OPTICS

1. **The refractive index of a material of a plane concave lens is 5/3, the radius of curvature is 0.3m. The focal length of the lens in air is**

   1) -0.45 m   2) – 0.6 m   3) – 0.75 m   4) –1.0 m

2. **The refractive index of the material of a double convex lens is 1.5 and its focal length is 5 cm. If the radio of curvature are equal, the value of the radius of curvature (in cm) is**

   1) 5.0   2) 6.5   3) 8.0   4) 9.5

3. **The two surfaces of a biconvex lens has same radii of curvatures. This lens is made of glass of refractive index 1.5 and has a focal length 10 cm in air. The lens is cut into two equal halves along a plane perpendicular to its principal axis to yield two plano convex lenses. The two pieces are glued such that he convex surface touch each other. If this combination lens is immersed in water (refractive index = 4/3), its focal length (in cm) is**

   1) 5   2) 10   3) 20   4) 40

4. **Dispersive power depends on the following:**

   1) material of the prism   2) shape of the prism

   3) size of the prism   4) size, shape and material of the prism

5. **Assertion (A): Propagation of light through an optical fibre is due to total internal reflection taking place at the core-clad interface.**

   Reason (R): Refractive index of the material of the core of the optical fibre is greater than that of air.

   1) Both A and R are true and R is the correct explanation of A

   2) Both A and R are true and R is not the correct explanation of A

   3) A is true but R is false

   4) A is false but R is true

6. **The focal length of an equi-convex lens is greater than the radius of curvature of any of the surfaces. Then the refractive index of the material of the lens is**

   1) greater than zero but less than 1.5   2) greater than 1.5 but less than 2.0

   3) greater than 2.0 but less than 2.5   4) greater than 2.5 but less than 3.0

7. The refraction angle of a prism is A and the refractive index of the material of the prism is cot(A/2). The angle of minimum deviation of the prism is :

1) $\pi + 2A$ 2) $\pi - 2A$ 3) $\frac{\pi}{2} + A$ 4) $\frac{\pi}{2} - A$

8. The principal section of a glass prism is an isosceles triangle ABC with AB =AC. The face AC is silvered. A ray of light is incident normally on the face AB and after two reflections; it emerges from the base BC perpendicular to the base. Angle BAC of the prism is

1) 30° 2) 36° 3) 60° 4) 72°

9. A ray of light is incident on the hypotenuse of a right-angled prism after travelling parallel to the base inside the prism. If μ is the refractive index of the material of the prism, the maximum value of the base angle for which light is totally reflected from the hypotenuse is

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

10. A prism of refractive index μ and angle A is placed in the minimum deviation position. If the angle of minimum deviation is A, then the value of A in terms of μ is

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

11. A convex lens of focal length 0.15 m is made of a material of refractive index 3/2. When it is placed in a liquid, its focal length is increased by 0.225m. The refractive index of the liquid is

1) $\frac{7}{4}$ 2) $\frac{5}{4}$ 3) $\frac{9}{4}$ 4) $\frac{3}{2}$

12. A prism is made up of material of refractive index $\sqrt{3}$. The angle of the prism is A°. If the angle of minimum derivation is equal to the angle of the prism, then the value of A is

1) 30° 2) 45° 3) 60° 4) 75°

13. In the visible region the dispersive powers and the mean angular deviations for crown and flint glass prism ω, ω' are d, d' respectively. The condition for getting dispersion with zero deviation, when the two prisms are combined is

1) $\sqrt{\omega d} + \sqrt{\omega' d'} = 0$ 2) $\omega' d +, \omega d' = 0$ 3) $\omega d + \omega' d' = 0$ 4) $(\omega d)^2 + (\omega' d')^2 = 0$

14. One face of the glass prism is silver polished. A light ray falls at an angle of 45° on the other face. After reflection it is subsequently reflected from the silvered face and then retraces its path. The refracting angle of the prism is 30°. The refractive index of the prism is

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

15. When a glass prism of refracting angle 60° is immersed in a liquid its angle of minimum deviation is 30°. The critical angle of glass with respect to the liquid medium is

1) 42° 2) 45° 3) 50° 4) 52°

16. In a compound microscope cross wires are fixed at the point:

1) Where the image is formed by the objective

2) Where the image is formed by the eye –piece

3) Where the focal point of the objective lies

4) Where the focal point of the eye-piece lies

17. Under minimum deviation condition in a prism, if a ray is incident at an angle 30°, the angle between the emergent ray and the second refracting surface of the prism is : (Angle of the prism = 60°)

1) 0° 2) 30° 3) 45° 4) 60°

18. The focal length of the lenses of an astronomical telescope is 50 cm and 5 cm. The length of the telescope when the image is formed at the least distance of distinct vision is

1) 45 cm 2) 55 cm 3) 275/6 m 4) 325/6 cm

19. A glass slab of thickness 8 cms contains the same number of waves as 10 cm long path of water when both are traversed by the same monochromatic light. If the refractive index of water is 4/3., the refractive index of glass is:

1) $\frac{5}{3}$ 2) $\frac{5}{4}$ 3) $\frac{16}{15}$ 4) $\frac{3}{2}$

20. Solar spectrum is an example of

1) line emission spectrum 2) band absorption spectrum

3) line absorption spectrum 4) continuous emission spectrum

21. **The velocities of light in two different mediums are** $2\times10^{8}ms^{-1}$ **and** $2.5\times10^{8}ms^{-1}$ **respectively . The critical angle for these medium is**

1) $\sin^{-1}\left(\frac{1}{5}\right)$ 2) $\sin^{-1}\left(\frac{4}{5}\right)$ 3) $\sin^{-1}\left(\frac{1}{2}\right)$ 4) $\sin^{-1}\left(\frac{1}{4}\right)$

22. **A diverging meniscus lens of 1.5 refractive index has concave surfaces of radii 3 and 4 cm. The position of the image if an object is placed 12 cm in front of the lens is**

1) 7 cm 2) –8 cm 3) 9 cm 4) 10 cm

23. **A light ray is travelling between two media as given below. The angle of incidence on the boundary in all the cases is 30°. Identify the correct sequence of increasing order of angles of refraction**

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

24. **If the focal length of a double convex lens for red light is f_R, its focal length for the violet light is**

1) f_R 2) greater than f_R 3) less than f_R 4) $2f_R$

25. **A thin equiconvex lens is made of glass of refractive index 1.5 and its focal length is 0.2m. If it acts as a concave lens of 0.5 m focal length when dipped in a liquid, the refractive index of liquid is**

1) $\frac{17}{8}$ 2) $\frac{15}{8}$ 3) $\frac{13}{8}$ 4) $\frac{9}{8}$

26. **The phenomenon used in optical fibres for transmission of light energy is**

