PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

RAY OPTICS

Multiple Choice Question Level I

1. Show that if 'p' and 'q' are distance of object and image from the principal focus of a

concave mirror, then what is relation between p,q and f?

A. $pq = \sqrt{f}$

B. pq = f

C. $pq = f^2$

D. $pq = \frac{1}{f}$

Answer: C

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2. A convex mirror of focal length f produces an image $\frac{1}{n}$ of the size of the object. The distance of the object from the mirror is:

A. (n-1) f

B. $\left(\frac{n+1}{n}\right)f$

C. (n - 2) f

D. (n - 3) f

Answer: A

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3. A short linear object of length l lies along the axis of a concave mirror of focal length f at a distance u from the pole of mirror. The size of image is nearly equal to

A. $l(u+f)^2)$

B. $l(u-f^2)$

C. $l\left(\frac{f}{u-f}\right)^2$

D. $l\left(\frac{u-f}{f}\right)^2$

Answer: C

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4. A man 1.8 m tall wishes to see his full image in a plane mirror, happing vertically in a wall. Find the length of the shortest mirror in which he can see his full length image.

A. 0.3 m

B. 0.6 m

C. 0.9 m

D. 1.2 m

Answer: A

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5. In above question, if eyes if man are at 1 - 70 m above the ground, find the position of the mirror :

A. 0.85 m

B. 0.65 m

C. 0.45 m

D. 0.25 m

Answer: A

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6. What should be angle between two mirrors that what so ever may be angle of incidence, the incident and reflected rays from the two mirros are parallel to each other:

A. $\frac{\pi}{3}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{2}$

D. $\frac{\pi}{4}$

Answer: C

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7. Find the power of a thin glass lens $(\mu = 1.5)$ in a liquid with refractive index $\mu_0 = 1.7$, if its power in air is : -5D.

A. $+4D$

B. $+2D$

C. $-4D$

D. $-2D$

Answer: D

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8. A glass plate the thickness t and ref. index μ. At what angle of incidence (from air), the reflected and refracted rays by plate be perpendicular to each other:

A. $\sin^{-1}\mu$

B. $\cos^{-1}\mu$

C. $\cot^{-1}\mu$

D. $\tan^{-1}\mu$

Answer: A

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9. The medium on both sides of a lens is air. The distance of object O, image I from the first and second foci F_1 and F_2 are shown in fig.

The focal length of the lens is :

A. 20 cm

B. 10 cm

C. 15 cm

D. 9.5 cm

Answer: C

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10. If the ciritical angle for the medium of a prism is C and the angle of prism is A. then there will be no emergent ray when :

A. $A < 2C$

B. A = 2C

C. $A > 2C$

D. $A \leq 2C$

Answer: A

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11. A parallel beam is incident on a convex lens of focal length f. It is then put in correct with a concave lens of focal length $\frac{f}{2}$. What will happen to image?

A. real at $v = \frac{f}{2}$

B. real at v = f

C. virtual at $v = \frac{f}{2}$

D. virtual at v = f.

Answer: A

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12. A concave lens of glass, refractive index 1.5, has both surfaces of same radius of curvature R. On immersion in a medium of refractive index 1.75, it will behave as a,

A. convergent lens of focal length 3.5 R

B. convergent lens of length 3.0 R

C. divergent lens of focal length 3.5 R

D. divergent lens of focal length 3.0 R

Answer: A

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13. A certain prism is that to produce minimum deviation of 38°. If produces a deviation of 44° when the angle of incidence is either 42° or 62°. What is refractive index of material of prism?

A. 1.51

B. 1.33

C. 1.62

D. 1.732

Answer: D

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14. For a ray refracted through a prism of angle 60°, thte angle of incidence is equal to angle of emergence, each equal to 45°. Find the refractive index of material:

A. 1.414

B. 1.5

C. 1.62

D. 1.732

Answer: C

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15. A prism of refractive index $\sqrt{2}$ has a refracting angle 60°. At what angle a ray must

be incident on it so that it suffers minimum deviation ?

A. 30°

B. 35°

C. 40°

D. 45°

Answer: C

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16. A slide projecto gives magnification of 10. If a slide of dimensions $3cm \times 2cm$ is projector on screen, the area of image on screen is :

A. $300cm^{\circ}$

B. $15cm^{\circ}$

C. $600cm^{\circ}$

D. $25cm^{\circ}$

Answer: A

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17. If accelerating potential increases from 20 kV to 80 kV in an electron microscope, its resolving power R would change to :

A. $\frac{R}{4}$

B. 4R

C. 2R

D. $\frac{R}{2}$

Answer: B

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18. A ray of light strikes a horizontal plane mirror at an angle of 45°. At what angle should a second plane mirror be placed in order that the reflected ray finally be refracted horizontally from the second mirror:

A. 22.5° with horizontal

B. 67.5° with horizontal

C. 45° with horizontal

D. 75° with horizontal.

Answer: B

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19. A ray of light passes from vacuum into a medium of refractive index μ, the angle f incidence is found to be twice the angle of refractive. Then angle of refractive. Then angle of incidences is:

A. $\frac{\cos^{-1}(\mu)}{2}$

B. $2\frac{\cos^{-1}(\mu)}{2}$

C. $2\sin^{-1}\mu$

D. $2\frac{\sin^{-1}(\mu)}{2}$.

Answer: D

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20. At what angle does a diver see the setting sun ?

A. At about 41° to the horizon

B. At about 49° to the horizon

C. At about 60° to the horizon

D. At about 90° to the horizon

Answer: B

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21. The maximum value of index of refraction of a material of a prism which allows the passage of light through it when the refracting angle of prism is A is :

A. $\sqrt{1+\sin^2 a/2}$

B. $\sqrt{1+\cos^2 A/2}$

C. $\sqrt{1+\tan^2 A/2}$

D. $\sqrt{1+\cot^2 A/2}$

Answer: D

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22. If u is the distance of the real point object from thte principal focus of a spherical mirror or a focal length f and v is the distance of the

real point image from the principal focus, then uv is equal to :

A. f

B. f^2

C. f^3

D. f^4

Answer: B

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23. One side of the biconcave lens is silvered. It behaves like :

A. Convex mirror or $f = \frac{R}{2\mu}$

B. Concave mirror of $r = \frac{R}{2\mu}$

C. Convex mirror or focal length $\frac{R}{4\mu - 2}$

D. Concave mirror of focal length $\frac{R}{4\mu - 2}$

Answer: D

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24. When the convex side of the plano - convex lens is silvered, it behaves like:

A. Concave mirror of focal length $\frac{f}{2}$

B. Convex mirror of focal length $\frac{f}{2}$

C. Concave mirror of focal length $\frac{R}{2\mu}$

D. Convex mirror of focal length $\frac{R}{2\mu}$.

Answer: C

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25. In the displacement method, a convex lens is placed in between an obect and a screen. If the magnification in the two positions are m_1 and m_2 and the displacement of the lens between two positions is x, then the focal length of the lens is:

A. $\frac{x}{m_1 + m_2}$

B. $\frac{x}{m_1 - m_2}$

C. $\frac{x}{(m_1 + m_2)^2}$

D. $\frac{x}{(m_1 - m_2)^2}$

Answer: B

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26. For a mypoic eye, the far point is to 250 cm. To correct this defect, the nature of the lens and its focal length will be:

A. concave lens of 250 cm focal length

B. convex lens of 250 cm focal length

C. concave lens of 25 cm focal length

D. covex lens of 25 cm focal length

Answer: A

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27. A long sighted person has a least - distance of distinct vision of 50 cm. He wants to reduce it to 25 cm. He should use a :

A. concave lens of focal length 50 cm

B. convex lens of focal length 25 cm

C. convex lens of focal length 50 cm

D. concave lens of focal length 25 cm

Answer: C

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28. A myopic person can see things clearly lying between 8 cm and 100 cm from his eyes. The lens which enables his to see the moon should have a focal length of :

A. $+100cm$

B. $-100cm$

C. infinity

D. zero.

Answer: B

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29. Statement - I : The angular dispersion produced by a prism increases if the mean refractive index of the matetial of prism increases.

Statement - II : A prism prodouces deviation as

well as dispersion when polychromatic light is incident on it.

