PHYSICS

BOOKS - DC PANDEY PHYSICS (HINGLISH)

RAY OPTICS

Examples

1. A ray of light is incident at an angle of 30° with the plane of a plane mirror. Find the angle of reflection.

A. 0°

B. 90°

C. 30°

D. 60°

Answer: D

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2. A point objects O is nat angle of 30° from the plane mirror M, as shown In the figure. If OO'=2m, then find the location of the image

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3. Consider a ray of light is incident on aplane mirror M. If deviation produced by the mirror in the incident light ray is 120° then, find I and r.

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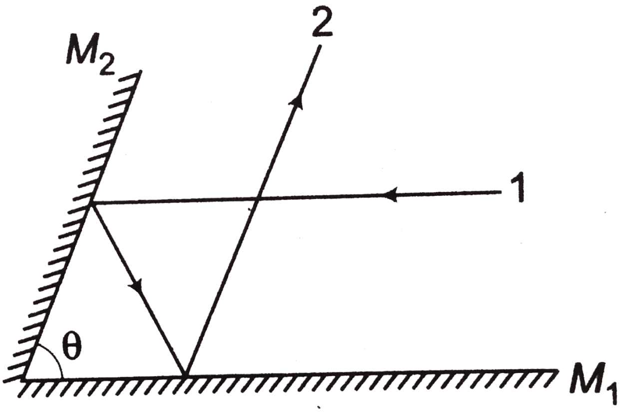
4. Two plane mirror M_1 and M_2 area inclined at angle θ as shown. A ray of light 1, which is parallel to M_1strikes M_2 and after two

reflection , the ray 2 become parrallel to M_2.Find the angle θ



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5. a ray of light is incident on a plane miror at an angle of 30° in anti-clockwise direction. Find the angle and sense of rotation of the reflected ray.

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6. A point source of light S, placed at a

distance L in front of the centre of a mirror of width

d,

hangs vertically on a wall. A man walks in front of

the

mirror along a line parallel to th mirror at a distane

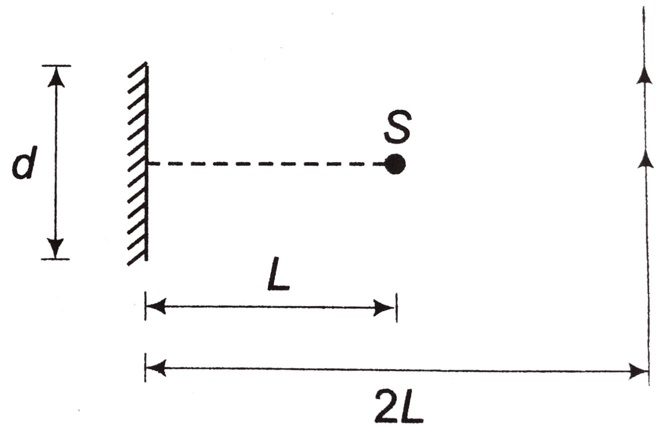
2L form it as shown.The greatest distance over

which

he can see the image of the light source in the

mirror is

(a) $d/2$ (b) d (c) 2d (d) 3 d.



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7. Consider a point object moving towards a stationary plane mirror with velocity $5m/s$. Find velocity of image w.r.t

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8. Consider two plane mirrors inclined at an angle θ as shown in figure. Find the number of object O formed these mirror when

(i)$\theta = 60^\circ$

(ii) $\theta = 72^\circ$ and the object at 40° from M_1

(iii) $\theta = 72^\circ$ and the object is at 36° from M_1

(iv) $\theta = 80^\circ$

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9. Two plane mirror are placed paralled to each other at a seperation of 6m as shown in figure. Find the (i) number of images of the object O, (ii) seperation between 5th image.

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10. An object is 30.0 cm from a spherical mirror along the central axis. The absolute value of lateral magnification is $\frac{1}{2}$. The image produced is inverted. What is the focal length of the mirror?

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11. A 4.5 cm needle is placed 12 cm away from a convex mirror of focal length 15 cm. Give the location of the image and the magnification. Describe what happens as the needle is moved farther from the mirror?