1) Total internal reflection 2) Scattering

3) Diffraction 4) Refraction

27. **A converging crown glass lens has a focal length 20 cm for the violet rays. Its focal lengths for red rays is (given** $\mu_r = 1.53, \mu_v = 1.56$ **)**

1) 20.82 cm 2) 21.13 cm 3) 22.85 cm 4) 24.85cm

28. **Fraunhofer lines are due to**

1) the diffraction effects in the atmosphere

2) the absorption of Sun's radiation by the earth's atmosphere

3) the absorption of Sun's radiation by the Sun's atmosphere

4) the characteristic emission of Sun's radiation

29. When a ray of light is incident normally on one refracting surface of an equilateral prism [Refractive index of the material of the prism is 1.5]

1) Emerging ray is deviated by 30°

2) Emerging ray is deviated by 45°

3) Emerging ray just grazes the second refracting surface

4) The ray undergoes total internal reflection at the second refracting surface

30. In a compound microscope the focal lengths of two lenses are 1.5 cm and 6.5 cm. If an object is placed at 2 cm from objective and the final image is formed at 25 cm from eye lens, the distance between the two lenses is

1) 6.00 cm 2) 7.75 cm 3) 9.25 cm 4) 11.00 cm

31. In the Young's double slit experiment the intensities at two points P_1 and P_2 on the screen are respectively I_1 and I_2. If P_1 is located at the centre of bright fringe and P_2 is located at a distance equal to a quarter of fringe width from P_1, then I_1/I_2 is

1) 2 2) 1/2 3) 4 4) 16

32. In Young's double slit experiment, the 10^{th} maximum of wavelength λ_1 is at a distance of y_1 from the central maximum. When the wavelength of the source is changed to λ_2, 5^{th} maximum is at a distance of y_2 from its central maximum. The ratio (y_1 / y_2) is

1) $\frac{2\lambda_1}{\lambda_2}$ 2) $\frac{2\lambda_2}{\lambda_1}$ 3) $\frac{\lambda_1}{2\lambda_2}$ 4) $\frac{\lambda_2}{2\lambda_1}$

33. Four light sources produce the following four waves:

i) $y_1 = a\sin(\omega t + \phi)$ ii) $y_2 = a\sin 2\omega t$

iii) $y_3 = a'\sin(\omega t + \phi)$ iv) $y_4 = a'\sin(3\omega t + \phi)$

Superposition of which two waves give rise to interference

1) (i) and (ii) 2) (ii) and (iii) 3) (i) and (iii) 4) (iii) and (iv)

34. In Young's double slit experiment, first slit has width four times the width of the second slit. The ratio of the maximum intensity to the minimum intensity in the interference fringe system is

1) 2 : 1 2) 4 : 1 3) 9 : 1 4) 8 : 1

35. A light ray of wavelength λ is passing through a pin hole of diameter 'D' and the effect is observed on a screen placed at a distance 'L' from the pin hole. The approximations of geometrical optics are applicable if

1) $D \le 1$ 2) $\frac{L\lambda}{D^2} = 1$ 3) $\frac{L\lambda}{D^2} << 1$ 4) $\frac{L\lambda}{D^2} >> 1$

36. In Young's double slit experiment, an interference pattern is obtained on a screen by a light of wavelength 6000 A° coming from the coherent sources S_1 and S_2. At certain point P on the screen third dark fringe is formed. Then the path difference $S_1P - S_2P$ in microns is

1) 0.75 2) 15 3) 3.0 4) 4.5

37. In Young's double slit interference experiment the wave-length of light used is 6000A°. If the path difference between waves reaching a point P on the screen is 1.5 microns, then at that point P.

1) Second bright band occurs 2) Second dark band occurs

3) Third dark band occurs 4) Third bright band occurs

38. Light waves producing interference have their amplitudes in the ratio 3: 2. The intensity ratio of maximum and minimum of interference fringes is

1) 36: 1 2) 9 : 4 3) 25 : 1 4) 6 : 4

39. Two light beams produce interference pattern to give maxima and minima on the screen. If the intensities of the light beams are in the ratio of 9: 4, then the ratio of intensities of maxima and minima is

1) 3: 2 2) 5 :1 3) 25 : 1 4) 9 :1

40. Wave theory cannot explains the phenomena of

A) Polarization B) Diffraction

C) Compton effect D) Photoelectric effect

Which of the following is correct?

1) A and B 2) B and D 3) C and D 4) D and A

41. In Young's double slit experiment using two identical slits, the intensity at a bright fringe on the screen is 1. If one of the slits is now closed, the intensity of the same bright fringe on the screen will be

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

42. **Two coherent monochromatic light sources are located at two vertices of an equilateral triangle. If the intensity due to each of the sources independently is 1 Wm^{-2} at the third vertex the resultant intensity due to both the sources at that point (i.e., at the third vertex) is (in Wm^{-2})**

1) Zero 2) $\sqrt{2}$ 3) 2 4) 4

43. **When two coherent monochromatic light beams of intensities I and 4I are super imposed, the ratio between maximum and minimum intensities in the resultant beam is**

1) 9 : 1 2) 1 : 9 3) 4 : 1 4) 1 : 4

44. **In an interference, the intensity of two interfering waves are I and 4I respectively. They produce intensity at two points A and B with phase angle of $\pi/2$ and π respectively. Then difference in between them is**

1) I 2) 2I 3) 4I 4) 5I

45. **In a single slit diffraction with $\lambda = 500$ nm and a lens of diameter 0.1 mm then width of central maxima, obtain on screen at a distance of 1m will be**

1) 5mm 2) 1 mm 3) 10 mm 4) 2.5 mm

46. **Two lens of focal lengths -20 cm and +10 cm are put in combination, find the power of the combination.**

1) - 1 D 2) - 2 D 3) + 5 D 4) + 2 D

47. **A far sighted person has his near point 50 cm; find the power of lens he should use to see at 25 cm, clearly**

1) +1 D 2) +2 D 3) -2 D 4) -1 D

48. **A boy is trying to start a fire by focusing sunlight on a piece of paper using an equiconvex lens of focal length 10cm. The diameter of the sun is $1.39\text{x}10^{9}$ m and its mean distance from the earth is 1.5 $\text{x}10^{11}$ m. What is the diameter of the sun's image on the paper?**

1) 6.5 $\text{x}10^{-5}$ m 2) 12.4 $\text{x}10^{-4}$ m 3) 9.2 $\text{x}10^{-4}$ m 4) 6.5 $\text{x}10^{-4}$ m

49. **Two thin lenses of focal lengths f_1 and f_2 are in contact and coaxial. The power of the combination is**

