinary ray is equal to velocity of extraordinary ray

C The velocity of ordinary ray is greater than velocity of extraordinary ray

D The velocity of extraordinary ray is greater than velocity of ordinary ray

58 Huygen explained the phenomenon of double refraction on the basis of

A Primary wavelets

B Secondary wavelets

C Circular wavelets

D Cylindrical wavelets

59 When light is incident on the doubly refracting crystal perpendicular to the optic axis of the crystal then

A The O- and E- ray travel in different directions with same velocity

B The O- and E- ray travel in same directions with same velocity

C The O- and E- ray travel in different directions with different velocity

D The O- and E- ray travel in same directions with different velocity

60 When light is incident on the doubly refracting crystal parallel/along to the optic axis of the crystal then

A The O- and E- ray travel in different directions with same velocity

B The O- and E- ray travel in same

directions with same velocity

C The O- and E- ray travel in different directions with different velocity

D The O- and E- ray travel in same directions with different velocity

61 When light is incident on the doubly refracting crystal normally such that the optic axis is inclined to the crystal surface then

A The O- and E- ray travel in different directions with same velocity

B The O- and E- ray travel in same directions with same velocity

C The O- and E- ray travel in different directions with different velocity

D The O- and E- ray travel in same directions with different velocity

62 When light is incident on the doubly refracting crystal along the optic axis of the crystal then O ray and E ray

A Does not split up and travels with different velocity.

B Does not split up and travels with same velocity.

C Split up into two component and travels with different velocity

D Split up into two component and travels with same velocity

63 When light is incident on the doubly refracting crystal perpendicular to optic axis of the crystal then O ray and E ray

A Does not split up and travels with different velocity.

B Does not split up and travels with same velocity.

C Split up into two component and travels with different velocity

D Split up into two component and travels with same velocity

64 When light is incident normally on the doubly refracting crystal such that the surface on which light is incident is cut perpendicular to its optic axis then O ray and E ray

A Does not split up and travels with different velocity.
B Does not split up and travels with same velocity.
C Split up into two component and travels with different velocity
D Split up into two component and travels with same velocity

65 When light is incident normally on the doubly refracting crystal such that the surface on which light is incident is cut parallel to its optic axis then O ray and E ray
A Does not split up and travels with different velocity.
B Does not split up and travels with same velocity.
C Split up into two component and travels with different velocity
D Split up into two component and travels with same velocity

66 In double refraction we get two refracted rays called O-ray and E- ray. Which of the following statements is true?
A only the O-ray is polarized
B only the E-ray is polarized
C both O and E rays are polarized
D neither O-ray nor E-ray is polarized

67 For a double refracting crystal, the refractive indices for the ordinary and extraordinary rays are denotted by μ_0 and μ_e. Which of the following relations is valid along the optical axis of the crystal?
A $\mu_0 = \mu_e$
B $\mu_0 \leq \mu_e$
C $\mu_0 < \mu_e$
D $\mu_0 > \mu_e$

68 If μ_0 and μ_e be the refractive indices of the doubly refracting crystal for O-ray and E-ray respectively then for the negative crystal which of the following relations is correct?

A $\mu_0 = \mu_e$

B $\mu_0 \leq \mu_e$

C $\mu_0 < \mu_e$

D $\mu_0 > \mu_e$

69 If μ_0 and μ_e be the refractive indices of the doubly refracting crystal for O-ray and E-ray respectively then for the positive crystals which of the following relations is correct?

A $\mu_0 = \mu_e$

B $\mu_0 \leq \mu_e$

C $\mu_0 < \mu_e$

D $\mu_0 > \mu_e$

70 The O-ray travels with the same velocity '*v_o*' in all directions and hence according to Huygen the corresponding wave front is

A Ellipsoid

B Spherical

C Cylindrical

D None of these

71 The E-ray travels with the different velocity '*v_e*' in different directions and hence according to Huygen the corresponding wave front is

A Ellipsoid

B Spherical

C Cylindrical

D None of these

72 In the doubly refracting crystals, the O-ray travels with the same velocity '*v_o*' in all directions therefore its refractive index for O ray is _________ in all directions.