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12. A small candle $2.5 cm$ in size is placed $27 cm$ in front of a concave mirror of radius of curvature $36 cm$. At what distance from the mirror should a screen be placed in order to receive a sharp image ?

Describe the nature and size of the image. If the candle is moved closer to the mirror, how would the screen have to be moved ?

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13. Determine the diameter of the image formed by a spherical concave mirror of focal length 8 m. The diameter of the moon is 3450 km and the distance between the earth and the moon is approx 4×10^5 km.

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14. Find the distance of object from a concave mirror of focal length 10 cm so that image size is four time the size of the object.

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15. A concave mirror has a radius of curvature of 24 cm. How far is an object from the mirror, if an image is formed that is

(i) virtual and 3.0 times the size of the object,

(ii) real and 3.0 times the size of the object and

(iii) real and $1/3$ the size of the object?

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16. A thin stick of length f/5 placed along the principal axis of a concave mirror of focal length f such that its image is real and elongated just touch the stick. What is the magnification?

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17. A convex mirror is formed from a spherical surface of radius 20 cm. Find the power of the mirror.

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18. An object is 40 cm form a spherical mirror, along the central axis. The image produced is inverted. What is the power of the mirror?

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19. (i) Find the speed of light of wavelength λ=780 nm (in air) in a medium of of refractive index μ=1.55.

(ii) What is the wave length of this light in the given medium?

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20. Light of wavelength 300 nm in medium A enters into medium B througha plane surface. If frequency of light is 5×10^{14} Hz and $v_a / v_b = 4/5$, then find absolute refractive indices of media A and B.

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21. A ray of light falls on a glass plate of refractive index $\mu = 1.5$.

What is the angle of incidence of the ray if the angle between the reflected and

refracted rays is 90°?

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22. Refractive index of glass with respect to water is $(9/8)$.

Refractive index of glass with respect to air is $(3/2)$.

find the refractive index of water with respect to air .

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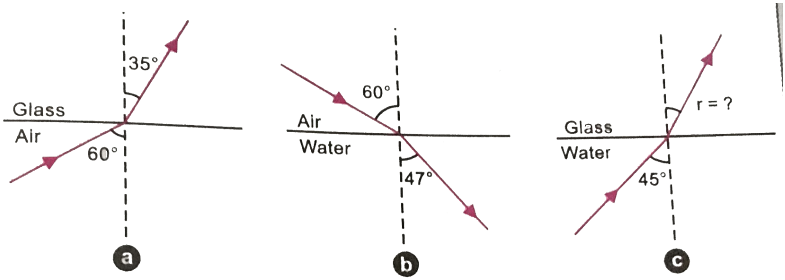
23. Fig. (a) and (b) show refraction of an incident ray in air at 60° with the normal to a glass-air and water-air interface respectively. Predict the angle of refraction of an incident ray in water at 45° with the normal to a water glass interface. Take $.^{a}\mu_g = 1.32.$



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24. A light beam passes from medium 1 to medium 2. Show that the emerging beam is parallel to the incident beam.

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25. A rectangular glass block of thickness 10 cm and refractive index 1.5 placed over a small coin. A beaker is filled with water of refractive index $4/3$ to a height of 10 cm and is placed over the glass block.

(a) Find the apparent position of the object when it is viewed at near normal incidence.

(b) if the eye is slowly moves away from the normal at a certain position, the object is found to disappear, due to total internal reflection. At what surface does this happen and why ?

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26. A pile 4m high driven into the bottom of a lake is 1m above the water . Determine the length of the shadow of the pile on the bottom of the lake if the sun rays make an angle of 45° with the water surface . The refractive index if water is $\frac{4}{3}$. `

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27. A printed page is kept pressed by a glass cube (μ=1.5) of edge 9.0 cm. By what amount will the printed letters appear to be shifted when viewed from the top?