1) $\frac{f_1+f_2}{2}$ 2) $\frac{f_1+f_2}{f_1 f_2}$ 3) $\sqrt{\frac{f_1}{f_2}}$ 4) $\sqrt{\frac{f_2}{f_1}}$

50. **A ray of light passes from vacuum into a medium of refractive index μ. If the angle of incidence is found to be twice the angle of refraction, then the angle of incidence is**

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

51. **Light passes through a glass plate with parallel sides and thickness d. If i and r are the angels of incidence and refraction, then the lateral displacement is**

1) dsin (i–r) 2) $\frac{d}{\cos r}$ 3) $\frac{d\sin(i-r)}{\cos r}$ 4) dtanr

52. **The critical angle of light passing from glass to air is minimum for**

1) red 2) green 3) yellow 4) violet

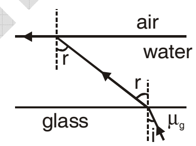
53. **An optical fibre (μ=1.72) is surrounded by a glass coating (μ=1.5). The critical angle for total internal reflection at the fibre-glass interface is**

1) 30° 2) 60° 3) $\sin^{-1}\left(\frac{75}{86}\right)$ 4) $\sin^{-1}\left(\frac{86}{75}\right)$

54. **If the length of the day on earth is defined as the time interval between the sunrise and sunset, how will the day be affected if earth loses its atmosphere?**

1) remains the same 2) increases 3) decreases 4) may increase or decrease

55. **A ray of light is incident a glass-water interface at an angle i. It emerges finally parallel to the surface of water. Then the value of μ_g would be**



1) (4/3) sini 2) 1/sini 3) 4/3 4) 1

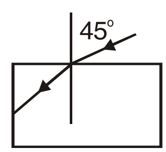
56. **Just before the time of sun-set, the sun appears to be elliptical because**

1) the sun changes the shape at that time 2) of the scattering of light
3) of the effects of refraction 4) of the effects of reflection and refraction

57. **When the moon is near the horizon, it appears bigger. This is due to**

1) atmospheric refraction 2) scattering of the light
3) diffraction 4) optical illusion

58. **A light ray falls on a square glass slab as shown in the figure, making an angle of incidence 45°. What must be refractive index of the glass if total internal reflection occurs at the vertical face?**



1) $\sqrt{1.5}$ 2) $\sqrt{2/3}$ 3) 1.5 4) $\sqrt{2}$

59. **Planets do not twinkle like stars because**

1) they are very near to earth 2) they are non-luminous bodies
3) there is no atmosphere on planets 4) they are far away from earth

60. **For an astronaut sky appears**

1) black 2) blue 3) red 4) white

61. **Sky appears blue due to**

1) Refraction 2) scattering 3) dispersion 4) diffraction

62. **Lens maker's formula is applicable for**

a) thin lenses b) thick lenses c) paraxial rays d) marginal rays

1) "a" only correct 2) a & b correct

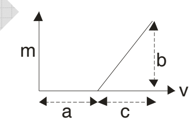
3) "a" and "c" are correct 4) "a" and "d" are correct

63. **If the behaviour of light rays through a convex lens is as shown in the figure, then**
1) $\mu_1 = \mu_2$ 2) $\mu_1 < \mu_2$ 3) $\mu_1 > \mu_2$ 4) $\mu_1 \le \mu_2$

64. **The following figure shows three arrangements of thin lenses. The radii of curvature of all the curved surfaces are the same. The ratio of the equivalent focal lengths of the combination P, Q and R is**

1) 1:1:1 2) 1:1:-1 3) 2:1:1 4) 2:1:2

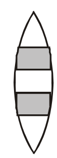
65. **The graph shows how the magnification m produced by a thin convex lens varies with the image distance v. What was the focal length of the lens used?**



1) b/c 2) b/ca

3) bc/a 4) c/b

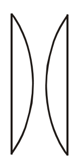
66. **A layered lens as shown in the figure is made of two materials indicated by different shades. A point object is placed on its axis. The lens will form**



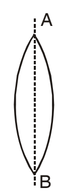
1) one image 2) two images

3) five images 4) three images

67. **If the space between the two thin lenses (shown in the figure) is filled with water, the focal length and power of the system respectively**
1) decreases, increases
2) decreases, remains same
3) increases, remains same
4) increases, decreases



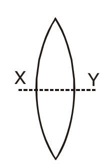
68. **An equiconvex lens of focal length f is cut into two halves by a plane AB as shown in the figure. The focal length of each half is**



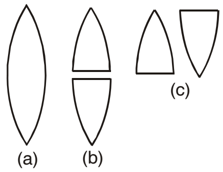
1) 2f 2) f

3) f/2 4) zero

69. **An equiconvex lens of focal length is cut into two halves by a plane XY as shown in the figure. The focal length of each half is**
1) zero 2) f/2 3) f 4) 2f

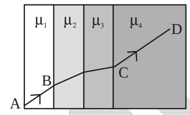


70. **A thin equiconvex lens (a) has a focal length f and power P. It is cut into two symmetrical halves (b) by a plane containing the principal axis. The two pieces are recombined as shown in figure (c). The power of the new combination is**



1) P 2) P/2 3) 2P 4) zero

71. **A ray of light passes through four transparent media with refractive indices μ_1, μ_2, μ_3 and μ_4 as shown in the figure. The surfaces of all media are parallel. If the emergent ray CD is parallel to the incident ray AB, we must have**



1) $\mu_1 = \mu_2$ 2) $\mu_2 = \mu_3$

3) $\mu_3 = \mu_4$ 4) $\mu_4 = \mu_1$

72. **In Young's double slit experiment, the distance between two slits is made three times then the fringe width will become**

1) 9 times 2) 1/9 times 3) 3 times 4) 1/3 times

73. **The two coherent light sources will produce constructive interference if they differ in phase by**

1) 2π 2) $\pi/2$ 3) $3\pi/2$ 4) $5\pi/2$

74. **The two coherent sources of intensity ratio 2:8 produce an interference pattern. The values of maximum and minimum intensities will be respectively**

1) I and $9I_1$ 2) $9I_1$ and I_1 3) $2I_1$ and $8I_1$ 4) $8I_1$ and $2I_1$

75. **In a double slit experiment the intensity of each wave producing interference is I_0. Then the resultant intensity I will be**

1) $4I_0 \cos^2\frac{\phi}{2}$ 2) $4I_0 \sin^2\frac{\phi}{2}$ 3) $4I_0 \tan^2\frac{\phi}{2}$ 4) $2I_0 \cos^2\frac{\phi}{2}$

