CET- Sample questions
Topic: Geometrical optics

Refraction at a plane surface

1) If a glass rod is immersed in a liquid of the same refractive index, then it will_____.

   (1) look bent
   (2) disappear
   (3) look longer
   (4) none of these

2) When light passes from one medium into another medium, then the physical property which does not change is_____.

   (1) velocity
   (2) wavelength
   (3) frequency
   (4) refractive index

3) Time taken by sunlight to pass through a window of thickness 4mm whose refractive index is 3/2 is

   (1) 2×10^{-4} s
   (2) 2×10^{-8} s
   (3) 2×10^{-11} s
   (4) 2×10^{-11} s

4) When light travels from an optically rarer medium to an optically denser medium, the velocity decreases because of change in

   (1) wavelength
   (2) frequency
   (3) amplitude
   (4) phase

5) In vacuum, speed of light depends upon
(1) colour
(2) wavelength
(3) frequency
(4) none of the above

6) V_a, V_g and V_w are the values of the velocity of light in air, glass and water respectively. Which of the following relations is true?

(1) $\dfrac{V_w}{V_g} = 1$ and $\dfrac{V_g}{V_a} = 1$

(2) $\dfrac{V_g}{V_w} < 1$ and $\dfrac{V_a}{V_w} > 1$

(3) $\dfrac{V_w}{V_g} = 1$ and $\dfrac{V_w}{V_a} < 1$

(4) $\dfrac{V_a}{V_w} > 1$ and $\dfrac{V_w}{V_g} < 1$

7) If C_1 and C_2 are velocities of light in two media and the respective angles of incidence and refraction are θ_1 and θ_2 then,

(1) $C_1 \cos ec\ \theta_1 = C_2 \cos ec\ \theta_2$

(2) $C_1 \cot \theta_1 = C_2 \cot \theta_2$

(3) $C_1 \tan \theta_1 = C_2 \tan \theta_2$

(4) $C_1 \sin \theta_1 = C_2 \sin \theta_2$

8) The refractive index of a certain glass is 1.50 for light whose wavelength in vacuum is $6000 A°$. What is the wavelength of this light as it passes through glass?

(1) $6000 A°$
(2) $9000 A°$
(3) $4000 A°$
(4) none of these

9) The velocity of light in medium in a $2 \times 10^{10} cms^{-1}$. The refractive index of the medium is

(1) 1.4
(2) 2.3
(3) 1.0
(4) 1.5

10) The refractive index of water is 1.33. The velocity of light in water is

(1) $2.25 \times 10^8 \, ms^{-1}$

(2) $3 \times 10^8 \, ms^{-1}$

(3) $4 \times 10^8 \, ms^{-1}$

(4) none of these

11) A ray of light enters a rectangular glass slab of refractive index $\sqrt{3}$ at an angle of incidence 60^0. It travels a distance of 5 cm inside the slab and emerges out of the slab. The perpendicular distance between the incident and emergent rays is

(1) $4\sqrt{3}cm$

(2) $\dfrac{5}{2}$ cm

(3) $\dfrac{5\sqrt{3}}{2}cm$

(4) $5cm$

12) A beaker contains water and alcohol with a pin at its bottom. The depth of water and alcohol are 8 cm and 12 cm respectively. The apparent depth of the pin is (take n_w = 4/3 and n_A = 6/5).

(1) 12 cm

(2) 10 cm

(3) 4 cm

(4) 16 cm

13) A spot is made on the bottom of a transparent slab of material of refractive index 1.5. The spot is viewed vertically from the top, and it seems to be raised by 2 cm. Then the height of the slab is

(1) $10cm$

(2) $8cm$

(3) $6cm$

(4) $4cm$

14) A plane glass slab is placed over various coloured letters. The letter which appears to be raised least is