A. Statement I is true, statement II is false.

B. Statement I is false, statement II is true.

C. Statement I is true, statement II is true, statement I is correct explanation of statement II.

D.

Answer: C

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30. A lens of negligible thickness of focal length (f) has as aperture (d). If forms an image of intensity I. Now, the central part of aperture upto diameter d/2 is blocked by opaque paper. The focal length and image intensity will change to :

A. $\frac{f}{2}, \frac{I}{2}$

B. $\frac{3f}{4}, \frac{I}{2}$

C. $f, \frac{I}{4}$

D. $f, \frac{3I}{4}$

Answer: D

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31. A plane mirror reflecting a ray of incident light is rotated through an angle θ about an axis through the point of incidence in the plane of the mirror perpendicualr to the plane of incidence, then

A. The reflected ray does not rotate

B. The reflected ray rotates through an angle θ

C. The reflected ray rotates through an angle 2θ

D. The incident ray is fixed.

Answer: C::D

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32. Two plane mirrors are inclined to each other such that a ray of light incident on the first mirror and parallel to the second is reflected from the second mirror parallel to the first mirror. The angle between the two mirrors is :

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C

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33. A ray of light incidents on a plane mirror at an angle of 30°. The deviation produced in the ray is

A. 30°

B. 60°

C. 90°

D. 120°

Answer: D

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34. Two plane mirrors are at right angles to each other. A man stands between them and combs his hair with his right hand. In how many of the images will he be seen using his right hand

A. None

B. 1

C. 2

D. 3

Answer: B

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35. When a plane mirror is rotated through an angle θ then the reflected ray turns through the angle 2θ then the size of the image

A. Is doubled

B. Is halved

C. Remains the same

D. Becomes infinite.

Answer: C

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36. A ray of light is incident at 50° on the middle of one of the two mirros arranged at an angle of 60° between them. The ray then

touches the second mirror, making an angle of incidence of

A. 50°

B. 60°

C. 70°

D. 80°

Answer: C

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37. A light beam is being reflected by using two mirrors, as in a periscope used in submarines. If one of the mirros rotates by an angle θ, the reflected light will deviate from its original path by the angle 2θ

A. 0°

B. θ

C. 4θ.

D.

Answer: A

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38. The refracting angle of a prism is A and the refractive index is $\cot(A/2)$. The angle of minimum deviation is :

A. $180^\circ - 2A$

B. $180^\circ - A$

C. $180^\circ - 3A$

D. $180^\circ - 4A$.

Answer: A

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39. An object is placed in front of a convex mirror of focal length f. Find the maximum and minimum distance of an object from the mirror such that the image formed is real magnified

A. $2f$ and ∞

B. f and 2f

C. f and 0

D. None of these.

Answer: D

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40. A square wire of side 1 cm is placed perpendicular to the principal axis of a concave mirror of focal length 15 cm at a distance of 20 cm. The area enclosed by the image of the wire is :

A. $4cm^2$

B. $6cm^2$

C. $2cm^2$

D. $9cm^2$.

Answer: D

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41. The focal length of a cocave mirror is f and the distane from the object to the principal focus is x. The ratio of the size of the image to the size of the object is :

A. $\frac{f+x}{f}$

B. $\frac{f}{x}$

C. $\sqrt{\frac{f}{x}}$

D. $\frac{f^2}{x^2}$

Answer: B

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42. A concave mirror is used to focus the image of a flower on a nearby well 120 cm from the flower. If a lateral magnification of 16 is

desired, the distance of the flower from the mirror shuld be :

A. 8cm

B. 12 cm

C. 80 cm

D. 120 cm.

Answer: A

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43. Radius of curvature of concave mirror is 40 cm and the size of image is twice as that of object, then the object distance is :

A. 60 cm

B. 20 cm

C. 40 cm

D. 30 cm.

Answer: D

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44. A point object is placed at a distance of 30 cm from a convex mirror of focal length 30 cm. The image will form at

A. Infinity

B. focus

C. Pole

D. 15 cm behind the mirror.

Answer: D

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45. An object moving at a speed of 5 m/s towards a concave mirror of local length f = 1 m is at a distance of 9 m. The average speed of the image is :

A. $\frac{1}{5} m/s$

B. $\frac{1}{10} m/s$

C. $\frac{5}{9} m/s$

D. $\frac{2}{5} m/s$

Answer: A

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46. For unit magnification, the distance of an object from a concave mirror of focal length 20 cm will be :

A. 20 cm

B. 10 cm

C. 40 cm

D. 60 cm

Answer: C

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47. Monochromatic light is refracted from air into the glass of refractive index μ. The ratio of the wavelenght of incident and refracted waves is :

A. $1:\mu$

B. $1:\mu^2$

C. $\mu:1$

D. $1:1$

Answer: C

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48. A vessel of depth 2d cm is half filled with a liquid of refractive index μ_1 and the upper half with a liquid of refractive μ_2. The apparent depth of the vessel seen perpendicularly is

A. $d\left(\frac{\mu_1\mu_2}{\mu_1+\mu_2}\right)$

B. $d\left(\frac{1}{\mu_1}+\frac{1}{\mu_2}\right)$

C. $2d\left(\frac{1}{\mu_1}+\frac{1}{\mu_2}\right)$

D. $2d\left(\frac{1}{\mu_1\mu_2}\right)$

Answer: B

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49. A ray of light is incident on a surface of glass slab at an angle 45°. If the lateral shift produced per unit thickness is $\frac{1}{\sqrt{3}}$m, the angle of refraction prduced is :

A. $ta^{-1}\left(\frac{\sqrt{3}}{2}\right)$

B. $\tan^{-1}\left(1-\sqrt{\frac{2}{3}}\right)$

C. $\sin^{-1}\left(1-\sqrt{\frac{2}{3}}\right)$

D. $\tan^{-1}\left(\sqrt{\frac{2}{\sqrt{3}-1}}\right)$

Answer: B

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50. Light travels with a speed of 2×10^8 m/s in crown glass of refractive index 1.5. What is the speed of light in dense flint glass of refractive index 1.8

A. $1.33 \times 10^8 m/s$

B. $1.67 \times 10^8 m/s$

C. $2.0 \times 10^8 m/s$

D. $3.0 \times 10^8 m/s.$

Answer: B

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51. In the adjoining diagram, a wavefront AB, moving in air is incident on a plane glass surface XY. Its position CD after refraction

through a glass slab is shown also along with the normals drawn at A and D. The refractive of glass with respect to air $(\mu = 1)$ will be equal to

A. $\frac{\sin\theta}{\sin\theta'}$

B. $\frac{\sin\theta}{\sin\phi}$

C. $\frac{\sin\phi'}{\sin\theta}$

D. $\frac{AB}{CD}$.

Answer: B

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52. A man stading in a swimming pool looks at a stone lying at the bottom. The depth of the swimming pool is h, At what distance from the surface of water is the image of the formed (Line of vision is normal , Refractive index of water is n)

A. h/n

B. n/h

C. h

D. hn.

Answer: A

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53. If $\hat{i}$ denotes a unit vector along incident light ray $\hat{r}$ a unit vector along refracted ray a medium of refractive index μ and $\hat{n}$ vector normal to boundary of medium directed towards incident medium, then law of refraction is

A. $\hat{i}, \hat{n} = \mu(\hat{r}. \hat{n})$

B. $\hat{i} \times \hat{n} = \mu(\hat{n} \times \hat{r})$

C. $\hat{i} \times \hat{n} = \mu(\hat{r} \times \hat{n})$

D. $\mu(\hat{r} \times \hat{n}) = \hat{r} \times \hat{n}$

Answer: C

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54. The two lenses of an achromatic doublet should hav

A. Equal powers

B. Equal dispersive powers

C. Equal ratio of their power and dispersive power

D. Sum of the product of their powers and dispersive power equal to zero.

Answer: D

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55. Maximum lateral displacement of a ray of light incident on a slab of thickness t is

A. $\frac{t}{2}$

B. $\frac{t}{3}$

C. $\frac{t}{4}$

D. t.

Answer: D

View Text Solution

56. Each quarter of a vessel of depth H is filled with liquids of the refractive indices n_1, n_2, n_3 and n_4 from the bottom respectively. The apparent depth of the vessel when looked normally is