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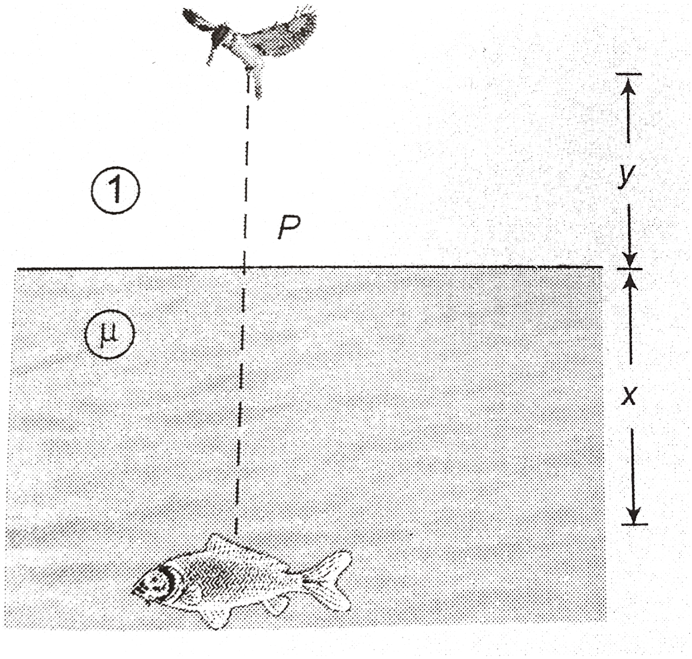
28. Consider the situation as shown in the diagram.



Find the distance between bird and fish as seen by

(a) bird and (b) fish

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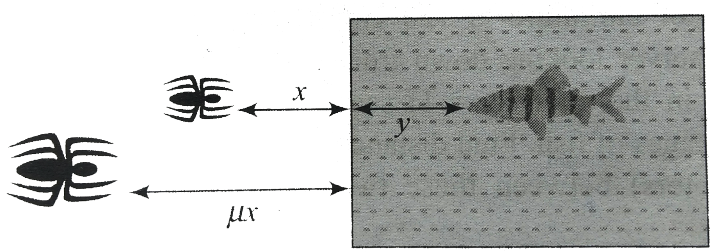
29. A fish in an aquarium approaches the left wall at a rate of $3ms^{-1}$ observes a fly approaching it at $8ms^{-1}$. If the refractive index of water is $(4/3)$, find the actual velocity of the fly.



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30. A concave mirror of radius of curvature two meter is placed at the bottom of the tank of water. The mirror forms an image of the sun when it is directly overhead. Calculate the images from the

mirror for (i) 160 cm and (ii) 80 cm of water in the tank. (Take,μ=4/3 for water)

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31.

Consider the situtaion shown in figure. Find distance of image of O from eye E.

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32. A small pin fixed on a table top is viewed from above from a distance of $50cm$. By what distance would the pin appear to be raised, if it be viewed from the same point through a $15cm$. Thick glass slab held parallel to the table ? μ of glass 1.5 Does the answer depend on location of the slab ?

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33. A light ray is incident at an angle of 45° with the normal to a 4 cm thick plate (u = 2.0). Find the shift in the path of the light as it emerges out from the plate.

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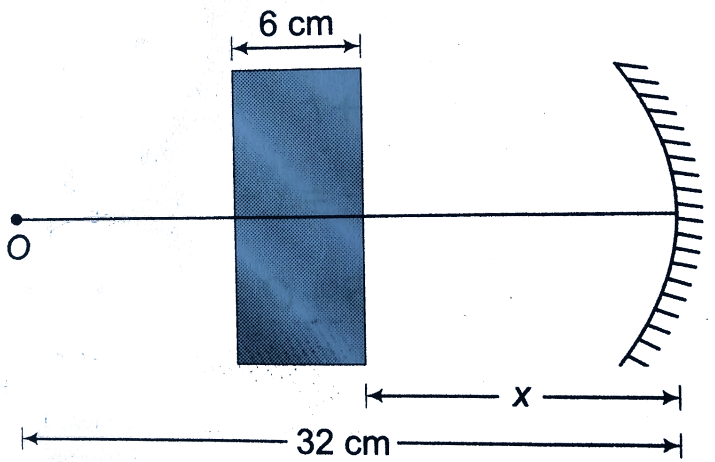
34. A point object O is placed in front of a concave mirror of focal length $10cm$. A glass slab of refractive index $\mu = \frac{3}{2}$ and thickness $6cm$ is inserted between object and mirror. Find the position of final image when the distance x shown in figure is



(a) $5cm$, (b) $20cm$

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35. An isotropic point source is placed at a depth h below the water surface. A floating opaque disc is placed on the surface of water so that the source is not visible from the surface. What is the minimum radius of the disc? Take refractive index of $\text{water} = \mu$.