(1) Violet

(2) Yellow

(3) Red

(4) Green

15) A man inside water sees a flying aeroplane as if it is

(1) Nearer
(2) Farther
(3) At the same distance
(4) None

16) A ray of light suffers refraction at the air glass interface of a parallel faced slab of thickness 10 cm. The angle of incidence and refraction are 60^0 and 30^0 respectively. The lateral shift of the light ray is

(1) $\frac{10}{\sqrt{3}} cm$

(2) $\frac{5}{\sqrt{3}} cm$

(3) $\frac{10}{\sqrt{2}}$ cm

(4) $\frac{5}{\sqrt{2}} cm$

17) A rectangular glass block of thickness 10 cm and refractive index 1.5 is placed over a small coin. A beaker filled with water upto a height of 10 cm is placed over the glass block. The apparent shift in the position of the coin is n_w =4/3

(1) 14.2 cm
(2) 5.83 cm
(3) 2.83 cm
(4) None

18) A beaker contains water and benzene of refractive indices 4/3 and 3/2 respectively. If their depths are each 12 cm. The apparent depth of the bottom of the beaker is

(1) 18 cm
(2) 16 cm
(3) 34 cm
(4) 17 cm

19) A microscope is focused on a mark. Then a glass slab of refractive index 1.5 and thickness 6 cm is placed on the mark. To get the mark again in focus the microscope should be moved

(1) $4cm$ upward
(2) $2cm$ downward
(3) $2cm$ upward
(4) $4cm$ downward

20) A person looks at the bottom of a vessel containing water of refractive index n to a height h. Level of the persons eyes is (h/4) above the water surface. The apparent depth of the bottom of the vessel to him/her is

(1) $\frac{h}{n}\left(1+\frac{n}{4}\right)$

(2) $\frac{h}{n}$

(3) $\frac{h}{n}+\frac{h}{4}$

(4) $\frac{5h}{4n}$

21) Total internal reflection takes place when light is incident _____.

(1) on a concave mirror
(2) from air on a plane glass surface at a certain given angle
(3) from air on a plane surface at any angle
(4) from inside glass placed in water at a certain given angle

22) It is possible to observe total internal reflection when a ray travels from _____.

(1) air to water
(2) air into glass
(3) water into glass
(4) glass into water

23) Two transparent media A and B are in contact. Velocity of light in A is 2 x 10^8 ms^{-1} and in B is 2.5 x $10^8 ms^{-1}$. The critical angle for which ray of light going from A to B is totally internally reflected is _____.

(1) $sin^{-1}(4/7)$
(2) $sin^{-1}(4/5)$
(3) $sin^{-1}(2/5)$
(4) $sin^{-1}(1/2)$

24) Critical angle for light passing from glass to water is minimum for

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

25) The critical angle for light going from medium A into medium B is θ. The speed of light in medium A is v. The speed of light in medium B is

(1) v/sin θ
(2) v sin θ
(3) v/tan θ
(4) v tan θ

26) A ray of light inside a rectangular glass block of RI $\sqrt{2}$ is incident on the glass-air surface at an angle of 45°. The ray will

(1) emerge into air without any deviation
(2) be reflected back into glass.
(3) be absorbed
(4) emerge into air at an angle of refraction equal to 90°

27) The speed of light in medium A is 2×10^8m/s and that in medium B is 2.4×10^8m/s. The critical angle for light tending to go from A to B is

(1) $\sin^{-1}(\frac{5}{12})$

(2) $\sin^{-1}(\frac{5}{6})$

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

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

28) A diver inside water sees the setting sun at

(1) $41°$ to the horizon
(2) $49°$ to the horizon
(3) $0°$ to the horizon
(4) $45°$ to the horizon

29) A fish looking up through water sees the outside world contained in a circular cone. If the RI of water is 4/3 and the fish is 12 cm below the surface of water, the radius of the base of the cone in cm is

(1) $12\times3\times\sqrt{5}$
(2) $12\times3\times\sqrt{7}$
(3) $\frac{12\times3}{\sqrt{7}}$
(4) $4\times\sqrt{5}$