76. **The correct formula for fringe visibility is**

1) $V=\frac{I_{max}-I_{min}}{I_{max}+I_{min}}$ 2) $V=\frac{I_{max}+I_{min}}{I_{max}-I_{min}}$ 3) $V=\frac{I_{max}}{I_{min}}$ 4) $V=\frac{I_{min}}{I_{max}}$

77. **In Young's double slit experiment with monochromatic light the central fringe will be**

1) coloured 2) white 3) bright 4) black

78. **In the phenomenon of interference, energy is**

1) destroyed at bright fringes 2) created at dark fringes

3) conserved, but it is redistributed 4) same at all points

79. **In Young's double slit experiment if the maximum intensity of light is I_{max} then the intensity at path difference $\lambda/2$ will be**

1) I_{max} 2) $I_{max}/2$ 3) $I_{max}/4$ 4) zero

80. **The fringe width for red colour as compared to that for violet colour is approximately**

1) three times 2) double 3) four times 4) eight times

81. **When a thin film of thickness t is placed in the path of light wave merging out of S_1 then increase in the length of optical path will be**

1) $(\mu-1)t$ 2) $(\mu+1)t$ 3) μt 4) μ/t

82. In Young's double slit experiment the distance of m[th] dark fringe from central fringe will be

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

83. On using red light (λ=6600 Å) in Young's double slit experiment, 60 fringes are observed in the field of view. If violet light (λ=4400 Å) is used, the number of fringes observed will be

1) 30 2) 60 3) 90 4) 120

84. In Young's double slit experiment, if the monochromatic source of light is replaced by white light, then one sees

1) no interference fringe pattern 2) coloured fringes

3) black and white fringes

4) white central fringe surrounded by a few coloured fringes on either side

85. The fringe pattern observed in a Young's double slit experiment is

1) a diffraction pattern
2) an interference pattern
3) a combination of diffraction and interference patterns

4)neither a diffraction nor an interference pattern

86. For constructive interference to take place between two monochromatic light waves of wavelength λ, the path deference should be

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

87. In Young's double slit experiment, the technique used is, division of

1) amplitude 2) wave front 3) light rays 4) particles

88. 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

1) 5λ 2) $3\lambda/4$ 3) 2λ 4) $11\lambda/2$

89. A Young's double slit experiment is performed with white light

a) The central fringe will be white

b) There will not be a completely dark fringe

c) The fringe next to the central will be red

d) The fringe next to the central will be violet

1) a and d are correct 2) a and c are correct

3) a, b and d are correct 4) a, b and c are correct

90. The fringes produced in diffraction pattern are of

1) equal width
2) unequal width
3) all dark fringes of zero intensity
4) all bright fringes of equal intensity

91. The position of minima in the diffraction pattern due to a single slit are expressed by the formula

1) $d\sin\theta = n\lambda$
2) $d\sin\theta = (2n+1)\frac{\lambda}{2}$
3) $d\sin\theta = \frac{n\lambda}{2}$
4) $d\sin\theta = (2n-1)\frac{\lambda}{2}$

92. **The diffraction effect of light expresses that**
1) light is transverse wave motion
2) light is wave motion
3) light is longitudinal wave motion
4) light has quantum nature

93. **The size of the obstacle in order to observe diffraction of light must be**
1) of an1y order
2) of the order of wavelength
3) much larger than wavelength
4) much smaller than wavelength

94. **In the diffraction pattern due to single slit, in the direction of $\theta = 0$ we get**
1) first secondary minimum
2) central maximum
3) first secondary maximum
4) second secondary maximum

95. **The fringe width in single slit diffraction pattern is proportional to**
1) $\frac{\alpha}{\lambda}$
2) $\frac{\lambda}{d}$
3) $d\lambda$
4) λ

96. **Te phenomenon of diffraction can be treated as interference phenomenon if the number of coherent sources is**
1) one
2) two
3) zero
4) infinity

97. **In order to raise the resolving power of the electron microscope we should**
1) retard the electron
2) increase the de-Broglie wavelength of the electron
3) accelerate the electron through low potential
4) accelerate the electron through high potential

98. **Let'd' is the size of the obstacle or aperture, and λ is the wavelength of light. If d $\approx \lambda$, then**
1) geometrical shadow of obstacle appears
2) reflection occurs
3) diffraction occurs
4) none of these occurs

99. In propagation of light waves, the angle between the plane of vibration and the plane of polarization is
1) 0°
2) 90°
3) 45°
4) 180°

100. In the propagation of electromagnetic waves, the angle between the direction of propagation and plane of polarisation

1) 0° 2) 45° 3) 90° 4) 180°

101. Polarisation of light proves of light

1) Corpuscular nature of light
2) quantum nature of light
3) transverse wave nature of light
4) longitudinal saves nature of light

102. An unpolarised light is incident upon a glass plate of refractive index 1.54 at Brewster's angle and gets completely plane polarised. The angle of polarisation (given tan 57° = 1.54) is

1) 57° 2) 46° 3) 33° 4) 82°

103. For a surface, the polarizing angle is 57°. The angle of incidence so that reflected light is plane polarised is

1) 127° 2) 90° 3) 47° 4) 57°

104. The property of certain substances by virtue of which they rotate the plane of polarisation of a plane polarised light is known as

1) Optical activity 2) Malu's law 3) Brewster's law 4) specific rotation

105. If the polarizing angle for a medium is 45°, the refracting angle is

1) 45° 2) 55° 3) 135° 4) 60°

106. Polarising angle is 60°. The angle of refraction for that medium is

1) 60° 2) 45° 3) 30° 4) 90°

107. The one that cannot be polarised is

1) electromagnetic waves

2) ultra violet rays

3) infra and rays

4) ultrasonic waves

108. The angle between plane of polarization and direction of propagation of light is

1) 0° 2) 45° 3) 60° 4) 90°

109. Polarizing angle is 60°. The angle of refraction for that medium is

1) 60° 2) 45° 3) 30° 4) 90°

110. If the critical angle is 45°, the polarizing angle is

1) 45° 2) $\tan^{-1}(1/\sqrt{2})$ 3) $\tan^{-1}(\sqrt{2})$ 4) $\tan^{-1}(2\sqrt{2})$

111. A plane which contains the optic axis and is perpendicular to two opposite faces is called

1) plane of incidence 2) principal section
3) plane of vibration 4) plane of polarization

112. Consider the following statement A and B and identify the correct answer:

A : Polarized light can be used to study the helical structure of nucleic acids

B: Optic axis is a direction and not any particular line in the crystal

1) A and B are correct 2) A and B are wrong

3) A is correct and B is wrong 4) A is wrong and B is correct

113. Read the following and choose the correct answer.

a) Critical angle is maximum for red and minimum for violet

b) Velocity of light is minimum for red and maximum for violet in a medium

c) Velocity of light is maximum for red and minimum for violet in a medium.