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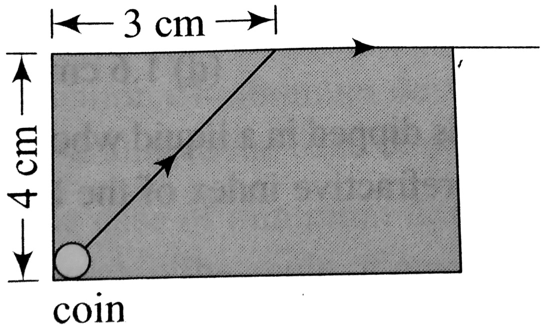
36. A small coin is resting on the bottom of a beaker filled with a liquid. A ray of light from the coin travels up to the surface of the liquid and moves along its surface (see figure).

How fast is the light travelling in the liquid ?



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37. Light enters at an angle of incidence in a transparent rod of refractive index n. For what value of the refractive index of the material of the rod the light once entered into it will not leave it through its lateral face whatsoever be the value of angle of incidence.

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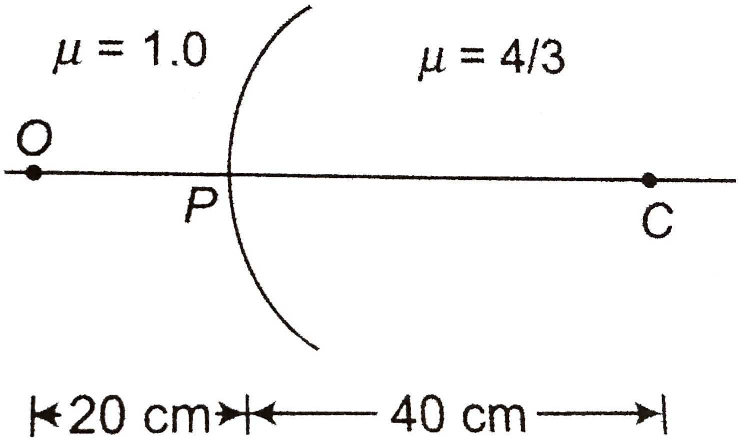
38. 

Locate the image of the point object O. The point C is centre of curvature of the spherical surface.

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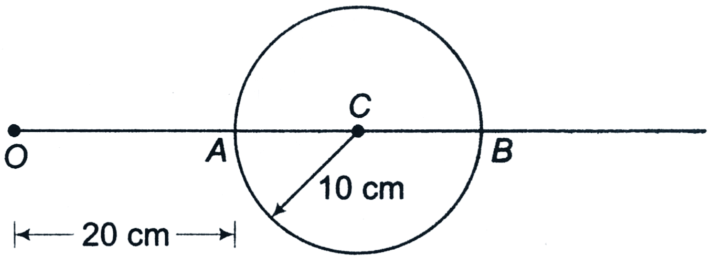
39. A glass sphere of radius $R = 10cm$ is kept inside water. A ponit object O is placed at $20cm$ from A as shown in figure. Find the position and nature of the image when seen from other side of the sphere. Also draw the ray diagram. Given, $\mu_g = 3/2$ and $\mu_w = 4/3$



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40. A linear object of length 4 cm is placed at from the plane surface of hemispherical glass of radius 10 cm. The hemispherical glass is surrounded by water. Find the final position and size of the image.

