EXERCISE – I

CONCEPTUAL QUESTIONS

REFLECTION OF LIGHT AT PLANE SURFACE

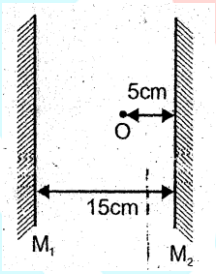
1. When a ray of light is incident normally on a plane mirror then the angle of reflection will be
(1*) 0° (2) 90° (3) 180° (4) –90°

2. A ray is incident at 30° angle on plane mirror. What will be deviation after reflection from mirror
(1*) 120° (2) 60° (3) 30° (4) 45°

3. Two plane mirrors are lying perpendicular to each other, there is lamp in between mirrors. Then number of images of lamp will be
(1*) 3 (2) 4 (3) 5 (4) 6

4. Am man runs towards stationary plane mirror at a speed of 15 m/s. What is the speed of the his image with respect to mirror
(1) 7.5 m/s (2*) 15 m/s (3) 30 m/s (4) 45 m/s

5. Figure shows two plane mirrors parallel to each other and an object O placed between them. Then the distance of the first three images from the mirror M_2 will be (in cm)



(1) 5, 10, 15 (2) 5, 15, 30 (3*) 5, 25, 35 (4) 5, 15, 25

6. A ray gets successively reflection from two mirrors inclined at an angle of 40°. If the angle of incidence on the first mirror is 30° then the net deviation of this ray after two reflections.
(1) 40° (2*) 280° (3) 80° (4) 240°

7. A tall man of height 6 feet, want to see his full image. Then required minimum length of the mirror will be
(1) 12 feet (2*) 3 feet (3) 6 feet (4) Any length

8. A man is 180 cm tall and his eyes are 10 cm below the top of his head. In order to see his entire height right from toe to head, he uses a plane mirror kept at a distance of 1 m from him. The minimum length of the plane mirror required is
(1) 180 cm (2*) 90 cm (3) 85 cm (4) 170 cm

9. Two plane mirrors are at 45° to each other. If an object is placed between them then the number of images will be
(1) 5 (2) 9 (3*) 7 (4) 8

REFLECTION AT SPHERICAL SURFACE

10. The focal length of a concave mirror is 50 cm. where an object be placed so that its image is two times magnified, real and inverted -
(1*) 75 cm (2) 72 cm (3) 63 cm (4) 50 cm

11. An object of height 7.5 cm is placed in front of a convex mirror of radius of curvature 25 cm at a distance of 40 cm. the height of the image should be
(1) 2.3 cm (2*) 1.78 cm (3) 1 cm (4) 0.8 cm

12. A square of side 3 cm is placed at a distance of 25 cm from a concave mirror of focal length 10 cm. The centre of the square is at the axis of the mirror and the plane is normal to the axis. The area enclosed by the image of the wire is
(1*) 4 cm^2 (2) 6 cm^2 (3) 16 cm^2 (4) 36 cm^2

13. The focal length of a concave mirror is 12 cm. Where should an object of length 4 cm be placed, so that a real image of 1 cm length is formed?
(1) 48 cm (2) 3 cm (3*) 60 cm (4) 15 cm

14. An object is lying at a distance of 90 cm from a concave mirror of focal length 30 cm. The position and nature of image formed by it will be
(1) 45 cm of the size of object (2) 90 cm smaller than object
(3) 30 cm bigger than object (4*) –45 cm smaller than object

15. An object of height 1.5 cm is situated at distance of 15 cm from a concave mirror. The concave mirror forms its real image of height 3.0 cm. The focal length of concave mirror will
(1*) –10 cm (2) –20 cm (3) 20 cm (4) 30 cm

16. A boy stands straight infront of a mirror at a distance of 30 cm away from it. He sees his erect image whose height is $1/5^{th}$ of his real height. The mirror he using is
(1*) Plane mirror (2) Convex mirror (3) Concave mirror (4) None

17. A point object is moving on the principle axis of a concave mirror of focal length 24 cm towards the mirror. When it is at a distance of 60 cm from the mirror, its velocity is 9 cm/sec. What is the velocity of the image eat that instant
(1) 5 cm/sec (2) 12 cm/sec (3*) 4 cm/sec (4) 9 cm/sec