A. $\frac{H(n_1+n_2+n_3+n_4)}{4}$

B. $\frac{H\left(\frac{1}{4}+\frac{1}{n_2}+\frac{1}{n_3}+\frac{1}{n_4}\right)}{4}$

C. $\frac{(n_1+n_2+n_3+n_4)}{2}$

D. $\frac{H\left(\frac{1}{n_1}+\frac{1}{n_2}+\frac{1}{n_3}+\frac{1}{n_4}\right)}{2}$

Answer: B

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57. An under water swimmer is at a depth of 12 m below the surface of water. A bird is at a height of 18 m from the surface of water, directly above his eyes. For the swimmer the bird appears to be a disance from the surface of water equal to $\left(\text{Refractive Index of water is} \frac{4}{3}\right)$

A. 24 m

B. 12 m

C. 18 m

D. 9 m

Answer: A

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58. A light ray from air is incident (as shown in figure) at one end of a glass fiber (refractive indexmu = 1.5) making an incidence angle of60^(@)` "on the lateral surface, so that it undergoes a total

internal reflection. How much time would it take to traverse the straight fiber of lenght 1 km"

A. $3.33\mu s$

B. $6.67\mu s$

C. $5.77\mu s$

D. $3.85\mu s$

Answer: D

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59. 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

A. Yellow, orange, red

B. Violet, indigo, blue

C. All colours

D. All colours except green.

Answer: A

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60. Light travels in two media A and B with speeds $1.8 \times 10^8 ms^{-1}$ and $2.4 \times 10^8 ms^{-1}$ respectively. Then the critical angle between them is :

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

B. $\tan^{-1}\left(\frac{3}{4}\right)$

C. $\tan^{-1}\left(\frac{2}{3}\right)$

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

Answer: D

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61. When a glass prism of refractive angle 60° immersed in a liquid, its angle of minimum deviation $(\delta_m) = 30^\circ$. The critical angle of glass w.r.t liquid medium is :

A. 45°

B. 42°

C. 50°

D. 52°

Answer: A

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62. A double convex lens of focal length 20 cm is made of glass of refractive index 3/2. When placed completely in water $(._a\mu_w = 4/3)$, its focal length will be :

A. 80 cm

B. 15 cm

C. 17.7 cm

D. 22.5 cm

Answer: A

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63. A parallel beam of light is incident on a converging lens parallel to its principal axis. As

one moves away from the lens on the other side of the principal axis, the intensity of light

A. First decreases and then increases

B. Continuously increases

C. Continuously decreases

D. First increases and then decreases.

Answer: D

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64. A double convex thin lens made of glass $(\text{refractive index} \mu = 1.5)$ has both radii of curvature of magnititude 20 cm Incident light rays parallel to thte axis of the lens will converge at a distance L such that

A. L = 20 cm

B. L = 10 cm

C. L = 40 cm

D. L = 20/3 cm.

Answer: A

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65. An object is placed at 15 cm from a convex lens of focal length 10 cm. Where should another convex mirror of radius 12 cm placed such that image will coincide with object

A. 18 cm

B. 17 cm

C. 14 cm

D. 20 cm.

Answer: A

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66. A convex and a lens separated by distane d are then put in contact. The focal length of the combination

A. Becomes 0

B. Remains the same

C. Decreases

D. Increases.

Answer: D

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67. A convex lens is made of 3 layers of glass of 3 different materials as in the figure. A point object is placed on its axis. The number of images of the object are :

A. 3

B. 4

C. 1

D. 2

Answer: C

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68. Two plano - concave lenses (1 and 2) of glass of refractive index i.5 have radii of curvature 25 cm and 20 cm. They are placed in contact with their curved surface towards each other and the space between them is

filled with liquid of refractive index 4/3. Then the combination is :

A. Convex of focal length 70 cm

B. Concave of focal length 70 cm

C. Concave of focal length 66.6 cm

D. Concave of focal length 66.6 cm

Answer: C

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

A. $\frac{17}{8}$

B. $\frac{15}{8}$

C. $\frac{13}{8}$

D. $\frac{9}{8}$

Answer: B

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70. The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm. Its focal length is 12 cm. What is the refractive index of glass ?

A. 1

B. 1.33

C. 1.25

D. 1.5

Answer: D

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71. The position of final image formed by the given lens combination from the third lens will be at a distance of $f_1 = +10cm, f_2 = -10cm, f_3 = +30cm$

A. 15 cm

B. Infinity

C. 45 cm

D. 30 cm.

Answer: D

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72. The principal section of a glass prism is an isosceles triangle PQR with PQ = PR. The face PR is silvered. A ray incident normally on face PQ after two reflections, emerges from the

base QR in a direction perpendicular to it. What is the $\angle QPR$ of the prism ?

A. 36°

B. 46°

C. 60°

D. 72°

Answer: B

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73. An object is placed at a distance of 10 cm from a coaxial combination of two lenses A and B contact. The combination forms a real image three times the size of an object. If len B is concave with a focal length of 30 cm, what is the nature and focal lenght of lens A ?

A. Convex, 6 cm

B. Concave, 12 cm

C. Convex, 12 cm

D. Convex, 20 cm

Answer: B

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74. A plano - convex lens acts like a concave mirror of 28 cm focal length when its plane surface is silvered and like a concave mirror of 10 cm focal length its curved surface is silvered. The refractive index of the material of the lens is :

A. 1.55

B. 2.55

C. 1.6

D. 2.65

Answer: C

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75. The image formed by an objective of a compound microscope is :

A. virtual and diminished

B. real and diminished

C. real and enlarged

D. virtual and enlarged

Answer: C

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76. A pin is placed 0.1 m in front of a convex lens of focal length 0.2 m and refractive index 1.50. The surface of the lens farther away from the pin is silvered and has a radius of

curvature of 0.22 m. How far from the lens is the final image formed ?

A. 10 cm

B. 11 cm

C. 12 cm

D. 13 cm

Answer: D

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77. To get three images of a single object, one should have two plane mirrors at an angle of :

A. 60°

B. 90°

C. 120°

D. 30°

Answer: B

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78. The size of the image of an object which is at infinity as formed by a convex lens of focal length 30 cm is 2 cm. If a concave lens of focal length 20 cm is placed between the convex lens and the image at a distance of 26 cm from convex lens, find new size of image :

A. 1.25 cm

B. 2.5 cm

C. 1.05 cm

D. 2 cm

Answer: B

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79. A ray of light is incident at glass - water interface at angle I. It emerges finally parallel to surface of water, then μ_g is :

A. $4/3 \sin i$

B. $1/\sin i$

C. $4/3$

D. 1

Answer: B

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80. Light ray is incident perpendicularly to one face of a 90° prism and is totally internaly reflected at the glass - air interface. If the angle of reflection is 45°, we conclude that the refractive index n :

A. $n > \sqrt{2}$

B. $n > \frac{1}{\sqrt{2}}$

C. $n < \frac{1}{\sqrt{2}}$

D. $n < \sqrt{2}$.

Answer: A

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81. A plano-convex lens of refractive index 1.5 and radius of curvature 30 cm is silvered at the curved surface, Now this lens has been

used to form the image of an object. At what distance from this lens an object be placed in order to have a real image of the size of the object :

A. 80 cm

B. 60 cm

C. 30 cm

D. 20 cm.

Answer: D

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82. Two glasses have dispersive powers in the ratio of $2:3$ These glasses are used in the manufacture of an achromatic objective of focal length 0.2m. The focal lenghts of the two lenses of the objective are :

A. 6.67 cm, - 10 cm

B. 7.5 cm, - 12.5 cm

C. 9.67 cm, - 15 cm

D. 12.5 cm, - 20 cm.

Answer: A

View Text Solution

83. A point object is placed at the centre of a glass sphere of radius 6 cm and $\mu = 1.5$. The distance of virtual image from the surface of sphere is :

A. 2 cm

B. 4 cm

C. 6 cm

D. 12 cm

Answer: C

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84. A fish looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is $\frac{4}{3}$ and fish is 12 cm below the surface, the radius of the circle in cm is :