30) A ray of light from a sodium lamp undergoes total internal reflection. The critical angle will be smallest when it travels, from

(1) water to glass
(2) glass to air
(3) glass to water
(4) water to air

31) A swimmer is inside a water tank. Supposing that the surface is calm, the swimmer when looking up, sees the outside world in an angular separation of

(1) 40^0
(2) 90^0
(3) 98^0
(4) 101^0

Refraction through a prism

32) The angle of a prism is 30^0. The rays incident at 60^0 at one refracting face suffer a deviation of 30^0. The angle of emergence is

(1) 0^0
(2) 30^0
(3) 60^0
(4) 90^0

33) The angle of incidence and emergence in an equilateral prism are 50^0 and 70^0 The angle of deviation is

(1) $45°$
(2) $50°$
(3) $60°$
(4) $30°$

34) A ray of light passes through an equilateral prism such that the angle of emergence is equal to the angle of incidence and each is equal to (3/4)th of the angle of the prism. The angle of deviation is

(1) 45^0
(2) 39^0
(3) 20^0
(4) 30^0

35) In a prism of refracting angle 72^0, the angle of refraction at the first face is 27^0. If the refractive index of the material of the prism is $\sqrt{2}$, the angle of emergence is

(1) 0^0
(2) 60^0
(3) 45^0
(4) 90^0

36) The refractive index of the material of equilateral prism is $\sqrt{3}$. The angle of minimum deviation for the prism is

(1) $30°$
(2) $41°$
(3) $49°$
(4) $60°$

37) Angle of minimum deviation is equal to the angle of prism A of an equilateral glass prism. The angle of incidence at which minimum deviation will be obtained is

(1) 60^0
(2) 30^0
(3) 45^0
(4) $\sin^{-1}(2/3)$

38) The refracting 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 is

(1) $180^0 - 3A$
(2) $180^0 + 2A$
(3) $90^0 - A$
(4) $180^0 - 2A$

39) A beam of monochromatic light is incident on one face of an equilateral prism, the angle of incidence being 55^0. If the angle of emergence is 46^0 then the angle of minimum deviation is

(1) 41^0
(2) $< 41^0$
(3) $> 41^0$
(4) $\geq 41^0$

40) Dispersive power depends on:

(1) angle of prism
(2) shape of prism
(3) material of prism
(4) none of these

41) The refractive index of a particular material is 1.67 for violet light and 1.63 for red light. The dispersive power of the material is

(1) 0.0615
(2) 0.024
(3) 0.031
(4) 1.65

42) A ray of light passes through a prism of angle 10^0. If the R.I. of the prism is 1.531 for blue and 1.521 for red light. Find the angular dispersion and dispersive power of the material of the prism.

(1) $1^0 \, and \, 0.019$

(2) $0.1^0 \, and \, 0.019$

(3) $0.1^0 \, and \, 2$

(4) $0.1^0 \, and \, 0.0065$

43) A thin prism of angle $7°$ and refractive index 1.5 is combined with another prism of angle θ and refractive index 1.7. The emergent ray goes undeviated. What is the value of θ?

(1) $3°$
(2) $5°$
(3) $9°$
(4) $11°$

44) A ray is incident at an angle of incidence i on one surface of a prism of small angle A and emerges normally from the opposite surface. If the refractive index of the material of the prism is n, the angel of incidence i is nearly equal to

(1) $\dfrac{A}{n}$

(2) $\dfrac{A}{2n}$

(3) nA

(4) $\dfrac{nA}{2}$

45) A beam of monochromatic light is incident on one face of an equilateral prism, the angle of incidence being 55^0. If the angle of emergence is 46^0 then the angle of minimum deviation is

(1) 41^0 (2) $< 41^0$
(3) $> 41^0$ (4) $\geq 41^0$

46) The path of a refracted ray of light in a prism is parallel to the base of the prism only when the

(1) light is of a particular wavelength
(2) ray is incident normally at one face.
(3) ray undergoes minimum deviation
(4) prism is made of a particular type of glass

47) When the angle of deviation for refraction though the prism is minimum then the true statement is
Angle of incidence is equal to :

(1) the angle of refraction
(2) the angle of emergence
(3) half the angle of prism
(4) half the angle of deviation.