d) In vacuum all the colours travel with same speed

1) a and c are true 2) a, b and d are true 3) a, c, d are true 4) b, c, d are true

114. Four different independent waves are represented by

i) $y_1 = a_1 \sin \omega t$, ii) $y_2 = a_2 \sin \omega t$, iii) $y_2 = a_3 \sin \omega t$, iv) $y_4 = a_4 \sin\left(\omega t + \frac{\pi}{3}\right)$

1) in (i) and (iii)

2) in (i) and (iv)

3) in (iii) and (iv)

4) not possible with any combination

115. Four light waves are represented by

i) $y = a_1 \sin \omega t$ ii) $y = a_2 \sin(\omega t + \varepsilon)$ iii) $y = a_1 \sin 2\omega t$ iv) $y = a_2 \sin 2(\omega t + \varepsilon)$

Interference fringes may be observed due to superposition of

1) i and ii 2) i and iii 3) ii and iv 4) i, ii, iii and iv

116. Match the following:

List – I	**List – II**
a) interference	e) silver lining around a shadow
b) diffraction	f) colours of thin films
c) polarization	g) glittering of diamond
d) total internal	h) helical structure reflection of nucleic acids

1) a – f, b – e, c – h, d – g 2) a – e, b – f, c – h, d – g

3) a – e, b – f, c – g, d – h 4) a – g, b – f, c – e, d – h

1) Both A and R are true and R is the correct explanation of A

2) Both A and R are true and R is not the correct explanation of A

3) A is true but R is false

4) Both A and R are false

117. [A]: Lens maker's formula is applicable to thin lenses and hold good only for paraxial rays.

[R]: Paraxial rays converge at a farther point from lens after refraction than the marginal or peripheral rays.

118. [A]: By properly combining two prisms made of different materials it is possible to have dispersion without average deviation.

[R]: By properly combining two prisms made of different materials, it is possible to have neither dispersion nor average deviation.

119. [A]: The resolving power of an electron microscope is higher than that of an optical microscope.
[R]:The wavelength of electron is more than the wavelength of visible light.

120. [A]: If the angles of the base of the prism are equal, then in the position of minimum deviation, the refracted ray will pass parallel to the base of prism.

[R]: In the case of minimum deviation, the angle of incidence is equal to the angle of emergence.

121. [A]: It is possible to eliminate dispersion by combining two prism of same refracting angles but of different materials.

[R]:The angular dispersion does not depends on refractive index of the material of the prism.

122. [A]: Just before setting, the Sun may appear to be elliptical. This happens due to refraction.

[R]: Refraction of light rays through the atmosphere may cause different magnification in mutually perpendicular directions.

123. [A]: A normal human eye can clearly see all the objects at the different distance.

[R]:A human eye has the capacity to suitably adjust the focal length of its lens to a certain extent.

124. [A]: A ray of white light shows no dispersion on emerging from a glass slab although there occurs dispersion inside the glass slab.

[R]:The velocity of light inside the glass slab is same for all different colours.

125. [**A]:** In Young's interference experiment the incident light used is white. When one slit is covered with red filter and the other with a blue filter, the phase difference at any point on the screen will continuously change producing uniform illumination.

(R): Two independent source of light would no longer act as coherent sources.

126. [A]: Shape of wave front depends on nature of source.
[R]: Wave front is a locus of points oscillating in same phase.

127. [A]:In YDSE the wave with smaller wavelength form its maxima before the wave with longer wavelength.
[R]:In YDSE, the position of maximum is proportional wavelength.

128. [A]: The maximum intensity in interference pattern is four times the intensity due to each slit.
[R]: Intensity is directly proportional to square of amplitude.

129. [A]: In Young's double slit experiment; we observe an interference pattern on the screen if both the slits are illuminated by two bulbs of same power.
[R]: The interference pattern is observed when source is monochromatic and coherent.

130. [A]: If the whole apparatus of Young's experiment is immersed in liquid, the fringe width will decrease.
[R]: The wavelength of light in water is less than that of air.

131. [A]: The wave front corresponding to a parallel beam of light rays is plane.
[R]: The tangential surface to all the secondary wave fronts gives the new wave front.

132. [A]: In diffraction at a straight edge, the intensity at point 'P' on screen is maximum, when wave front has odd number of Fresnel zones.
[R]: In diffraction at a straight edge, the resultant effect at any point will depend on the combined effect of all the secondary waves emanating from the various Fresnel zones

133. [A]: The interference occurs due to the super position of wavelets from two wavefronts.
[R]: Diffraction occurs due to the super position of wavelets from the two parts of the same wave front.

134. When a light wave is travelling along Z-axis the electric field vector is in yz-plane in unpolarised light.
[R]: A light wave is travelling along Z-axis; electric field vector is confined to y-axis. Then x-z plane is plane of polarization.

135. [A]: When angle of incidence is polarizing angle, the reflected light is plane polarized with its plane of vibration perpendicular to the plane of incidence.
[R]: When angle of incidence is polarizing angle the refracted light is partially plane polarized.

136. [A]: The Brewster's angle is different for different wavelengths.
[R]: Refractive index of material depends on wavelength.

KEY:

1) **1**	2) **1**	3) **4**	4) **1**	5) **2**	6) **1**	7) **2**	8) **3**	9) **4**	10) **3**
11) **2**	12) **3**	13) **3**	14) **2**	15) **2**	16) **1**	17) **4**	18) **4**	19) **1**	20) **3**
21) **2**	22) **3**	23) **1**	24) **3**	25) **2**	26) **1**	27) **1**	28) **3**	29) **4**	30) **4**
31) **1**	32) **1**	33) **3**	34) **3**	35) **3**	36) **2**	37) **3**	38) **3**	39) **3**	40) **3**
41) **3**	42) **4**	43) **1**	44) **3**	45) **3**	46) **3**	47) **2**	48) **3**	49) **2**	50) **2**
51) **3**	52) **4**	53) **3**	54) **3**	55) **2**	56) **3**	57) **1**	58) **1**	59) **2**	60) **1**
61) **2**	62) **3**	63) **2**	64) **1**	65) **4**	66) **2**	67) **4**	68) **1**	69) **3**	70) **4**
71) **4**	72) **4**	73) **1**	74) **2**	75) **1**	76) **1**	77) **3**	78) **3**	79) **4**	80) **2**
81) **1**	82) **1**	83) **3**	84) **4**	85) **3**	86) **3**	87) **2**	88) **4**	89) **3**	90) **2**
91) **1**	92) **2**	93) **2**	94) **2**	95) **2**	96) **4**	97) **4**	98) **2**	99) **2**	100) **1**
101) **3**	102) **1**	103) **4**	104) **1**	105) **1**	106) **3**	107) **4**	108) **1**	109) **3**	110) **3**
111) **2**	112) **1**	113) **2**	114) **4**	115) **4**	116) **1**	117) **2**	118) **3**	119) **3**	120) **1**
121) **4**	122) **1**	123) **1**	124) **3**	125) **1**	126) **2**	127) **1**	128) **2**	129) **4**	130) **1**
131) **2**	132) **2**	133) **4**	134) **2**	135) **2**	136) **1**				