A. $36\sqrt{7}$

B. $\frac{36}{\sqrt{7}}$

C. $\frac{36}{\sqrt{5}}$

D. $\frac{4}{\sqrt{5}}$.

Answer: B

View Text Solution

85. Two point white dots are 1 mm apart on a black paper. They are viewed by eye of pupil diameter 3 mm. Approximately, what is the maximum distance at which these dots can be

resolved by the eye ? (Take wavelenght of light = 500 nm) :

A. 5 m

B. 1 m

C. 6 m

D. 3 m

Answer: A

View Text Solution

86. Thin glass (refractive index 1.5) lens has optical power of - 5 D in air. Its optical power in a liquid medium with refractive index 1.6 will be :

A. 1 D

B. $-1D$

C. 25 D

D. $-25D$

Answer: A

View Text Solution

View Text Solution

87. The refractive index of glass is 1.520 for red light and 1.525 for blue light. Let D_1 and D_2 be minimum angles of deviation for red and blue light in a prism of this glass then :

A. $D_1 > D_2$

B. $D_1 < D_2$

C. $D_1 = D_2$

D. none of above.

Answer: B

View Text Solution

88. Two lenses of powers - 15 D and + 5D are in contact with each other. The focal length of combination is :

A. $-10cm$

B. $+20cm$

C. $+10cm$

D. $-20cm$

Answer: A

View Text Solution

Multiple Choice Question Level Ii

1. A convex and a concave mrror of radius 10 cm each are placed 15 cm apart, facing each other. An object is placed mid - way between them. Find the position of final image if the reflection first takes place in the concave and then in the convex mirror :

A. Final image is formed on the pole of concave mirror

B. Final image is formed on the pole of convex mirror

C. Final image is formed at ∞ :

D. None of above.

Answer: B

View Text Solution

2. A convex mirror gives the image of an object 30 cm from it at the same point as plane mirror at a distance of 5.0 cm from the convex mirror and 25.0 cm from the object, Find the radius of curvature of convex mirror.

A. 30 cm

B. 60 cm

C. 90 cm

D. 120 cm.

Answer: D

View Text Solution

3. An object is x times, the focal length ofa concave mirror away from the principal focus. Show that the image will be $\frac{1}{nx}$ times the focal lehght of mirror away from principal focus, where n is :

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. 1

D. 1.5

Answer: C

View Text Solution

4. A lamp is placed 25 cm from a wall. What should be distance of concave mirror from the wall to get an image of lamp magnified two times on wall?

A. 10 cm

B. 20 cm

C. 50 cm

D. 60 cm

Answer: C

View Text Solution

5. A motor car is fitted with a convex driving mirror of focal length 20 cm. A second motor car 2 cm broad and 1.6 m high is 6 m away

from the first car. Then position of second car as seen from the first car is :

A. 10.2 cm

B. 8.3 cm

C. 12.2 cm

D. 19.4 cm

Answer: D

View Text Solution

6. In the previous question, if the second car is overtaking at a relative speed of $15ms^{-1}$, how fast will the image be moving ?

A. $1.2ms^{-1}$

B. $0.4ms^{-1}$

C. $0.12ms^{-1}$

D. $0.016ms^{-1}$

Answer: D

View Text Solution

7. The distance between two point sources of light is 24 cm. Where should a convergent lens of focal length 9 cm be placed between them to obtain images of both sources at the same point ?

A. u = 6 or 18 cm

B. u = 4, 12 cm

C. u = 3, 6 cm

D. u = 2, 4 cm

Answer: A

View Text Solution

8. Find the power of a biconvex lens $(\mu = 1.5)$ with air on the left side and water $(\mu = 1.33)$ on the right side. The power of lens in air is $+10D$:

A. 3.2 D

B. 4.4 D

C. 6.67 D

D. 2.4 D

Answer: C

View Text Solution

9. A cubical vessel with non - transparent walls is so located that eye E of observer cannot see its bottom but can see all of the wall CD. To what height should water be filled in vessel for the observer to see an object O placed at a distance b = 10 cm from the corner $C\left(.^{a}\mu_{\omega}=\frac{4}{3}\right)$

A. 16.5 cm

B. 20.4 cm

C. 26.7 cm

D. 28.2 cm

Answer: C

View Text Solution

10. The area of moon's image produced by a convex lens is proportional to focal length as :

A. $\sqrt{f}$

B. f

C. f^2

D. None of these.

Answer: C

View Text Solution

11. A convex lens from a real image 16 cm long on a screen. Without altering the position of the object and screen, the lens is displaced so

as to again get a real image 4 cm long on screen. What is size of the object ?

A. 8 cm

B. 6 cm

C. 4 cm

D. 2 cm

Answer: A

View Text Solution

12. A prism of angle 60° deviates a ray of light through 31° for two angles of incidence, which differ by 17° What is refractive index of prism ?

A. 0.8

B. 1.4

C. 1.1

D. 2.2

Answer: B

View Text Solution

View Text Solution

13. The refractive index of a material of prism of refracting angle 45° is 1.6 for a certain monochromatic ray. What should be the minimum angle of incidence of this ray on this prism so that so internal reflection takes place as the ray comes out of the prism ?

A. 10.1°

B. 12.2°

C. 12.8°

D. 14.1°

Answer: A

View Text Solution

14. A ray of light is incident at an angle of 60° on one of the faces of a prism which has an angle of 30°. The ray emerging out of prism makes an angle of 30° with the incident ray. Calculate the refractive index of material.

A. 1.1

B. 1.33

C. 1.5

D. 1.732

Answer: D

View Text Solution

15. The principal cross section of a prism is an equlateral triangle. A ray is incident perpendicular to one of its faces. What will be path of the ray for different values of

refractive indices of material of the prism ?

A. the ray will be totally reflected and emerge through third face for $\mu \geq 1.5$

B. the ray will emerge at second face for $\mu < 1.15$ the ray will be emerging at second face for $\mu > 1.15$

C. none of above.

D.

Answer: A::B

View Text Solution

16. A hollow equilateral air prism is immersed in water. Calculate the deviation of a ray incident at an angle 30° from the base side $\left(.^a\mu_w = \frac{4}{3}\right)$

A. 8.5°

B. 12.5°

C. 16.5°

D. 20.2°

Answer: C

View Text Solution

17. A ray of light is incident normally on one face of a triangular prism of refracting angle 30° and refractive index 1.5 Find the deviaton of the ray produced.

A. 18.6°

B. 12.2°

C. 8.4°

D. 6.3°

Answer: A

View Text Solution

18. A ray of light incident normally on one of the faces of rt. Angled isosceles prism is found to be totally reflected, what is min. value of refractive index of material of prism ?

A. 1.01

B. 1.22

C. 1.414

D. 1.53

Answer: C

View Text Solution

19. A thin prism of angle 5° is placed at a distance of 10 cm from the object. What is distance of image from the object ?

A. 0.25 cm

B. 0.43 cm

C. 0.52 cm

D. 0.61 cm

Answer: B

View Text Solution

20. A glass prism of angle 60° and μ_g = 1.66 is immersed in a liquid of μ_1 = 1.33. Find the

angle of minimum deviation for a parallel beam of light passing through prism.

A. 9.4°

B. 17.2°

C. 12.6°

D. 9.2°

Answer: B

View Text Solution

21. A person can see clearly objects between 15 and 100 cm from his eye. Find the range of his vision is he wears close fitting spectacles having a power of 0.8 diopter :

A. 5 to 500 cm

B. 12 to 250 cm

C. 17 to 500 cm

D. 17 to 250 cm

Answer:

View Text Solution

View Text Solution

22. A telescope has an objective of local length 50 cm and an eye piece of foal length 5 cm. The least distance of distinct vision is 25 cm. The telescope is focussed for distinct vision on a scale 200 cm away from objective. Find the magnification and tube lenght.