A Different

B Same

C Changes

D None of these

73 In the doubly refracting crystals, the E-ray travels with the different velocity '*v_e*' in all directions therefore its refractive index for E ray is _________ in all directions.

A Different

B Same

C Changes

D None of these

74 In a doubly refracting crystal the ratio of velocities of E – ray in two different directions is 10:9, then the ratio of the refractive indices of that crystal for that ray is

A 100:81

B 81:100

C 9:10

D 10:09

75 In a doubly refracting crystal the ratio of its refractive indices for E – ray in two different directions is 10:9, then the corresponding ratio of the velocities of that ray is

A 100:81

B 81:100

C 9:10

D 10:09

76 In a doubly refracting crystal if O-ray and E-ray are travelling along the same direction but the velocity of E-ray is greater than that of O-ray then the crystal is

A Positive

B Negative

C Both A and B correct

D None of these

77 In a doubly refracting crystal if O-ray and E-ray are travelling along the same direction but the velocity of E-ray is greater than that of O-ray then

A The light is incident along the optic axis and the crystal is negative.

B The light is incident along the optic axis and the crystal is positive

C The light is incident perpendicular to the optic axis and the crystal is negative.

D The light is incident perpendicular to the optic axis and the crystal is positive.

78 In a doubly refracting crystal if O-ray and E-ray are travelling along the same direction but the velocity of E-ray is less than that of O-ray then

A The light is incident along the optic axis and the crystal is negative.

B The light is incident along the optic axis and the crystal is positive

C The light is incident perpendicular to the optic axis and the crystal is negative.

D The light is incident perpendicular to the optic axis and the crystal is positive.

79 In a doubly refracting crystal if O-ray and E-ray are travelling along the same direction and same velocity then

A The light is incident along the optic axis and the crystal is negative.

B The light is incident along the optic axis and the crystal is positive

C The light is incident along the optic axis and the crystal is negative or positive

D The light is incident perpendicular to the optic axis and the crystal is negative or positive.

80 In a doubly refracting crystal if O-ray and E-ray are travelling along the same direction and but with different velocity then

A The light is incident along the optic axis and the crystal is negative.

B The light is incident along the optic axis and the crystal is positive

C The light is incident along the optic axis and the crystal is negative or positive

D The light is incident perpendicular to the optic axis and the crystal is negative or positive.

81 **In a doubly refracting crystal if O-ray and E-ray are travelling along the same direction and with same velocity then**

A The light is incident perpendicular to the optic axis and the crystal is negative.

B The light is incident perpendicular to the optic axis and the crystal is positive

C The light is incident perpendicular to the optic axis and the crystal is negative or positive

D None of these

Engineering Physics
Unit III - Polarization and Laser - Answer Key

Que No.	Ans	Que No.	Ans	Que No.	Ans										
1.	C	34.	C	67.	A										
2.	A	35.	C	68.	D										
3.	B	36.	A	69.	C										
4.	C	37.	D	70.	B										
5.	A	38.	B	71.	A										
6.	A	39.	C	72.	B										
7.	B	40.	A	73.	A										
8.	D	41.	A	74.	C										
9.	B	42.	A	75.	C										
10.	A	43.	B	76.	B										
11.	A	44.	B	77.	C										
12.	B	45.	C	78.	D										
13.	C	46.	D	79.	C										
14.	B	47.	A	80.	D										
15.	A	48.	B	81.	D										
16.	B	49.	B												
17.	C	50.	D												
18.	C	51.	B												
19.	C	52.	A												
20.	A	53.	B												
21.	A	54.	C												
22.	D	55.	D												
23.	B	56.	C												
24.	C	57.	D												
25.	B	58.	B												

26.	**A**	**59.**	**D**										
27.	**D**	**60.**	**B**										
28.	**C**	**61.**	**C**										
29.	**A**	**62.**	**B**										
30.	**A**	**63.**	**A**										
31.	**C**	**64.**	**B**										
32.	**B**	**65.**	**A**										
33.	**B**	**66.**	**C**										