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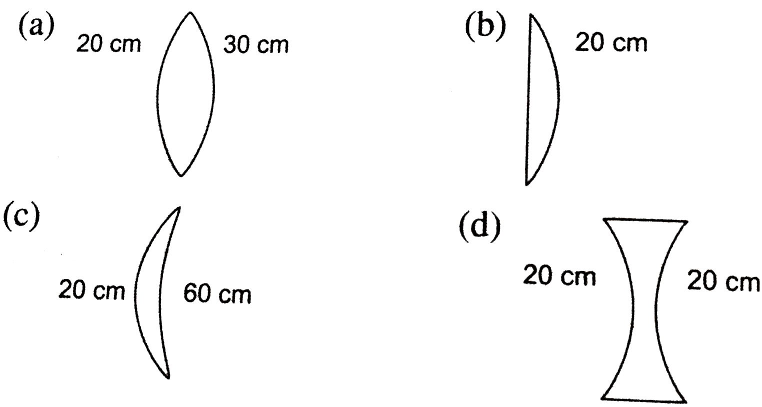

41.

Find focal lengths of lenses made of glass

$(\mu = 3/2)$ and placed in air.

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42. A double convex lens is made of glass of refractive index 1.55 with both faces of same radius of curvature. Find the radius of curvature required, if focal length is $20cm$.

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43. Find the refractive index of the material of a plano-convex lens, if the radius of curvature of the

convex surface is 20 cm and focal length of the lens is 60 cm?

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44. A beam of light converges to a point P. A lens is placed in the path of the covergent beam $12cm$ from P. At what point does the beam converge if the lens is

(a) a convex lens of focal length $20cm$

(b) a concave lens of focal length $16cm$?

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45. Focal length of a convex lense in air is $10cm$. Find its focal length in water. Given that $\mu_g = 3/2$ and $\mu_w = 4/3$.

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46. If the focal length of the lens is 20 cm, find the distance of the image from the lens in the following figure?

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47. The distance between two point sources of light is $24cm$. Find out where would you place a converging lens of focal length $9cm$, so that the images of both the sources are formed at the same point.

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48. An object of size $3.0cm$ is placed $14cm$ in front of a concave lens of focal length $21cm$. Describe the image produced by the lens. What happens if the object is moved further from the lens ?

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49. Find the distance of an object from a convex lens if image is

two times magnified. Focal length of the lens is $10cm$

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50. An object is placed at a distance of 80 cm from a screen. Where should a convex lens of focal length of 15 cm will be placed so as to obtain a real image of an object?

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51. The image of a small electric bulb fixed on the wall of a room is to be obtained on the opposite wall $3m$ away by means of a large convex lens. What is the maximum possible focal length of the lens required for the purpose ?

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52. For a given lens, the magnification was found twice as large when as when the object was 0.15 m distance from it as when the distance was 0.2 m. Find power of the lens.

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53. A spherical convex surface separates object and image space of refractive index 1.0 and $\frac{4}{3}$. If radius of curvature of the surface is $10cm$, find its power.

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54. A thin glass (refractive index 1.5) lens has optical power of $-5D$ in air. Its optical power in a liquid medium with refractive index 1.6 will be

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55. Two thin converging lenses are placed on a common axis, so that the centre of one of them coincides with the focus of the other. An object is placed at a distance twice the focal length from the left hand lens. Where will its image be? What is the lateral magnification? The focal of each lens is f.

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56. Two thin converging lenses are placed on a common axis, so that the centre of one of them coincides with the focus of the other. An object is placed at a distance twice the focal length from the left hand lens. Where will its image be? What is the lateral magnification? The focal of each lens is f.

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57. Two equi-convex lenses of focal length $30cm$ and $70cm$, made of material of refractive index $= 1.5$, are held in contact coaxially by a rubber band round their edges.A liquidof refractive index 1.3 is introduced in the space between the lenses filling it completely. Find the position of the image of a luminous point object placed on teh axis of the combination lens at a distance of $90cm$ from it.

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58. Two thin equiconvex lenses each of focal length 0.2 m are placed coaxially with their optic centres 0.5m apart. Then find the focal length of the combination.

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59. Two convex lenses, each of focal length 15 cm, are placed at a separation of 20 cm with their principal coinciding.