A. 1, 30.2 cm

B. 2, 70.83 cm

C. 1.5, 45.1 cm

D. 1.75, 56.2 cm

Answer: B

View Text Solution

23. A compound microscope has an objective of focal length 2 cm ahd eye piece of focal length 5 cm. The distance between two lenses is 25 cm. If final image is at 25 cm from the eye - piece, find the magnifying power of the microscope :

A. 56.5

B. 65.2

C. 25.6

D. 35.2

Answer: A

View Text Solution

24. A short linear object of length b lies along the axis of a concave mirror of focal length f at

a distance u from the pole of the mirror. The size of the image is approximately :

A. $b\sqrt{\frac{u-f}{f}}$

B. $b\sqrt{\frac{f}{u-f}}$

C. $b\left(\frac{u-f}{f}\right)$

D. $b\left(\frac{f}{u-f}\right)^2$

Answer: D

View Text Solution

25. A rod of length 10.0 cm lies along the principal axis of a concav mirror of focal length in such a way that the end closer to the pole is 20.0 cm away from it. The length of the image is :

A. 10.0 cm

B. 15.0 cm

C. 5.0 cm

D. 20.0 cm

Answer: C

View Text Solution

26. A convex lens has different media on its two sides. Its first focal length is 10 cm. An object is placed at a distance of 15 cm from the first principal focus. The lens produces its image on the other side at a distance of 20 cm from the second principal focus. The second focal lenght is :

A. 30 cm

B. 10 cm

C. 17.5 cm

D. 35 cm

Answer: A

View Text Solution

27. A convex lens of focal length f is placed some - where in between the object and a screen. The distance between object and screen is x. If magnification produced is m, the focal length of the lens is :

A. $\frac{mx}{(m+1)^2}$

B. $\frac{mx}{(m-1)^2}$

C. $\frac{(mx+1)^2}{m}x$

D. $\frac{(m-1)^2}{m}x$

Answer: D

View Text Solution

28. A person can see objects lying between 50 cm and 100 cm. What power of lens will he use

for reading a book ? (Distance of L.D.V. is 25 cm) :

A. $+2D$

B. $-2D$

C. $+0.2D$

D. $-0.2D$

Answer: A

View Text Solution

29. A thin rod (AB) of length $\frac{f}{3}$ is placed along the axis of a concave mirror of focal length f such that its image $(B'A')$ which is real and elongated the rod.

A. 2f

B. $\frac{5f}{3}$

C. $\frac{4f}{3}$

D. f

Answer: A

View Text Solution

30. A thin rod (AB) of length $\frac{f}{3}$ is placed along the axis of a concave mirror of focal length f such that its image $(B'A')$ which is real and elongated the rod.

The location of A from pole of mirror is :

A. $\frac{5f}{2}$

B. $\frac{7f}{3}$

C. $\frac{5f}{3}$

D. $\frac{4f}{3}$

Answer: C

View Text Solution

31. A thin rod (AB) of length $\frac{f}{3}$ is placed along the axis of a concave mirror of focal length f such that its image $(B'A')$ which is real and elongated the rod.

The location of image distance PA' from pole of mirror is :

A. $\frac{5f}{2}$

B. $\frac{3f}{2}$

C. $\frac{5f}{3}$

D. $\frac{4f}{3}$

Answer: A

View Text Solution

32. A thin rod (AB) of length $\frac{f}{3}$ is placed along the axis of a concave mirror of focal length f such that its image $(B'A')$ which is real and elongated the rod.

A. f/3

B. 2f/3

C. $\frac{3f}{2}$

D. f/2

Answer: D

View Text Solution

33. Two plane mirrors M_1 and M_2 parallel to each other and spaced 20 cm apart. An object O is placed between them at a distance 5 cm from the mirror as shown in the figure.

The distance of the three images from the mirror M_1 is :

A. 5 cm, 35 cm, 45 cm

B. 5 cm, 10 cm, 15 cm

C. 5 cm, 15 cm, 25 cm

D. 5 cm, 20 cm, 35 cm

Answer: A

View Text Solution

34. Two plane mirrors M_1 and M_2 parallel to each other and spaced 20 cm apart. An object O is placed between them at a distance 5 cm from the mirror as shown in the figure.

The distance of first three images from the mirror. M_2 is :

A. 15 cm, 35 cm, 45 cm

B. 15 cm, 25 cm, 55 cm

C. 15 cm, 45 cm, 55 cm

D. 15 cm, 20 cm, 35 cm.

Answer: B

View Text Solution

35. Two lenses (1) and (2) with $R_1 = R_2 = 0.20m$ each are made from glasses with $\mu_1 = 1.2$ and μ_2 = 1.6 respectively. The two lenses with a separation of 0.345 m are submerged in a liquid with $\mu_1 = 1.4$. The focal lenghts of (1) and (2) are found. An object is placed at a distance of 1.3m from lens 1.

The focal lenght of 1 is :

A. 0.7 cm

B. 70 cm

C. $-70cm$

D. $-0.7cm$

Answer: C

View Text Solution

36. Two lenses (1) and (2) with $R_1 = R_2 = 0.20m$ each are made from glasses with $\mu_1 = 1.2$ and μ_2 = 1.6 respectively. The two lenses with a separation of 0.345 m are submerged in a liquid with

$\mu_1 = 1.4$. The focal lenghts of (1) and (2) are found. An object is placed at a distance of 1.3m from lens 1.

The focal lenght of 2 is :

A. $-700cm$

B. $+700cm$

C. 7 cm

D. 70 cm

Answer: D

View Text Solution

37. Two lenses (1) and (2) with $R_1 = R_2 = 0.20m$ each are made from glasses with $\mu_1 = 1.2$ and μ_2 = 1.6 respectively. The two lenses with a separation of 0.345 m are submerged in a liquid with $\mu_1 = 1.4$. The focal lenghts of (1) and (2) are found. An object is placed at a distance of 1.3m from lens 1.

The location of the image while system remains inside the liquid is :

A. 6.52 m

B. 5.60 m

C. 0.56 m

D. 12.67 cm

Answer: B

View Text Solution

38. Two lenses (1) and (2) with $R_1 = R_2 = 0.20m$ each are made from glasses with $\mu_1 = 1.2$ and μ_2 = 1.6 respectively. The two lenses with a separation

of 0.345 m are submerged in a liquid with $\mu_1 = 1.4$. The focal lenghts of (1) and (2) are found. An object is placed at a distance of 1.3m from lens 1.

Two beams of red and violet colour are made to pass separately through a prism $(\text{angle of the prism is} 60^\circ)$. In the position of minimum deviation, the angle of regraction will be

A. 30° for both the colours

B. Greater for the violet colour

C. Greater for the red colour

D. Equal but not 30° for both the colour.

Answer: A

View Text Solution

39. 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

A. 2.6°

B. 3°

C. 4°

D. 5.33°

Answer: B

View Text Solution

40. When light of wavelenght λ is incident on an equilateral prism kept in its minimum deviation position, it is found that the angle of deviation equals the angle of the prism itself.

The refractive index of the material of the prism for the wavelenght λ is, then

A. $\sqrt{3}$

B. $\frac{\sqrt{3}}{2}$

C. 2

D. $\sqrt{2}$

Answer: A

View Text Solution

41. A person cannot see object clearly beyond 2.0 m. The power of lens requred to correct his vision will be :

A. $+2.0D$

B. $-1.0D$

C. $+1.0D$

D. $-0.5D$

Answer: D

View Text Solution

42. The refractive index of the material of the prism and liquid are 1.56 and 1.32 respectively. What will be the value of θ for the following refractive

A. $\sin\theta \geq \frac{13}{11}$

B. $\sin\theta \geq \frac{11}{13}$

C. $\sin\theta \geq \frac{\sqrt{3}}{2}$

D. $\sin\theta \geq \frac{1}{\sqrt{2}}$

Answer: B

View Text Solution

43. An isosecles prism of angle 120° has a refractive index of 1.44. Two parallel monochromatic rays enter the prism parallel to each other in air as shown. The rays emerging from the opposite faces.

A. Are parallel to each other

B. Are diverging

C. Make an angle $2\sin^{-1}(0.72)$ with each other

D. Make an angle $2\{\sin^{-1}(0.72) - 30^\circ)$ with each other

Answer: D

View Text Solution

44. A concave mirror is placed on a horizontal table with its axis directed vertically upwards. Let O be the pole of the mirror and C its

centre of curvature, A point object is placed at C. It has a real image, also located at C. If the object is placed at C. It has a real image, also located at C. If the mirror is now filled with water, the image will be :

A. Real, and will remain at C

B. Real, and located at a point between C and ∞

C. Virtual and located at a point between C and O

D. Real and located at a point between C and O.

Answer: D

View Text Solution

45. Consider an extended object immersed in water contained in a plane trough. When seen from close to th edge of the through the object looks distroted because

A. the apparent depth of the points close to the edge are nearer the surface of the water compared of the points away from the edge.