SOLUTIONS:-

1) Ans: 1

Sol. From lens maker's formula, for Plano concave lens

$$\frac{1}{F} = -(\mu - 1)\left[\frac{1}{R}\right]$$

$$\frac{1}{F} = -\left(\frac{5}{3} - 1\right)\left[\frac{1}{0.3}\right]$$

$$\therefore F - 0.45 \text{ m}$$

2) Ans: 1

Sol. The lens maker's formula for thin lens is $\frac{1}{F} = (\mu - 1)\left[\frac{1}{R_1} + \frac{1}{R_2}\right]$

But given $R_1 = R_2 = R$ [double convex]

$$\frac{1}{5} = (1.5 - 1)\left[\frac{2}{R}\right] \Rightarrow R = 5\text{cm}$$

3) Ans: 4

Sol. Let F is the focal length of a biconvex lens, if the lens is cut into two equal parts to yield two plano-convex lenses then the focal length of two parts is 2 F each.
When they are kept in contact, then effective focal length of combination is

$$\frac{1}{f}=\frac{1}{f_1}+\frac{1}{f_2}=\frac{1}{2F}+\frac{1}{2F}=\frac{1}{F}$$

$\therefore$ f = F (i.e) no change in focal length let F_ω is the focal length of lens in water

$$\therefore \frac{1}{F_{air}}=(\mu-1)\left[\frac{1}{R_1}+\frac{1}{R_2}\right]\text{...........(1)}$$

$$\frac{1}{F_{water}}=\left(\frac{\mu_g}{\mu_\omega}-1\right)\left[\frac{1}{R_1}+\frac{1}{R_2}\right]\text{.............(2)}$$

Dividing (1) and (2)

$$\frac{F_\omega}{F_a}=\frac{\mu_\omega\left[\mu_g-1\right]}{\left(\mu_g-\mu_\omega\right)}=\frac{\frac{4}{3}\left[\frac{3}{2}-1\right]}{\left(\frac{3}{2}-\frac{4}{3}\right)}=4$$

$\therefore F_{water}$ = 4 x 10 = 40 cm

4) Ans: 1

Sol. Dispersive power is the characteristic property of material.

Therefore it depends on the material of prism

5) Ans: 2

Sol. The condition for total internal reflection which takes place in optical fibre is due to

i) Light travels from denser medium to rarer medium

ii) Angle of incidence should be greater than critical angle

6) Ans: 1

Sol. Lens maker's formula for equi-convex lens is

$$\frac{1}{F}=(\mu-1)\left(\frac{2}{R}\right)$$

$$\Rightarrow F=\frac{R}{2[\mu-1]}$$

If F < R, So 2(μ –1) < 1

Therefore $(\mu - 1) < \frac{1}{2}$ or $\mu < 1.5$

As focal length of convex lens is positive

So, μ cannot be negative, hence μ should be greater than zero but less than 1.5

7) Ans: 2

Sol. From Snells law $\mu = \frac{\sin\left(\frac{A+d}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

But given that $\mu = \cot\left(\frac{A}{2}\right)$

$\therefore \cot\left(\frac{A}{2}\right) = \frac{\sin\left(\frac{A+d}{2}\right)}{\sin\left(\frac{A}{2}\right)}$ (or) $\frac{\cos\left(\frac{A}{2}\right)}{\sin\left(\frac{A}{2}\right)} = \frac{\sin\left(\frac{A+d}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

(or) $\sin\left(90° - \frac{A}{2}\right) = \sin\left(\frac{A+d}{2}\right)$ (or) $90° - \frac{A}{2} = \frac{A+d}{2}$

$\Rightarrow d = 180° - 2A$

8) Ans: 2

Sol. From the figure $i_1 = 90° - (90° - A) = A$

and $\alpha = 90° - 2i_1 = 90° - 2A$

$\therefore i_2 = 90° - \alpha = 90° - (90° - 2A) = 2A$

$\therefore \beta = 90° - i_2 = 90° - 2A$

From the geometry of the figure

$A + 2A + 2A = 180°$

$\therefore$ A = 36°

9) Ans: 4

Sol. Angle made by the emergent ray RS with base is BC or OR = 90°- C

But $\mu = \frac{1}{\sin c} = \frac{1}{\cos(90 - c)} = \frac{1}{\cos\theta}$

$\therefore \cos\theta = \frac{1}{\mu}$

$\Rightarrow \theta = \cos^{-1}\left(\frac{1}{\mu}\right)$

10) Ans: 3

From Snell's law in the minimum deviation position for prism

$$\mu = \frac{\sin\left(\frac{A+d}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

Given that d = A

On simplifying $A = 2\cos^{-1}\left(\frac{\mu}{2}\right)$

11) Ans: 2

Sol: We know $\frac{f_{liq}}{f_{air}} = \frac{(\mu_g - 1)\mu_\ell}{(\mu_g - \mu_\ell)}$

$\therefore \frac{0.15 + 0.225}{0.15} = \frac{(3/2 - 1)\mu_\ell}{(3/2 - \mu_\ell)}$

Solving the above equation, we get $\mu_\ell = \frac{5}{4}$

12) Ans: 3

Sol: $\mu_\ell = \frac{\sin\frac{A + D_m}{2}}{\sin(A/2)}$

But $A = D_m$ (given)

$\therefore$ A = 60°

13) Ans: 3

Sol: The condition for getting dispersion without deviation when two prisms are combined is

$\omega d + \omega' d' = 0$ which is called as condition for achromatism

14) Ans: 2

Sol: Angle of incidence (i) = 45°

$r_1 + r_2 = A = 30°$

$\therefore\ \mu = \dfrac{\sin i}{\sin r}$ [from Snell's law]

When the ray of light retraces its path at the silvered face, the angle of refraction becomes 30°.

$\therefore \mu = \dfrac{\sin i}{\sin r} = \dfrac{1/\sqrt{2}}{1/2} = \sqrt{2}$

15) Ans: 2

Sol: We know A = 60° and D_m = 30°

If C is critical angle then $\mu = \sqrt{2}$ We know that $\mu = \dfrac{1}{\sin c}$

$\sin C = \dfrac{1}{\mu} = \dfrac{1}{\sqrt{2}} \Rightarrow C = 45°$

16) Ans: 1

Sol: Cross wires in a compound microscope are fixed at the same point where the image due to the objective is formed.