(i) Show that a light beam coming parallel to the principal axis diverges as it comes out of the lens system.

(ii) Find the location of the virtual image formed by the lens system of an object placed far away.

(iii) Find the focal length of equivalent lens.

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60. Two plano-concave lenses of glass of refractive 1.5 have radii of curvature of 20 and 30 cm. They are placed in contact with curved surface towards each other and the space between yhem is filled with a liquid of refractive index 2/3. Find the focal length of the system.

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61. A converging lens of focal length 20 cm and a converging mirror of focal length 10 cm are placed 60 cm apart with common principal axis. A point source is placed in between the lens and the mirror at a distance of 50 cm from the lens. Find the locations of the images formed.

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62. A converging lens and a diverging mirror are placed at a separation of 20 cm. The focal length of

the lens is 30 cm and that of the mirror is 50 cm. Where should a point source be placed between the lens and the miror, so that the light, after getting reflected by the mirror and then getting transmitted by the lens, comes out parallel to the principal axis?

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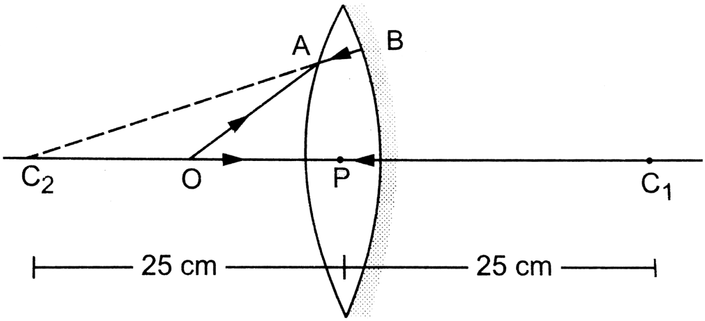
63. A biconvex thin lens is prepared from glass $(\mu = 1.5)$, the two bounding surfaces having equal radii of 25 cm each. One of the surfaces is silvered from outside to make it reflecting. Whee should an object be placed before this lens so that the image is formed on the object itself?



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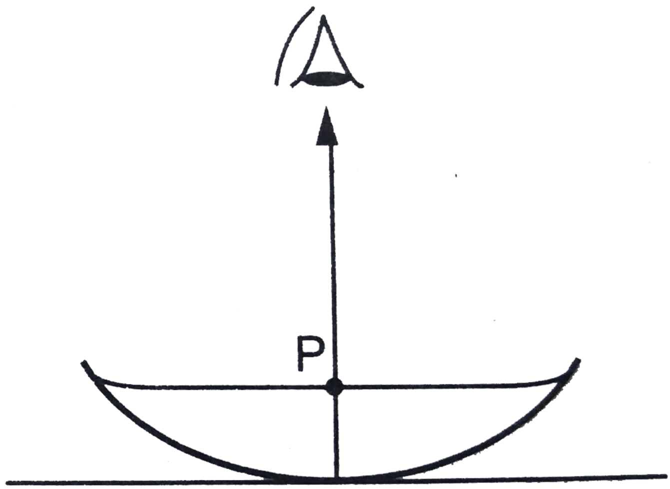
64. A concave mirror of radius 40 cm lies on a horizontla tale and wateis filled in it up t a heightof 5.00 cm. A small dust particle floats on the water surface at a point P vertically above tge pointof contact of the miror with the table. Locate the image of the dust particle as seen from a point directly above it. tEh refractie index of water is 1.33.



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65. A ray of light is incident at an angle of 60° on the face of a prism having refracting angle 30°. The ray emerging out of the prism makes an angle 30° with the incident ray. Show that the emergent ray is

perpendicular to the face through which it emerges and calculate the refractive index of the material of prism.

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66. The refracting angle of a glass prism is 30°. A ray is incident onto one of the faces perpendicular to it. Find the angle δ between the incident ray and the ray that leaves the prism. The refractive index of glass is $\mu = 1.5$.

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67. The angle of minimum deviation for a glass prism with $\mu = \sqrt{3}$ equals the refracting angle of the prism. What is the angle of the prism?