18. A concave mirror gives an image three times as large as the object placed at a distance of 20 cm from it. For the image to be real, the focal length should be
(1) –10 cm (2*) –15 cm (3) –20 cm (4) –30 cm

19. The minimum distance between the object and its real image for concave mirror is
(1) f (2) 2f (3) 4f (4*) Zero

20. A convex mirror has a radius of curvature of 22 cm. If an object is placed 14 cm away from the mirror then its image is formed at
(1) 6.2 cm on the front side of the mirror (2*) 6.2 cm on the back side of the mirror
(3) 51.3 cm on the front of the mirror (4) 51.3 cm on the back of the mirror

21. The focal length of a spherical mirror is
(1) Maximum for red light (2) Maximum for blue light
(3) Maximum for white light (4*) Same for all lights

22. A point object is placed at a distance of 10 cm and its real image is formed at a distance of 20 cm from a concave mirror. If the object is moved by 0.1 cm towards the mirror, the image will shift by about
(1*) 0.4 cm away from the mirror (2) 0.4 cm towards the mirror
(3) 0.8 cm away from the mirror (4) 0.8 cm towards the mirror

23. The focal length of a convex mirror is 20 cm its radius of curvature will be
(1) 10 cm (2) 20 cm (3) 30 cm (4*) 40 cm

24. A diminished virtual image can be formed only in
(1) Plane mirror (2) A concave mirror (3*) A convex mirror (4) None

REFRACTION AT PLANE SURFACE:
SNELL'S LAWS TIR

25. The colour are characterised by which of following character of light
(1*) Frequency (2) Amplitude (3) Wavelength (4) Velocity

26. The wavelength of light in two liquids 'x' and 'y' is 3500 Å and 7000 Å, then the critical angle will be
(1) 60° (2) 45° (3*) 30° (4) 15°

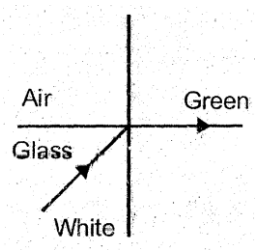
27. A microscope is focused on a mark, then a glass slab of refractive index 1.5 and thickness of 6 cm is placed on the mark to get the mark again in focus, the microscope should be moved
(1) 4 cm (2*) 2 cm (3) 6 cm (4) 8 cm

28. Velocity of light in glass, whose refractive index w.r.t. air is 1.5 is 2×10^8 m/sec. The refractive index of liquid w.r..t air is
(1) 0.64 (2) 0.80 (3*) 1.20 (4) 1.44

29. A point source of light is place 4 m below the surface of water of refractive index 5/3. The minimum diameter of a disc which should be placed over the surface of water to cut-off all light coming out of water is ($\mu = 5/3$)
(1) 2 m (2*) 6 m (3) 4 m (4) 3 m

30. When a ray of light enter a medium of refractive index μ, it is observed that the angle of refractive is half of the angle of incidence is than angle of incidence is
(1*) $2\cos^{-1}\left(\frac{\mu}{2}\right)$ (2) $\cos^{-1}\left(\frac{\mu}{2}\right)$ (3) $2\cos^{-1}(\mu)$ (4) $2\sin^{-1}\left(\frac{\mu}{2}\right)$

31. White light is incident on the interface of glass and air as shown in the figure. If green light is just totally internally reflected then the emerging ray in air contains



(1*) Yellow, orange, red
(2) Violet, indigo, blue
(3) All colours
(4) All colour except green

32. A plane glass slab is kept over various coloured letters; the letter which appears least raised is
(1) blue (2) violet (3) green (4*) red

33. A bubble in glass slab ($\mu = 1.5$) when viewed from one side appears at 5 cm and 2 cm from other side, then thickness of slab is
(1) 3.75 cm (2) 3 cm (3*) 10.5 cm (4) 2.5 cm

34. A ray of light travelling in air have wavelength λ, frequency n, velocity V and intensity I. If this ray enters into water than these parameters are λ', n', v' and I' respectively. Which relation is correct from following
(1) $\lambda = \lambda'$ (2*) $n = n'$ (3) $v = v'$ (4) $I = I'$

35. Light travels through a glass plate of thickness t and having refractive index n. If c is the velocity of light in vacuum. The time taken by the light to travel this thickness of glass is
(1) $\frac{t}{nc}$ (2) tnc (3*) $\frac{nt}{c}$ (4) $\frac{tc}{n}$