B. the angle subtended by the image of the object at the eye is smaller than the actual angl subtended by the object in air.

C. some of the points of the object far away from the edge may not be visible

because of total internal reflection.

D. water in a trough acts as a lens and magnifies the object.

Answer: A::B::C

View Text Solution

46. Between the primary and secondary rainbows, there is a dark band known as Alexandar's dark band. This is because

A. light scattered into this region interfere destructively.

B. there is no light scattered into this region.

C. light is absorbed in this region.

D. angle made at the eye by the scattered rays with respect to the incident light of the sun lies between approximately 42° and 50°.

Answer: A::D

View Text Solution

47. A magnifying glass is used, as the object to be viwed can be brought closer to the eye than the normal near point. This results in

A. a larger angle to be subtended by the object at the eye and hence viewed in greater detail.

B. the formation of a virtual erect image.

C. increase n the field of view.

D. infinite magnification at the near point.

Answer: A::B

View Text Solution

48. An astronomical refractive telescope has an objective of focal length 20 m and en eyepiece of focal length 2 cm.

A. the length of the telescope tube is 20.02 m.

B. The magnification is 1000.

C. The image formed is inverted.

D. An objective of a larger aperture will increase the brightness and reduce chromatic aberration of the image.

Answer: A::B::C

View Text Solution

49. A concave lens is in contact with convex lens. The ratio of magnitude of their power is 2/3. Their equivalent focal length is 30 cm. What are their individual focal lenghts ?

A. $-75, 50$

B. $-10, 15$

C. $75, 50$

D. $-15, 10.$

Answer: D

View Text Solution

View Text Solution

50. A container is filled with water $(\mu = 1.33)$ up to height of 33.2 cm. A concave mirror is placed 15 cm above the water level. Image of an object placed at bottom is formed 25 cm below the water level. The focal length of mirror is :

A. 10 cm

B. 15 cm

C. $-20cm$

D. 2 cm

Answer: C

View Text Solution

51. A ray of light travelling in water is incident on its surfac open to air. The angle of incident is θ, which is less than the critical angle. Then there will be :

A. only a reflected ray and no refracted ray

B. only a refracted ray and no reflected ray

C. a reflected ray and a refacted ray and the angle between them would be less than $(180^\circ - 2\theta)$

D.

Answer: C

View Text Solution

52. In an experiment to determine the focal length (f) of a concave mirror by the u - v method, a student places the object pin A on the principal axis at a distance x from the pole P. The students looks at the pin and its inverted image from a distance keeping his/her eye in line with PA. When the student shifts his/her eye towards left, the image appears to the right of the object pin. Then,

A. $x < f$

B. $f < x < 2f$

C. x = 2f

D. $x > 2f$.

Answer: B

View Text Solution

53. A student measures the focal length of a convex lens by putting an object pin at a distance u from the lens and measuring the distance V of the image pin. The graph

between u and V plotted by the student should look like

A. 

B. 

C. 

D. 

Answer: D

View Text Solution

54. A light beam is travelling from Region IV (figure). The refractive index in regions I, II and III and IV are $n_0, \frac{n_0}{2}, \frac{n_0}{6}$ and $\frac{n_0}{8}$ respectively. The angle of incidence θ for which are beam just misses entering region IV is

A. $\sin^{-1}(3/4)$

B. $\sin^{-1}(1/8)$

C. $\sin^{-1}(1/4)$

D. $\sin^{-1}(1/3)$

Answer: B

View Text Solution

55. In an optics experiment, with the position of the object fixed, studen varies the position of a convex lens and for each position, the screen is adjusted to get a clear image of the object. A graph between the object distance u and the image distance v, from the lens is plotted using the same scale for the two axes. A straight line passing through the origin and

making an angle of 45° with the x - axis meets the experimental curve at P. The coordinates of P will be :

A. (2f, 2f)

B. (f/2,f/2)

C. (f,f)

D. (4f,4f)

Answer: A

View Text Solution

56. An initially parallel cylindrical beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I,$ where μ_0 and μ_2 are positive constants and I is the intensity of the light beam. The intensity of the beam is decreasing with increasing radius.

The initial shape of the wavefront of the beam is :

A. planar

B. convex

C. concave

D. convex near the axis and concave near the periphery.

Answer: A

View Text Solution

57. An initially parallel cylindrical beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I$, where μ_0 and μ_2 are positive constants and I is the intensity of the light beam. The intensity of the beam is

decreasing with increasing radius.

The speed of light in the medium is :

A. maximum on the axis of the beam

B. minimum on the axis of the beam

C. the same everywhere in the beam

D. directly proportional to the intensity 1.

Answer: B

View Text Solution

58. An initially parallel cylindrical beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I,$ where μ_0 and μ_2 are positive constants and I is the intensity of the light beam. The intensity of the beam is decreasing with increasing radius.

As the beam enters the medium, it will :

A. travel as a cylindrical beam

B. diverge

C. converge

D. diverge near the axis and converge near the periphery.

Answer: A

View Text Solution

59. An initially parallel cylindrical beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I$, where μ_0 and μ_2 are positive constants and I is the intensity of the light beam. The intensity of the beam is

decreasing with increasing radius.

A ray OP of monochromatic light is incident on the face AB of prism ABCD near vertex B at an incident angle of 60° (see fig). If the refractive index of the material of the prism is $\sqrt{3}$, which of the following is (are) correct ?

A. The ray gets totally internally reflected at face CD

B. The ray comes out through face AD

C. The angle between the incident ray and the emergent ray is 90°

D. The angle between the incident ray and the emergent ray is 120°

Answer: A::B::C

View Text Solution

60. A biconvex lens of focal length 15 cm is in front of a plane mirror. The distance between the lens and the mirror is 10 cm. A small object

is kept at a distance of 30 cm from the lens. The final image is

A. virtual and at a distance of 16 cm from the mirror

B. real and at a distance of 16 cm from the mirror

C. virtual and at a distance of 20 cm from the mirror

D. real and at a distance of 20 cm from the mirror.

Answer: B

View Text Solution

Multiple Choice Question Level Iii

1. A breaker contains water up to a height h_1 and kerosene of height h_2 above water so that the total height of (water + kerosene) is $(h_1 + h_2)$. Refractive index of water is μ_1 and that of kerosene is μ_2. The apparent shift in

the position of the bottom of the beaker when viewed from above is :

A. $\left(1+\frac{1}{\mu_1}\right)h_1-\left(1+\frac{1}{\mu_2}\right)h_2$

B. $\left(1-\frac{1}{\mu_1}\right)h_1+\left(1-\frac{1}{\mu_2}\right)h_2$

C. $\left(1+\frac{1}{\mu_1}\right)h_2+\left(1+\frac{1}{\mu_2}\right)h_1$

D. $\left(1-\frac{1}{\mu_1}\right)h_2+\left(1-\frac{1}{\mu_2}\right)h_1$

Answer: B

View Text Solution

2. When monochromatic red light is used instead of blue light in a convec lens, its focal length will :

A. increase

B. decrease

C. remain same

D. does not depend on colour of light

Answer: A

View Text Solution

3. The question has a paragraph followed by two statements, Statement - 1 and Statement - 2. Of the given four alternatives after the statements, choose the one that describes the statements. (A.I.E.E.E. 2011)

A thin air film is formed by putting the convex surface of a plane - convex lens over a plane glass plate. With monochromatic light, this film gives an interference pattern due to light reflected from the top (convex) surface and the bottom (glass plate) surface of the film.

Statement - 1 : When light reflects from the air

- glass plate interface, the reflected wave suffers a phase change of π.

Statements - 2 : The centre of the interfrence pattern is dark.