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68. One face of a prism with a refrective angle of 30° is coated with silver. A ray of light incident on another face at an angle of 45° is refracted and reflected from the silver coated face and retraces its path. What is the refractive index of the prism?

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69. A prism is made of glass of unknown refractive index. A parallel beam of light is incident on a face of the prism. By rotating the prism, the minimum angle of deviation is measured to be 40°. What is the refractive index of the prism ? If the prism is placed in water $(\mu = 1.33)$, predict the new angle of minimum deviation of the parallel beam. The refracting angle of prism is 60°.

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70. The refracting angle of a prism is A and refractive index of the material of prism is $\cot(A/2)$. The angle of minimum deviation will be

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71. At what angle should a ray of light be incident on the face of a prism of refracting angle 60° so that it just suffers total internal reflection at the other face ? The refractive index of the prism is 1.524.

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72. An isosceles glass prism has one of its faces silvered. A light ray is incident normally on the other face which is identical in size to the silvered face. The light ray is reflected twice on the same sized faces and emerges through the base of the prism perpendicularly. Find the minimum value of refractive index of the material of the prism.

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73. The refractive indices of flint glass for red and violet light are 1.613 and 1.632, respectively. Find the angular dispersion produced by the thin prism of flint glass having refracting angle 4°.

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74. Find the dispersive power of flint glass. The refractive indices of flint glass for red, yellow and violet light are 1.613, 1.620 and 1.632 respectively.

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75. White light is passed through a prism of angle 4°. If the refractive indices for red and blue colours are 1.641 are 1.659 respectively, then calculate the angle of deviation between them, also calculate the dispersive power.

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76. We have to combine a crown glass prism of angle 4° with a flint glass prism in such a way that the mean ray passes undeviated, find (i) the angle of the flint glass prism needed and (i) the angular dispersion produced by the combination when white light goes through it. Refractive indices for red, yellow and violet light are 1.514, 1.517 and 1.523 respectively for crown glass and 1.613, 1.620 and 1.632 for flint glass.

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77. It is given that the aispersive powers of crown and flint glasses are 0.06 and 0.10 respectively. Also the refractive indices for yellow light for these glasses are 1.517 and 1.621, respectively. We have to form an achromatic combination of prism of crown and flint glasses which can produce a deviation of 1° in the yellow ray. Evaluate the refracting angles of the two prisms needed.

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78. A 20 D lens is used as a magnifier. Where should the object be placed to obtain maximum angular magnification? (Given, D=25 cm).

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79. An object is seen through a simple microscope of focal length 20 cm. Find the angular magnification produced, if the image is formed at 30 cm from the lens.

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80. The separation between the objective and the eyepiece of a compound microscope can be adjusted between 9.8 cm to 11.8 cm. If the focal lengths of the objective and the eyepiece are 1.0 cm and 6 cm respectively, find the range of the magnifying power if the image is always needed at 24 cm from the eye.

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81. A compound microscope has a magnifying power of 100 when the image is formed at infinity. The objective has a focal length of 0.5 cm and the tube length is 6.5 cm. Find the fbcal length of the eyepiece.

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82. A small telescope has an objective lens of focal length $140cm$ and eye piece of focal length $5.0cm$. What is the magnifying power of telescope for viewing distant objects when

(a) the telescope is in normal adjustment (i.e. when the image is at infinity)

(b) the final image is formed at the least distance of distinct vision $(25cm)$.

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83. A small telescope has an objective lens of focal length $144cm$ and an eye-piece of focal length

$6.0cm$. What is the magnifying power of the telescope ? What is the separation between the objective and the eye-piece ?

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84. The eye-piece of an astronomical telescope has focal length of 10 cm. The telescope is focused for normal vision of distant objects when the tube length is 1.0 m. Find the focal length of the objective and the magnifying power of the telescope.

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85. An astronomical telescope has an angular magnification of magnitude 5 for distant object. The separation between the objective and eyepiece is $36cm$ and the final image is formed at infinity. Determine the focal length of objective and eyepiece.