36. A ray of light propagates from glass (refractive index = 3/2) to water (refractive index = 4/3). The value of the critical angle
(1) $\sin^{-1}\left(\frac{1}{2}\right)$ (2) $\sin^{-1}\left(\frac{\sqrt{8}}{9}\right)$ (3*) $\sin^{-1}\left(\frac{8}{9}\right)$ (4) $\sin^{-1}\left(\frac{5}{7}\right)$

37. Relation between critical angles of water and glass is
(1*) $C_w > C_g$ (2) $C_w < C_g$ (3) $C_w = C_g$ (4) $C_w = C_g = 0$

38. Critical angle of light passing from glass to air is minimum for
(1) Red (2) Green (3) Yellow (4*) Violet

39. Which of the following is used in optical fibres?
(1*) TIR (2) Scattering (3) Diffraction (4) Refracting

40. Brilliance of diamond is due to
(1) Shape (2) Cutting (3) Reflection (4*) T.I.R.

41. 'Mirage' is a phenomenon due to
(1) Reflection of light
(2) Refraction of light
(3*) T.I.R. of light
(4) Diffraction of light

42. An object is immersed in a fluid. In order that the object becomes invisible, it should
(1) Behave as a perfect reflector
(2) Absorb all light falling on it
(3) Have refractive index one
(4*) Have refractive index exactly matching with that of the surrounding fluid

PRISM AND DISPERSION

43. The angle of glass is 4.5° and its refractive index is 1.52. The angle of minimum deviation will be
(1) 1.5° (2*) 2.3° (3) 4.5° (4) 2°

44. A ray of light passes through equilateral Prism angle. The angle of deviation is
(1) 60° (2*) 30° (3) 45° (4) 120°

45. Prism angle of glass prism is 10°. It's refractive index of red and violet colour is 1.51 and 1.52 respectively. Then its dispersive power will be
(1) 0.015 (2) 0.020 (3) 0.011 (4*) 0.019

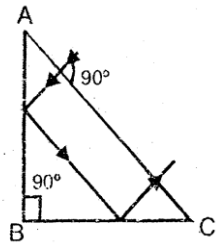
46. If the refractive indices of crown glass for red, yellow and violet colours are 1.5140, 1.5170 and 1.5318 respectively and for flint glass these are 1.6434, 1.6499 and 1.65852 respectively, then the dispersive powers for crown and flint glass are respectively
(1*) 0.034 and 0.0064 (2) 0.064 and 0.034 (3) 1.00 and 0.064 (4) 0.034 and 1.0

47. A thin Prism P_1 with angle 4° and made from glass of refractive index 1.54 is combined with another thin Prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of Prism P_2 is
(1) 5.33° (2) 4° (3*) 3° (4) 2.6°

48. The angle of minimum deviation measured with a prism is 30° and the angel of prism is 60°. The refractive index of prism material is
(1*) $\sqrt{2}$ (2) 2 (3) $\frac{3}{2}$ (4) $\frac{4}{3}$

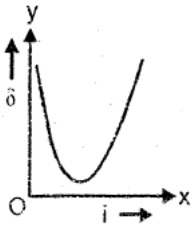
49. Angle of prism is A and its one surface is silvered. Light rays falling at an angle of incidence 2A on first surface return back through the same path after suffering reflection at second silvered surface. Refractive index of the material of prism is
(1) 2 sin A (2*) 2 cos A (3) $\frac{1}{2}$ cos A (4) tan A

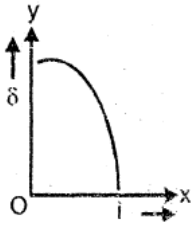
50. A ray falls on a prism ABC (AB = BC) and travels as shown in figure. The minimum refractive index of the prism material should be

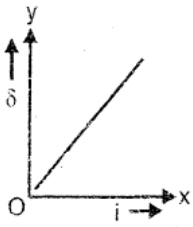


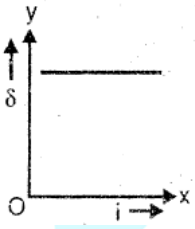
(1) $\frac{4}{3}$ (2*) $\sqrt{2}$ (3) 1.5 (4) $\sqrt{3}$

51. For a prism, graph between angle of deviation (δ) and angle of incidence will be

(1*) 