48) For which colour the angle of deviation is the least ?

(1) Violet   (2) Blue
(3) Red   (4) Yellow.

49) A thin prism of angle 7^0 and refractive index 1.5 is combined with another prism of angle θ and refractive index 1.7. The emergent ray goes undeviated. What is the value of θ ?

(1) 3^0 (2) 5^0
(3) 9^0 (4) 11^0

50) A thin glass prism ($\mu = 1.5$) is immersed in water ($\mu = 1.3$). If the angle of deviation in air for a particular ray be D, then that in water will be

(1) 0.2 D   (2) 0.3 D
(3) 0.5 D   (4) 0.6 D

51) A ray of light is incident making angle 36^0 with the face of an equilateral prism. If the ray suffers minimum deviation, the angle of deviation is:

(1) 42^0 (2) 48^0
(3) 54^0 (4) 60^0.

52) Deviation of 5^0 is observed from a prism of refractive index 1.5 having a small angle. The angle of prism is

(1) 7.5^0 (2) 10^0
(3) 5^0 (4) 3.3^0

53) The refractive indices of violet and red lights are 1.54 and 1.52 respectively. If the angle of prism is 10^0, then the angular dispersion is

(1) 0.02 (2) 0.2
(3) 3.06 (4) 30.6

54) A thin prism P_1 with angle 4^0 and refractive index 1.54 is combined with another prism P_2 of refractive index 1.72 to produce dispersion without deviation. The angle of prism P_2 is

(1) 2.6^0 (2) 3^0
(3) 4^0 (4) 5.33^0

Refraction through a spherical surface

55) The R of spherical surface (centre of curvature C) is said to be positive if

(1) object is in denser medium
(2) object is in rarer medium
(3) C is in denser medium
(4) C is in rarer medium

56) Power of a spherical surface depends on

(1) R only (2) R and n of both the media
(3) u (4) v

57) For a plane refracting surface

(1) R = 0 (2) f = 0
(3) P = 0 (4) P is infinity

58) An ink dot on a glass sphere is observed from the side diametrically opposite to it. It appears

(1) nearer
(2) farther
(3) at the same distance
(4) on the nearer surface
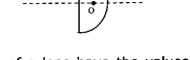
59) A plastic hemisphere has a radius of curvature of 8 cm and RI 1.6. On the axis half way between the plane surface and the spherical one (4 cm from each) is a small object O. The distance between the two images when viewed along the axis from the two sides of the hemisphere is approximately

(1) 1 cm
(2) 1.5 cm
(3) 3.75 cm
(4) 2.5 cm

60) The radii of curvature of the two faces of a lens have the values 10cm and 15cm. If the refractive index of the material of the lens is 1.54, then its focal length is given by (in cm)

(1) 9.0
(2) 16.2
(3) 38.5
(4) 11.1

61) The focal length of lens of focal power 2D is

(1) 2 cm
(2) 0.5 cm
(3) 50 cm
(4) - 0.5 cm

62) The two faces of biconvex lens of focal length 24cm have radii of curvature 20cm and 30cm. The refractive index of the material of the lens is

(1) 1.5
(2) 1.6
(3) 1.33
(4) 1.54

63) A plano-convex lens of focal length 16 cm is to be made of glass of refractive index 1.5. The radius of curvature of the curved surface should be

(1) 8 cm
(2) 12 cm
(3) 16 cm
(4) 24 cm

64) An air bubble in water behaves as

(1) convex lens
(2) concave lens
(3) convex mirror
(4) concave mirror

65) A convex lens made of glass n_g = 3/2 has a focal length F. When immersed in water of refractive index 4/3 its focal length becomes

(1) 2F
(2) 4F
(3) F/4
(4) 3F

66) A convex lens of glass has power P in air. If it is immersed in water its power will be

(1) more than P
(2) less than P
(3) P
(4) more than P for some colours and less than P for others.