17) Ans: 4

Sol: At minimum deviation position of a prism, angle of incidence and angle of emergence are equal.

$\Rightarrow i = e = 30°$

$\therefore$ The angle between the emergent ray and the second refracting surface will be

$90° - e = 90° - 30° = 60°$

18) Ans: 4

Sol: f_0 = 50 cm f_e = 5 cm

When the final image is formed at least distance of distinct vision, it length

$$L = f_0 + ue$$

But ue = $\frac{v_e f_e}{v_e + f_e} = \frac{(25)(5)}{(30)} = \frac{25}{6}\text{cm}$

$$\therefore \ L = 50 + \frac{25}{6} = \frac{325}{6}\text{cm}$$

19) Ans: 1

Sol: $(\mu_{glass})(8) = (\mu_{water})(10)$

$$\Rightarrow \mu_{glass} = \left(\frac{4}{3}\right)\left(\frac{10}{8}\right) = \frac{5}{3}$$

20) Ans: 3

Sol. Solar spectrum is an example of line absorption spectrum

21) Ans: 2

Sol. If c is the critical angle

$$\sin c = \frac{\text{velocity of light in medium}}{\text{velocity of light in vaccum}}$$

$$= \frac{\text{velocity of light in denser medium}}{\text{velocity of light in rarer medium}}$$

$$\therefore \ \sin c = \frac{2\times10^8}{2.5\times10^8} = \frac{4}{5}$$

$$\therefore \ c = \sin^{-1}\left(\frac{4}{5}\right)$$

22) Ans: 2

Sol. Lens makers formula for a lens is $\frac{1}{F} = (\mu - 1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$

$R_1 = -3$ cm, $R_2 = -4$ cm

$\frac{1}{F} = (\mu - 1)\left[\frac{-1}{3} + \frac{1}{4}\right] = (1.5 - 1)\left[\frac{-1}{3} + \frac{1}{4}\right]$ ……………….(1)

from u, v formula

$\frac{1}{F} = \frac{1}{u} + \frac{1}{v}$ $\frac{1}{F} = \frac{1}{v} + \frac{1}{12}$ …………………..….(2)

comparing (1) and (2)

$-(1.5 - 1)\left[-\frac{1}{3} + \frac{1}{4}\right] = \frac{1}{v} + \frac{1}{12}$

on solving v = -8 cm

23) Ans: 1

Sol. From Snell's law $\mu = \frac{\sin i}{\sin r} \Rightarrow \sin r = \frac{\sin i}{\mu}$

As i is constant $\sin r \propto \frac{1}{\mu}$

1) air to water = $\frac{\mu_\omega}{\mu_a} = \frac{4}{3} = \mu_1$

2) water to glass = $\frac{\mu_g}{\mu_\omega} = \frac{3/2}{4/3} = \frac{9}{8} = \mu_2$

3) glass of water = $\frac{\mu_\omega}{\mu_g} = \frac{4/3}{3/2} = \frac{8}{9} = \mu_3$

As $\mu_1 > \mu_2 > \mu_3$ $\therefore \sin r_1 < \sin r_2 < \sin r_3$

$\therefore$ Increasing order is a, b, c

24) Ans: 3

Sol. From lens makers formula

$$\frac{1}{F}=(\mu-1)\left[\frac{1}{R_1}-\frac{1}{R_2}\right]$$

As $\mu_V > \mu_R$ $\quad\therefore\ F_R > F_V \ \text{since}\ \frac{1}{F}<(\mu-1)$

$\therefore$ Focal length for the violet light is less than for red light

25) Ans: 2

Sol. $$\frac{1}{F_{air}}=(\mu_g-1)\left[\frac{1}{R_1}+\frac{1}{R_2}\right]\ldots\ldots\ldots\ldots..(1)$$

$$\frac{1}{F_{liq}}=\left(\frac{\mu_g}{\mu_\ell}-1\right)\left[\frac{1}{R_1}+\frac{1}{R_2}\right]\ldots\ldots\ldots\ldots(2)$$

Dividing (1) and (2)

$$\frac{F_{liq}}{F_{air}}=\frac{(\mu_g-1)\mu_\ell}{(\mu_g-\mu_\ell)}$$

$$\frac{0.5}{0.2}=\frac{-(1.5-1)\mu_\ell}{(1.5-\mu_\ell)}$$

On solving $\mu_\ell=\frac{7.5}{4}=\frac{15}{8}$

26) Ans: 1

Sol. Total internal reflection so that no loss of energy takes place during transmission of light energy.

27) Ans: 1

$$\frac{1}{f}=(\mu-1)\left(\frac{1}{R_1}+\frac{1}{R_2}\right)\Rightarrow f\alpha\frac{1}{\mu-1}$$

$$.\therefore \frac{f_{red}}{f_{violet}}\frac{\mu_v-1}{\mu_R-1}=\frac{1.54-1}{1.52-1}$$

$$\Rightarrow f_{Red}=\left[\frac{0.54}{0.52}\right]20=20.76\text{cm}$$

28) Ans: 3

Sol. Dark lines observed in the solar spectrum due to absorption of suns radiation by the suns atmosphere

29) Ans: 4

Sol: Angle of the prism = 60°

Refractive index = 1.5

Angle of incidence at the 1st face AB =0°

Angle of incidence at the 2n face AC is 60° which is greater than the critical angle of glass (42°). Therefore total internal reflection takes place.

30) Ans:4

Sol: f_0 = 1.5 m = focal length of objective

f_e= 6.25 cm = focal length of eye piece

$u_0 = 2cm$ and $v_e = D = 25cm$

$\therefore$ Image distance from the objective $V_0 = \frac{u_0 f_0}{u_0 - f_0} = 6cm$

Object distance from the eye-piece $u_e = \frac{v_e f_e}{v_e - f_e} = 5cm$

$\therefore$Length of the microscope = $v_0 + u_e = 6 + 5 = 11cm$

31) Ans: 1

Sol: If a is the amplitude of one of the interfering wave then intensity at any point is given as

$I = 4a^2 \cos^2\left(\frac{\phi}{2}\right)$ …………………….(1)

At bright fringe $\cos^2\left(\frac{\phi}{2}\right) = 1$

$\therefore\ I_1 = 4a^2$ …………..(1)

$I_2 = 4a^2 \cos^2\left(\frac{\pi}{4}\right) = 2a^2$ ………………(2)

$\therefore$ (1) divided by (2)