(2) 

(3) 

(4) 

52. Three prisms 1, 2 and 3 have the prism angle A = 60°, but their refractive indices are respectively 1.4, 1.5 and 1.6. If δ_1, δ_2, δ_3 be their respective angles of deviation then

(1*) $\delta_3 > \delta_2 > \delta_1$ (2) $\delta_1 > \delta_2 > \delta_3$ (3) $\delta_1 = \delta_2 = \delta_3$ (4) $\delta_2 > \delta_1 > \delta_3$

53. Rainbow is formed due to

(1) Scattering and refraction (2*) Total internal reflection and dispersion

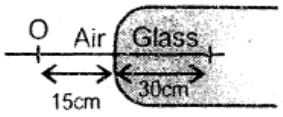
(3) Reflection only (4) Diffraction and dispersion

54. The refractive index of the material of a prism is $\sqrt{2}$ and its refracting angle is 30°. One of the refracting surfaces of the prism in silvered. A beam of monochromatic light entering the prism from the other face will retrace its path after reflection from the silvered surface if its angle of incidence on the prism is

(1) 60° (2) 0° (3) 30° (4*) 45°

REFRACTION AT SPHERICAL SURFACES

55. A point object O is placed in front of a glass rod having spherical end of radius of curvature 30 cm. The image would be formed by



(1*) 30 cm left (2) infinity (3) 1 cm to the right (4) 18 cm to the left

56. A spherical surface of radius of curvature R separates air (refractive index 1.0) from glass (refractive index 1.5). The centre of curvature is in glass. A point object P placed in air is found to have a real image Q in the glass. The line PQ cuts the surface at a point O and PO = OQ. The distance PO is equal to

(1) R (2) 3R (3) 2R (4*) 5R

LENSES

57. Two convex lens of focal length 20 cm and 25 cm are placed in contact with each other then power of this combination is :
(1) + 1D (2*) +9D (3) –1D (4) –9D

58. Two lenses of power +2.50 D and –3.75D are combined to form a compound lens. Its focal length in cm will be
(1) 40 (2) –40 (3*) –80 (4) 160

59. Lenses of powers 3D and –5D are combined to from a compound lens. An object is placed at a distance of 50 cm from this lens. Calculate the position of its image
(1) –10 cm (2) +10cm (3*) –25 cm (4) +25 cm

60. A convex lens of Focal length of 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is
(1*) –1.5 D (2) –6.5 D (3) +6.5 D (4) +6.67 D

61. An object is put at a distance of 5 cm from the first focus of a convex lens of focal length 10 cm. If a real image is formed it's distance from the lens will be
(1) 15 cm (2) 20 cm (3) 25 cm (4*) 30 cm

62. An equiconvex lens has a power of 5 dioptre. If it is made of glass of refractive index 1.5, then radius of curvature of its each surface will be ?
(1*) 20 cm (2) 10 cm (3) 40 cm (4) ∞

63. An object placed at a distance of 9 cm from first principal focus of convex lens, produces a real image at a distance of 25 cm from its second principal focus. Then focal length of lens is
(1) 9 cm (2) 25 cm (3*) 15 cm (4) 17 cm

64. A glass convex lens (μ_g = 1.5) has a focal length of 8 cm when placed in air. What would be the focal length of the lens when it is immersed in water (μ_w = 1.33)
(1) 2 m (2) 4 cm (3) 16 cm (4*) 32 cm

65. Two thin convex lenses of focal length 10 cm and 15 cm are separated by a distance of 10 cm. Then focal length of the combination is
(1) 4.2 cm (2) 6 cm (3*) 10 cm (4) 15 cm

66. A convex lens of power P is immersed in water. How will its power change?
(1) Increases
(2) Decreases
(3*) Remains unchanged
(4) Increase for red colour and decreases for blue colour

67. A convex lens is made up of three different materials as shown in the figure. For a point object placed on its axis, the number of images formed are

(1) 1 (2*) 3 (3) 4 (4) 5

68. The focal length of a convex lens is 10 cm and its refractive index is 1.5. If the radius of curvature of one surface is 7.5 cm, the radius of curvature of the second surface will be
(1) 7.5 cm (2*) 15.0 cm (3) 75 cm (4) 5.0 m