67) A convex lens, made of a material of refractive index 1.5 and having a focal length of 10 cm is immersed in a liquid of refractive index 3.0 . The lens will behave as a

(1) converging lens of focal length 10 cm
(2) diverging lens of focal length 30 cm
(3) converging lens of focal length 10/3 cm
(4) diverging lens of focal length 10 cm

68) A convex lens when placed in a certain medium does not at all act as a lens. The refractive index of lens is n_1 and that of medium is n_2, the relation between n_1 and n_2 is

(1) $n_1 > n_2$
(2) $n_1 < n_2$
(3) $n_1 = n_2$
(4) None of these

69) A biconvex lens forms a real image of an object placed perpendicular to its principal axis. If the radius of curvature of the lens surfaces tends to infinity, the image would

(1) disappear
(2) remain as real image still
(3) be virtual and of the same size as the object
(4) suffer from aberrations.

70) A lens of power +2D and a lens of -1D are kept in contact. The focal length of the combination is

(1) $+3m$ (2) $-3m$
(3) $+1m$ (4) $-1m$

71) A lens of power +4 D is kept in contact with another lens coaxially. The combination has the focal length of 40cm. The power of the second lens is

(1)   – 2.0D
(2)   – 1.5D
(3)   2.50
(4)   3.0D

72) Two lenses of power – 2.5D and +4.0D are kept in contact. The focal length of the combination is

(1)   25cm
(2)   33.3cm
(3)   66.7cm
(4)   50cm

73) Two lenses of powers +2D and – 6D kept in contact. Focal length of the combination is

(1)   -0.25m
(2)   0.25m
(3)   0.025m
(4)   -0.025m

74) Two converging lenses of equal focal length f are placed in contact coaxially. The focal length of the combination is

(1)   f   (2)   2f
(3)   f/2   (4)   3f

75) A combination of two thin lenses in contact behaves as a converging lens of focal length 80 cm. If one of the lenses is a converging lens of focal length 20 cm, the power of the other lens is

(1)   1.66D
(2)   4 D
(3)   – 1 D
(4)   – 3.75 D

76) With the help of a plano-convex lens a beam of parallel rays is brought to a focus. A thin concave lens of equal focal length is placed in contact with the plano-convex lens. Because of this

(1)   the focus comes very close to the lens
(2)   the focus is shifted to infinity
(3)   the focus does not change at all
(4)   the focus shifts by a small distance away from the lens

77) Two convex lenses of focal lengths f_1 and f_2 are separated co-axially by a distance d. The power of the combination will be zero if

(1) $d = \dfrac{f_1 + f_2}{2}$

(2) $d = \dfrac{f_1 - f_2}{2}$

(3) $d = f_1 + f_2$

(4) $d = \sqrt{f_1 f_2}$

78) If h_1 and h_2 be the sizes of the images respectively for the two positions of the lens in displacement method, then the size of the object is given by

(1) $(h_1 + h_2)/2$

(2) $\sqrt{h_1 h_2}$

(3) $\sqrt{h_1/h_2}$

(4) $\sqrt{h_2/h_1}$

79) A convex lens forms a real image 4 cm long on a screen. When the lens is shifted to a new position without disturbing the object or the screen, again real image is formed on the screen which is 16 cm long. The length of the object is

(1) 8 cm

(2) 10cm

(3) 12 cm

(4) 6 cm

80) The power of a lens is 4 D. Its focal length is

(1) 20 cm

(2) 25 cm

(3) 50 cm

(4) 400 cm

81) The focal length of a convex lens is 50 cm. its power is

(1) + 50 D

(2) - 50 D

(3) + 2 D

(4) - 2 D

82) A convex lens of glass has power P in air. If it is immersed in water its power will be

(1) more than P

(2) less than P

(3) P

(4) more than P for some colours and less than P for others

83) Power of a lens is measured in

   (1) lumen   (2) watt   (3) dioptre (4) HP

84) A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination in dioptre is

   (1) - 1.5   (2) - 6.5
   (3) + 6.5   (4) + 6. 67

85) If R_1 and R_2 are the radii of curvature of a double convex lens, which of the following will have the largest power?