A. Statement - 1 is true, Statement - 2 is true, Statement - 2 is the correct explanation of Statement - 1.

B. Statement - 1 is true, Statement - 2 is true, Statement - 2 is not the correct explanation of Statement - 1.

C. Statement - 1 is false, Statement - 2 is true,

D. Statement - 1 is true, Statement - 2 is false.

Answer: A

View Text Solution

4. A car is fitted with a convex side - view mirror of focal length 20 cm. A second car 2.8 m behind the first car is overtaking the first

car at relative speed of 15 m/s. The speed of the image of the second car as seen in the mirror of the first one is :

A. $\frac{1}{15} m/s$

B. 10m/s

C. 15m/s

D. $\frac{1}{10} m/s$

Answer: A

View Text Solution

5. Let the X - Z plane be the boundary between two transparent media. Medium 1 in $Z \geq 0$ has refractive index of $\sqrt{2}$ and medium 2 with $Z < 0$ has a refractive index of $\sqrt{3}$. A ray of light in medium 1 given by the vertor $\vec{A} = 6\sqrt{3\hat{i}} + 8\sqrt{3}\hat{j} - 10\hat{k}$ is incident on the plane of separation. The angle of refraction in medium 2 is :

A. 45°

B. 60°

C. 75°

D. 30°

Answer: A

View Text Solution

6. A light ray travelling in glass medium is incident on glass - air interface at an angle of incidence θ. The reflected (R) and transmitted (T) intensities, both as function of θ, are plotted. The correct sketch is :

A. 

B. 

C. 

D. 

Answer: C

View Text Solution

7. An object 2.4 m in front of lens forms a sharp image on a film 12 cm behind the lens. A glass plate 1 cm thick, of refractive index 1.50 is interposed between lens and film with its

plane faces parallel to film. At what distance (from lens) should object shifted to be in sharp focus on film ?

A. 5.6 m

B. 7.2 m

C. 2.4 m

D. 3.2 m

Answer: A

View Text Solution

8. A bi - convex lens is formed with two thin plano - convex lenses as shown in the figure. Refractive index n of the first lens is 1.5 and that of the second is 1.2. Both the curved surfaces are of the same radius of curvature R = 14 cm. For this bi - convex lens, for an object distance of 40 cm, the image distance will be

A. $-280.0cm$

B. $40.0cm$

C. $21.5cm$

D. $13.3cm$

Answer: B

View Text Solution

9. Most materials have the refractive index, $n < 1$. So, when a light ray from air enters a naturally occuring material, then by Snell's law, $\frac{\sin\theta_1}{\sin\theta_2} = \frac{n_2}{n_1}$, it is understood that the refracted ray bends towards the normal. But it never emerges on the same side of the normal

as the incident ray. According to electromagnetism, the refractive index of the medium is given by the relation, $n = \left(\frac{c}{V}\right) = \pm\sqrt{\varepsilon_r u_r}$, where c is the speed of electromagnetic waves is vacuum, v its speed in the medium , ε_r and μ_r are relative permittivity and permeability of the medium respectively. For light incident from air on a meta - material, the appropriate ray diagram is :

A. 

B. 

C. 

D. 

Answer: C

View Text Solution

10. Most materials have the refractive index, $n < 1$. So, when a light ray from air enters a naturally occuring material, then by Snell's law, $\frac{\sin\theta_1}{\sin\theta_2} = \frac{n_2}{n_1}$, it is understood that the refracted ray bends towards the normal. But it

never emerges on the same side of the normal as the incident ray. According to electromagnetism, the refractive index of the medium is given by the relation, $n = \left(\frac{c}{V}\right) = \pm\sqrt{\varepsilon_r u_r}$, where c is the speed of electromagnetic waves is vacuum, v its speed in the medium , ε_r and μ_r are relative permittivity and permeability of the medium respectively.

In normal materials, both ε_r and μ_r are positive, implying positive n for the medium. When both ε_r and μ_r are negative, one must choose the negative root of n. Such negative

refractive index material can now be artificially prepared and are called metamaterials. They exhibit significantly different optical behaviour, without violating any physical laws. Since n is negative, it results in a change in the direction of proporgation of the refracted light. However, similar to normal materials, the frequency of light remais unchanged upon refraction even in metal - materials.

A. The speed of light in the meta - material is $V = c|n|$

B. The speed of light in the meta - meterial is $V = \frac{c}{|n|}$

C. The speed of light in the meta - material is V = c.

D. The wavelenght of the light in the meta - material (λ_m) is given by $\lambda_m = \lambda_{air}|n| \text{where} \lambda_{air}$ is the wavelenght of the light in air.

Answer: B

View Text Solution

11. The graph between angle of deviation (δ) for a triangular prism is represented by :

A. 

B. 

C. 

D. 

Answer: B

View Text Solution

12. Diameter of plano - convex lens is 6 cm and thickness at the centre is 3 mm. If speed of light in material of lens is $2 \times 10^8 m/s$, the focal length of the lens is :

A. 20 cm

B. 30 cm

C. 10 cm

D. 15 cm.

Answer: B

View Text Solution

13. A thin convex lens made from crown glass $\left(\mu = \frac{3}{2}\right)$ has focal length f. When it is measured in two different liquids having refractive indices $\frac{4}{3}$ and $\frac{5}{3}$, it has t he focal length f_1 and f_2 respectively. The correct relation between the focal lenghts is :

A. f_1 and f_2 both become negative

B. $f_1 = f_2 < f$

C. $f_1 > f$ and f_2 becomes negative

D. $f_2 >$ and f_1 becomes negative.

Answer: C

View Text Solution

14. A green light is incident from the water to the air water interface at the critical angle (θ). Select the correct statement.

A. The entire spectrum of visible light will come out of the water at various angles

to the normal.

B. The entire spectrum of visible light will come out of the water at an angle of 90° to the normal

C. The spectrum of visible light whose frequency is less than that of green light will come out to the air medium

D. The spectrum of visible light whose frequency is more than that of green light will come out to the air medium.

Answer: C

View Text Solution

15. Assuming human pupil to have a radius of 0.25 cm and a comfortable viewing distance of 25 cm, the minimum separation between two objects that human eye can resolve at 500 nm wavelenght is :

A. $1\mu m$

B. $30\mu m$

C. $100\mu m$

D. $300\mu m.$

Answer: B

View Text Solution

16. Monochromatic light is incident on a glass prism of angle A. If the refractive index of the material of the prism is μ, a ray, incident at an angle θ, on the face AB would get transmitted

through the face AC of the prism provided :

A. $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

B. $\theta < \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

C. $\theta > \cos^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

D. $\theta < \cos^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

Answer: A

View Text Solution

Recent Competitive Question

1. 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 at

A. 30 cm left

B. infinity

C. 1 cm to the right

D. 18 cm to the left.

Answer: A

View Text Solution

2. A,B and C are the parallel sided transparent media of refractive indices n_1, n_2 and n_3 respectively. They are arranged as shown in the figure. A ray is incident at an angle I on the surface of separation of A and B which is an shown in the figure. After the refraction into the medium B, the ray grazes the surface of separation of the media B and C. Then, sin i

equals to

A. $\frac{n_3}{n_1}$

B. $\frac{n_1}{n_3}$

C. $\frac{n_2}{n_3}$

D. $\frac{n_1}{n_2}$.

Answer: A

View Text Solution

3. Two beams of red and violet colours are made to pass separately through a prism of $A = 60^\circ$. In the minimum deviation position, the angle of refraction inside the prism will be

A. greater for red colour

B. equal but not 30° for both the colours

C. greater for violet colour

D. 30° for both the colours.

Answer: D

View Text Solution

View Text Solution

4. A plane convex lens is made of refraction index of 1.6 The radius of curvature of the curved surface is 60 cm. The focal leght of the lens is :