69. A plano convex lens (μ = 1.5) has radius of curvature 10 cm. It is silvered on its plane surface. Find focal length after silvering.
(1*) 10 cm (2) 30 cm (3) 15 cm (4) 25 cm

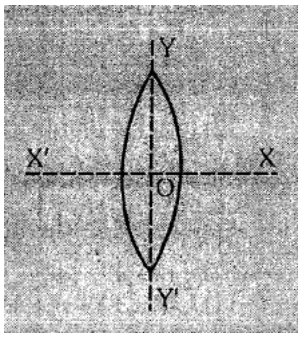
70. A plano convex lens is made of refractive index 1.6. The radius of curvature of the curved surface is 60 cm. The focal length of the lens is
(1) 50 cm (2*) 100 cm (3) 200 cm (4) 400 cm

71. If in a plano-convex lens, the radius of curvature of the convex surface is 10 cm and the focal length of the lens is 30 cm, then the refractive index of the material of lens will be
(1) 1.5 (2) 1.66 (3*) 1.33 (4) 3

72. If a convex lens of focal length 80 cm and a concave lens of focal length 50 cm are combined together, what will be their resulting power
(1) +6.5 D (2) –6.5 D (3) +7.5 D (4*) –0.75 D

73. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then its focal length will
(1) Become zero (2*) Become infinite
(3) Become small, but non-zero (4) Remain unchanged

74. An equiconvex lens is cut into two halves along (i) XOX' and (ii) YOY' as shown in the figure. Let f, f', f'' be the focal lengths of the complete lens, of each half in case (i), and of each half in case (ii) respectively. Choose the correct statement from following



(1*) $f' = f,\ f'' = 2f$ (2) $f' = 2f,\ f'' = f$ (3) $f' = f,\ f'' = f$ (4) $f' = 2f,\ f'' = 2f$

75. An object and its real image are located at distances 25 cm and 40 cm respectively from the two principal foci of a convex lens. The linear magnification of the image is near to
(1) +1.3 (2*) –1.3 (3) +1.8 (4) –1.8

CHROMATIC AND SPHERICAL ABERRATIONS

76. Lenses applied in achromatic combination having dispersive power in ratio of 5 : 3 if focal length of concave lens is 15 cm, then focal length of other lens will be
(1) –9 cm (2*) +9 cm (3) –12 cm (4) +12 cm

77. If the magnitude of dispersive powers of two lenses are 0.024 and 0.036. Then their focal lengths will be for aberration free combination
(1) 30 cm, –40 cm (2*) 30 cm, –45 cm (3) 10 cm, 30 cm (4) 20 cm, – 45 cm

78. An achromatic convergent doublet of two lenses in contact has a power of +2D. The convex lens has a power +5D. What is the ratio of the dispersive power of the convergent and divergent lenses
(1) 2 : 5 (2*) 3 : 5 (3) 5 : 2 (4) 5 : 3

79. the dispersive powers of the materials of the two lenses are in the ratio 4 : 3. If the two lenses are in the ratio 4 : 3. If the achromatic combination of these two lenses in contact is a convex lens of focal length 60 cm then the focal lengths of the component lenses are
(1) – 20 cm and 25 cm (2) 20 cm and –25 cm
(3) –15 cm and 40 cm (4*) 15 cm and – 20 cm

80. Two lenses of focal length +10 cm and –15 cm when put in contact behave like a convex lens. They will have a convex lens. They will have zero longitudinal chromatic aberration if their dispersive powers are in the ratio
(1) $+\frac{3}{2}$ (2*) $+\frac{2}{3}$ (3) $-\frac{3}{2}$ (4) $-\frac{2}{3}$

81. Refractive index of violet, yellow and Red colour of light for a material of lens are 1.66, 1.64 and 1.62 respectively. If mean focal length of lens is 10 cm. Then chromatic aberration between the colour of violet and red will be
(1*) 0.625 m (2) 0.125 m (3) 0.02 m (4) 0 cm

MICROSCOPES AND TELESCOPES

82. The focal length of convex lens is 2.5 cm. Its magnifying power for minimum distance of distinct vision will be
(1) 25 (2) 52 (3*) 11 (4) 1.1

83. An astronomical telescope of magnifying power 8 is made using two lenses spaced 45 cm apart. The focal length of the lenses used are
(1*) F = 40 cm, f = 5 cm (2) F = 8 cm, f = 5 cm
(3) F = 5 cm, f = 47 cm (4) F = 20 cm, f = 5 cm