   (1) $R_1=\infty$ $R_2=10cm$ (2) $R_1=10cm$, $R_2=\infty$
   (3) $R_1=R_2=10cm$ (4) $R_1=R_2=5cm$

86) If in a plano-convex radius of curvature of convex surface is 10cm and the focal length of the lens is 30cm, the refractive index of the material of the lens will be

   (1) 1.5   (2) 1.66   (3) 1.33   (4) 3

87) A convex lens of focal length 16cm forms a real image double the size of the object, what is the distance of the object from the lens?

   (1) 8cm   (2) 16cm   (3) 24cm   (4) 32cm

88) For which colour the focal length of a convex lens is more?

   (1) Red   (2) Yellow
   (3) Green   (4) Blue

89) A biconvex lens behaves as diverging lens in water and a converging lens in air. The refractive index of water is 1.33 and that of air is 1, the refractive index of the material of lens

   (1) n < 0   (2) 0 < n < 1
   (3) 1 < n < 1.33 (4) n > 1.33

90) A thin convex lens of crown glass having refractive index 1.5 has power 1 D. What will be the power of similar convex lens of refractive index 1.6?
   (1) 0.6 D   (2) 0.8 D
   (3) 1.2 D   (4) 1.6 D

91) A convex lens of crown glass (n = 1.525) will behave a divergent lens if immersed in

    (1)   water (n = 1.33)
    (2)   a medium of n = 1.525
    (3)   carbon disulfide (n = 1.66)
    (4)   it cannot act as a divergent lens

92) A plano – convex lens is made of glass of refractive index 1.5. The focal length f of the lens and radius of curvature R of its curved face are related as

    (1) $f = R/2$ (2) $f = R$
    (3) $f = 2R$ (4) $f = 3/2\ R$

93) If the top half a convex lens is covered with black paper

    (1)   the bottom half of the image will disappear
    (2)   the top half of the image will disappear
    (3)   the magnification will be reduced to half
    (4)   the intensity of image will be reduced to half

94) A convex lens of glass is immersed in a liquid of refractive index greater than that of the glass. It will behave as a

    (1)   convergent lens
    (2)   divergent lens
    (3)   plane glass
    (4)   homogeneous liquid

95) Two convex lenses of focal lengths f_1 and f_2 are mounted coaxially separated by a distance. If the power of the combination is zero, the distance between the lenses is

    (1) $| f_1 - f_2 |$ (2) $f_1 + f_2$
    (3) $\dfrac{f_1 f_2}{|f_1 - f_2|}$ (4) $\dfrac{f_1 f_2}{f_1 + f_2}$

96) The point inside a lens through which a ray of light passes undeviated is called

    (1) pole   (2) principal focus
    (3) optic centre   (4) centre of curvature
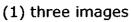
97) For a plane refracting surface

   (1) R = 0   (2) f = 0   (3) P = 0   (4) P is infinity

98) A camera is focused to take the picture of a girl standing 2m away from the camera lens. If the film is 10cm away from the lens, the focal length of the lens in cm, is

   (1) 20   (2) 9.5   (3) 200   (4) 10.0

99) A layered lens shown in the figure is made of three different materials. A point object is placed on the axis. The object will form

   (1) three images
   (2) two images
   (3) one image
   (4) infinite images.

100) In which case the image formed by a convex lens is virtual?

   (1) $0 = u = f$ (2) $f = u = 2f$
   (3) $2f = u = ß$ (4) $u = \infty$

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