A. 400 cm

B. 200 cm

C. 100 cm

D. 50 cm

Answer: C

View Text Solution

5. Critical angle for certain medium is $\sin^{-1}$ (0.6). The polarizing angle of that medium is :

A. $ta^{-1}[1.5]$

B. $\sin^{-1}[0.8]$

C. $\tan^{-1}[1.6667]$

D. $\tan^{-1}[0.6667]$

Answer: C

View Text Solution

6. The spectrum of an oil flame is an example for

A. line emission sepectrum

B. continuous emission spectrum

C. line absorption spectrum

D. band emission spectrum

Answer: B

View Text Solution

7. The cirtical angle of a certain medium is $\sin^{-1}\left(\frac{3}{5}\right)$. The polarzing angle of the medium is :

A. $\sin^{-1}\left(\frac{4}{5}\right)$

B. $\tan^{-1}\left(\frac{5}{3}\right)$

C. $\tan^{-1}\left(\frac{3}{4}\right)$

D. $\tan^{-1}\left(\frac{4}{3}\right)$.

Answer: B

View Text Solution

8. Flash spectrum confirms a/an

A. total solar eclipse

B. lunar eclipse

C. earthquake

D. magnetic storm.

Answer: A

View Text Solution

9. Wavelenght of given light waves in air and in a medium are 6000 Å respectively. The critical angle is :

A. $\tan^{-1}\left(\frac{2}{3}\right)$

B. $\tan^{-1}\left(\frac{3}{2}\right)$

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

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

Answer: C

View Text Solution

10. The time required for the light to pass through a glass slab (refractive index = 1.5) of thickness 4 mm is $\left(c = 3 \times 10^8 ms^{-1} \text{speed of light in free space}\right)$

A. 10^{-11}

B. $2 \times 10^{-11} s$

C. $2 \times 10^{11} s$

D. $2 \times 10^{-5} s$.

Answer: B

View Text Solution

11. A prism having refractive index 1.414 and refracting angle 30° has one of the refracting surfaces silvered. A beam of light incident on the other refracting surface will retrace its path, if the angle of incidence is :

A. 0°

B. 30°

C. 60°

D. 45°

Answer: D

View Text Solution

12. A planoconvex lens has a maximum thickness of 6 cm. When placed on a horizontal table with the curved surface in contact with the table surface, the apparent

depth of the bottommost point of the lens is found to be 4 cm. It the lens is inverted such that the plane face of the lens is in contact with the surface of the table the apparent depth of the centre of the plane face is found to be $\left(\frac{17}{4}\right)$ cm. The radius of curvature of the lens is :

A. 68 cm

B. 75 cm

C. 128 cm

D. 34 cm

Answer: D

View Text Solution

13. Two thin lense have a combined power of + 9 D. When they are separated by a distance of 20 cm, their equivalent power becomes $+\frac{27}{5}D$. Their individual powers (in dioptre) are

A. 1,8

B. 2,7

C. 3,6

D. 4,5

Answer: C

View Text Solution

14. A point source of light is kept below the surface of water $(n_w = 4/3)$ at a depth of $\sqrt{7}$ m. The radius of the circular bright patch of light noticed on the surface of water is :

A. $\sqrt{7}m$

B. $\frac{3}{\sqrt{7}}m$

C. 3m

D. $\frac{\sqrt{7}}{3}m.$

Answer: C

View Text Solution

15. A monochromatic beam of light is travelling from medium A of refractive index n_1 to a medium B of refractive index n_2. In the

medium A, there are x number of waves in certain distance. In the medium B, there are y number of waves in the same distance, Then, refractive index of medium A with respect to medium B is :

A. $\frac{x}{y}$

B. $\frac{y}{x}$

C. $\sqrt{\frac{x}{y}}$

D. $\frac{x}{y-x}$.

Answer: A

View Text Solution

16. Spectrum of sunlight is an example for

A. continuous absorption spectrum

B. band emission specturm

C. line absorption spectrum

D. continuous emission spectrum.

Answer: D

View Text Solution

17. White light is incident normally on a glass slab inside the glass slab,

A. all colours travel with the same speed

B. red light travels faster than other colours

C. violet light travels faster than other colours

D. Yellow light travels faster than other colours.

Answer: B

View Text Solution

18. Two plano - convex lense each of focal length f are placed as shown in the figure. The ratio of their effective focal lengths in the three cases is :

A. $3:2:1$

B. $1:2:3$

C. $1:2:1$

D. $1:1:1.$

Answer:

View Text Solution

19. The speed of light in media M_1 and M_2 are $.5 \times 10^8 ms^{-1}$ and $2 \times 10^8 ms^{-1}$ respectively. A ray travels from medium M_1 to the medium M_2 with an angle of incidence θ.

The ray suffers total internal reflection. Then the value of the angle of incidence θ is :

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

B. $< \sin^{-1}\left(\frac{3}{4}\right)$

C. $= \sin^{-1}\left(\frac{3}{4}\right)$

D. $\leq \sin^{-1}\left(\frac{3}{4}\right).'$

Answer: A

View Text Solution

20. Radii of curyature of a converging lens are in the ratio $1:2$, Its focal length is 6 cm and refractive index is 1.5. Then its radii of curvature are .... Respectively.

A. 9 cm and 18 cm

B. 6 cm and 12 cm

C. 3 cm and 6 cm

D. 4.5 cm and 9 cm.

Answer: D

View Text Solution

View Text Solution

21. Pick out the correct statement from the following

A. Mercury vapour lamo produced line emission spectrum

B. Oil flame produces line emission spectrum

C. Band spectrum helps us to study molecular structure

D. Sunlight spectrum is an example for line absorption spectrum.

Answer: A::C::D

View Text Solution

22. Pick out the wrong statement from the following

A. Lateral shift increases as the angle of incidence increases

B. Lateral shift increases as the value of refractive index increases

C. Normal shift decreases as the value of refractive index increases

D. Both normal shift and lateral shift are directly proportional to the thickness of the medium.

Answer: D

View Text Solution

23. The refractive through the prism are as shown. Pick out the wrong statement from the following. Path of the light ray in

A. A is correct if $n_2 > n_1$ and $n_2 > n_3$

B. B is correct if $n_1 = n_2$ and $n_2 > n_3$

C. C is correct if $n_2 > n_1$ and $n_2 = n_3$

D. D is correct if $n_1 > n_2$ and $n_2 > n_3$.'

Answer: B

View Text Solution

24. The distance between an object and its image produced by a converging lens is 0.72 m. The magnification is 2. What will be the magnification when the object is moved by 0.04 m towards the lens ?

A. 2

B. 4

C. 3

D. 6

Answer: B

View Text Solution

25. An object is placed at 20 cm in front of a concave mirror produces three times magnificed real image. What is the focal length of the concave mirror ?

A. 15 cm

B. 6.6 cm

C. 10 cm

D. 7.5 cm

Answer: A

View Text Solution

26. A focal length of a lens is 10 cm. What is power of a lens in dioptre ?

A. 0.1 D

B. 10 D

C. 15 D

D. 1 D.

Answer: B

View Text Solution

27. A microscope is having objective of focal length 1 cm and eyepiece of focal length 6 cm of tube length is 30 cm and image is formed at the least distance of distinct vision, what is the magnification produced by the microscope. Take D = 25 cm.

A. 6

B. 150

C. 25

D. 125

Answer: B

View Text Solution

28. Calculate the focal leght of a reading glass of a person if his distance vision is 75 cm.

A. 37.5 cm

B. 100.4 cm

C. 25.6 cm

D. 75.2 cm

Answer: A

View Text Solution

29. A person wants a real image of his own, 3 times enlarged. Where should be stand infront

of a concave mirror of radius of curvature 30 cm ?

A. 30 cm

B. 20 cm

C. 10 cm

D. 90 cm

Answer: B

View Text Solution

30. A concave mirror gives an image three times as large as its object placed at a distance of 20 cm from it. For the image to be real, the focal length should be :

A. 10 cm

B. 15 cm

C. 20 cm

D. 30 cm.

Answer: B

View Text Solution

View Text Solution

31. Two convex lenses A and B placed in contact from the image of a distant object at P. If the lens B is moved to the right a little, the image will :

A. Move to the left

B. Move to the right

C. Remain at P

D. Move either to the left or right, depending upon focal length of the lenses,

Answer: A

View Text Solution

32. A equiangular glass prism of Refractive index 1.6 is kept fully immersed in water of refractive index 4/3, for a certain ray of monochromatic light. What is the closest

value for the angle of minimum deviation of the light ray in this setup ? $(\text{Take } \sin 37^\circ = 0.6).$

A. 10°

B. 14°

C. 18°

D. 22°.

Answer: B

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