$\frac{I_1}{I_2} = \frac{4a^2}{2a^2} = 2$

32) Ans: 1

Sol: The condition to form bright band at a point is to have a path difference of $x = n\lambda$

From the given problem

$y_1 = 10\lambda_1$ ....(1)

$y_2 = 5\lambda_2$ ....(2)

Dividing (1) and (2)

$$\frac{y_1}{y_2} = \frac{2\lambda_1}{\lambda_2}$$

33) Ans : 3

Sol: For obtaining sustained interference pattern the sources should maintain same phase or constant phase difference i.e. the source should be coherent

34) Ans: 3

Sol: As Intensity $\propto$ width of the slit

$\therefore\ I \propto a^2$ Or $I \propto$ width of slit

$$\therefore\ \frac{I_{max}}{I_{min}} = \left[\frac{\sqrt{I_1} + \sqrt{I_2}}{\sqrt{I_1} - \sqrt{I_2}}\right]^2$$

$$= \left[\frac{\sqrt{w_1} + \sqrt{w_2}}{\sqrt{w_1} - \sqrt{w_2}}\right]^2$$

$$\frac{I_{max}}{I_{min}} = \left[\frac{\sqrt{4} + \sqrt{1}}{\sqrt{4} - \sqrt{1}}\right]^2 = \frac{9}{1}$$

35) Ans: 3

Sol: 1) If $\frac{b^2}{L\lambda} >> 1$, the approximation of geometrical optics is applicable

2) If $\frac{b^2}{L\lambda} << 1$, Fraunhofer diffraction is observed

3) $\frac{b^2}{L\lambda} \approx 1$, Fresnel diffraction is observed

36) Ans: 2

Sol: The condition for dark fringe is

. ∴path difference = (2n + 1) $\frac{\lambda}{2}$

$$\therefore\ \Delta x = (2\times2+1)\times\frac{6\times10^{-7}}{2}$$

$=1.5\times10^{-6}\,m = 1.5$ micron

37) Ans: 3

Sol: The condition for dark band is path difference $(2n-1)\frac{\lambda}{2}$

$$(2n-1) = \frac{2\times1.5\times10^{-6}}{600\times10^{-10}} = 5\ ;\ n = 3$$

∴ Third dark band occurs

38) Ans: 3

Sol: $\frac{a_1}{a_2} = \frac{3}{2}$ [given]

$$\frac{I_{max}}{I_{min}} = \left(\frac{a_1+a_2}{a_1-a_2}\right)^2 = \left(\frac{3+2}{3-2}\right)^2 = \frac{25}{1} = 25$$

39) Ans: 3

Sol: $\frac{I_1}{I_2} = \frac{9}{4}$[given]

$$\frac{I_1}{I_2} = \left(\frac{a_1}{a_2}\right)^2 = \frac{9}{4} \Rightarrow \frac{a_1}{a_2} = \frac{3}{2}$$

$$\therefore\ \frac{I_{max}}{I_{min}} = \left(\frac{a_1+a_2}{a_1-a_2}\right)^2 = \left(\frac{3+2}{3-2}\right)^2 = \frac{25}{1} = 25$$

40) Ans: 3

Sol: Wave theory explains the phenomena of polarization and diffraction but the particle nature explains about Compton Effect and photo electric effect.

41) Ans: 4

Sol: Let a is the amplitude of the interfering wave.

$$\therefore \; I = (a_1 + a_2)^2 = (a + a)^2 = 4a^2$$

If one slit is closed

$$I_1 = (a)^2 = \frac{I}{4}$$

42) Ans: 4

Sol: $I_1 = I_2 = 1 \text{watt}/m^2$

Phase angel θ = 0°

Resultant intensity at the third vertex

$$\therefore \; I = \left[\sqrt{I_1} + \sqrt{I_2}\right]^2 = I_1 + I_2 + 2\sqrt{I_1}\sqrt{I_2}\cos\phi$$

$$\therefore \; I = 1 + 1 + 2\sqrt{1-1} \times 1 = 4 \text{ watt}/m^2$$

43) Ans: 1

Sol: $$\frac{I_{max}}{I_{min}} = \left[\frac{\sqrt{I_1} + \sqrt{I_2}}{\sqrt{I_1} - \sqrt{I_2}}\right]^2 = \left[\frac{\sqrt{4I} + \sqrt{I}}{\sqrt{4I} - \sqrt{I}}\right]^2 = \frac{9}{1} = 9$$

44) Sol :(3)

Resultant intensity,

$$I = I_1 + I_2 + 2\sqrt{I_1 I_2}\cos\phi$$

Here, $I_1 = I$, $I_2 = 4I$, $\phi_1 = \frac{\pi}{2}$ and $\phi_2 = \pi$

At A intensity,

$$I_A = I + 4I + 2\sqrt{4I^2}\cos\frac{\pi}{2} = 5I$$

At B intensity,

$$I_B = I + 4I + 2\sqrt{4I^2}\cos\pi = 5I - 4I = I$$

Therefore, difference between intensities is

$I_A - I_B = 5I - I = 4I$

45) Sol :(3)

46) Sol :(3)

Here f_1 = -20 cm, f_2 = + 10 cm

Focal length of combination is,

$$\frac{1}{F}=\frac{1}{f_1}+\frac{1}{f_2}=\frac{1}{-20}+\frac{1}{10}$$

$$\frac{1}{F}=\frac{1}{20}\Rightarrow F = 20\text{ cm}$$

Power of the combination,

$$P=\frac{100}{F}=\frac{100}{20}=+5D$$

47) Sol :(2)

Here u = -25 cm, $\upsilon=-50$ cm

We have $\frac{1}{f}=\frac{1}{-u}+\frac{1}{\upsilon}$

i.e, $\frac{1}{f}=\frac{1}{25}-\frac{1}{50}$ or f = 50 cm

Power of lens he should use,

$$P=\frac{100}{f}=\frac{100}{50}=+2D$$

48) sol. (3)

$$\frac{size\ of\ image}{size\ of\ object}=\left|\frac{v}{u}\right|$$

$\Rightarrow$ Size of the image = $\frac{1.39\times10^{9}\times10^{-1}}{1.5\times10^{11}}$ = 0.92×10^{-3} m

Size of the image = 9.2×10^{-4} m

49) sol (2) :

As lenses are kept in contact

$$\frac{1}{f}=\frac{1}{f_1}+\frac{1}{f_2};$$

$$\text{Power} = \frac{1}{focal\ length}$$

$$\therefore \text{ Power P} = \frac{f_1+f_2}{f_1 f_2}$$

125) Ans: 1

Sol: The condition for interference is that two independent sources of light cannot act as coherent sources.

$\therefore$ Both A and R are true and R is the correct explanation of A