84. The magnifying power of the objective of a compound microscope is 7 if magnifying power of the microscope is 35, then the magnifying power of eyepiece will be

(1) 245 (2*) 5 (3) 28 (4) 42

85. An astronomical telescope has focal lengths 100 and 10 cm of objective and eyepiece lens respectively when final image is formed at least distance of distinct vision, magnification power of telescope will be
(1) –10 (2) –11 (3*) –14 (4) –15

86. If tube length of astronomical telescope is 105 cm and magnifying power is 20 for normal setting. Calculate the focal length of objective
(1*) 100 cm (2) 10 cm (3) 20 cm (4) 25 cm

87. Least distance of distinct vision is 25 cm. What will be magnifying power of simple microscope of focal length 5 cm, if final image is formed at minimum distance of distinct vision
(1) $\frac{1}{5}$ (2) 5 (3) $\frac{1}{6}$ (4*) 6

88. In a compound microscope, the intermediate image, in normal use is
(1) Virtual, erect and magnified (2) Real, erect and magnified
(3*) Real, inverted and magnified (4) Virtual, inverted and magnified

89. The focal lengths of the objective and eye-piece of a telescope are respectively 100 cm and 2 cm. The moon subtends and angle of 0.5° at the eye. If it is looked through the telescope, the angle subtended by the moon's image will be
(1) 100° (2) 50° (3*) 25° (4) 10°

90. In a laboratory four convex lenses L_1, L_2, L_3 and L_4 of focal lengths 2, 4, 6 and 8 cm respectively are available. Two of these lenses form a telescope of length 10 cm and magnifying power 4. The objective and eye lenses are
(1) L_2, L_3 (2) L_1, L_4 (3) L_3, L_2 (4*) L_4, L_1

91. The magnifying power of a simple microscope is 6.The focal length of its lens in metres will be if least distance of distinct vision is 25 cm
(1*) 0.05 (2) 0.06 (3) 0.25 (4) 0.12

92. An astronomical telescope has a magnifying power 10. The focal length of eyepiece is 20 cm. The focal length of objective is
(1) 2 cm (2*) 200 cm (3) $\frac{1}{2}$cm (4) $\frac{1}{200}$cm

93. A telescope has an objective lens of focal length 200 cm and an eye piece with focal length 2 cm. If his telescope is used to see a 50 meter tall building at a distance of 2 km, what is the height of the image of the building formed by the objective lens
(1*) 5 cm (2) 10 cm (3) 1 cm (4) 2 cm

DEFECTS OF VISION

94. Minimum and maximum distance should be for clear vision of healthy eye

(1) 100 cm and 500 cm (2) Infinite and 25 cm
(3) 25 cm and 100 cm (4*) 25 cm and infinite

95. A person can see clearly only upto a distance of 25 cm. He wants to read a book placed at a distance of 50 cm. What kind of lens does he require for his spectacles and what must be its power?
(1) Concave, –1.0 D (2) Convex, +1.5 D (3*) Concave, –2.0 D (4) Convex + 2.0 D

96. A person cannot see the objects beyond 50 cm. The power of a lens to correct this vision will be
(1) +2D (2*) – 2D (3) +5D (4) 0.5 D

97. A myopic person cannot see objects lying beyond 2 m. The focal length and power of the lens required to remove this defect will be
(1) 1 m and 0.5 D (2*) – 2 m and – 0.5 D
(3) 0.5 m and 0.5 D (4) –0.5 and 0.5 D

98. To remove myopia (short sightedness) a lens of power 0.66 D is required. The distant point of the eye is approximately
(1) 100 cm (2*) 151.5 cm (3) 50 cm (4) 25 cm

99. A person cannot see the objects clearly placed at a distance more than 40 cm. He is advised to use a lens of power
(1*) – 2.5 D (2) +2.5 D (3) –6.25 D (4) +1.5 D

100. A man cannot see clearly the objects beyond a distance of 20 cm from his eyes. To see distant objects clearly he must use which kind of lenses and of what focal length
(1) 10 cm convex (2) 100 cm concave (3) 20 cm convex (4*) 20 cm concave

EXERCISE-I (Conceptual Questions) ANSWER KEY

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