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86. An astronimical telescope is to be designed to hve a magnifying power of 50 in normal adjustment. If the length of the tube is 102 cm, fid the powers of the objective and the eyepiece.

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87. A telescope has an objective of focal length 50 cm and an eye-piece of focal length 5 cm. The least distance of distinct vision is 25 cm. The telescope is focused for distinct vision on a scale 2 m away from the objective. Calculate (i) magnification produced and (ii) separation between objective and eyepiece.

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88. A Galilean telescope is 27 cm long when focussed to form an image at infinity. If the objective has a focal length of 30 cm, what is the focal length of the eyepiece?

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89. Calculate the resolving power of a microscope with cone angle of light falling on the objective equal to 60°. Take $\lambda = 600 nm$, μ for air $= 1$.

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90. Assume that light of wavelength 6000Å is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 100 inch ?

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91. The diameter of the pupil of human eye is about $2mm$. Human eye is most sensitive to the wavelength $555nm$. Find the limit of resolution of human eye.

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92. A person who can see things most clearly at a distance of $10cm$. Requires spectacles to enable to him to see clearly things at a distance of $30cm$. What should be the focal length of the spectacles ?

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93. The power of a lens used by short sighted person, is -2D. Find the maximum distance of an object which he can see without spectacles.

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94. If a person can sees clearly at a distance of 100 cm, then find the power of leris used to see object at 40 cm.

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95. A myopia person has been using spectacles of power -1.0 dioptre for distant vision. During old age, he also needs to use separate reading glasses of power $+2.0$ dioptre. Explain what may have happened.

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Checkpoint 9 1

1. Ligtht falls on a plane reflecting surface.For what angler of incidence is the reflected ray normal to the incident ray.

A. 60°

B. 45°

C. 90°

D. 30°

Answer: B

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2. Which is not true for the image formed in a plane mirror ? The image is

A. erect

B. virtual

C. laterally inverted

D. closer to the mirror than the object

Answer: D

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3. A plane mirror reflects a pencil of light to form a real image. Then the pencil of light incident on the mirror is

A. parallel

B. convergent

C. divergent

D. None of these

Answer: B

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4. A plane mirror produces a magnification of

A. -1

B. $+1$

C. Zero

D. Between 0 and $+\infty$

Answer: B

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5. A ray of light is incident on a plane mirror at an angle of incidence of 30°. The deviation produced by the mirror is

A. 30°

B. 60°

C. 90°

D. 120°

Answer: D

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6. If the reflected ray is rotated by an angle of 4θ in clockwise direction then the mirror was rotated by

A. 2θ in anti-clockwise direction

B. 4θ in anti-clockwise direction

C. 2θ in clockwise direction

D. 4θ in clockwise direction

Answer: A

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7. 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 tow to head, he uses a plane mirror kept at a distance of 1 m from him. The minimum height of the plane mirror required is

A. 180 cm

B. 90 cm

C. 85 cm

D. 170 cm

Answer: B

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8. An object is moving towards a stationary plane mirror with a speed of 2 m/s. Velocity of the image w.r.t. the object is

A. 2 m/s towards right

B. 4 m/s towards right

C. 2 m/s towards left

D. 4 m/s towards left

Answer: D

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

A. 30°

B. 60°

C. 90°

D. 150°

Answer: C

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10. An object (O) is placed between two parallel plane mirror as shown in figure. Distance between the 4th image is

A. 16 m

B. 32 m

C. 8 m

D. 64 m

Answer: B

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Checkpoint 9 2

1. A concave mirror of focal length f (in air) is immersed in water $(\mu = 4/3)$. The focal length of the mirror in water will be

A. f

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

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

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

Answer: A

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2. An object is placed 40 cm from a concave mirror of focal length 20 cm. The image formed is

A. real, inverted and same in size

B. real, inverted and smaller in size

C. virtual, erect and larger in size

D. virtual, erect and smaller in size

Answer: A

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3. 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. pole

C. focus

D. 15 cm behined the mirror

Answer: D

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4. An object is placed at a distance of 30 cm from a concave mirror and its real image is formed at a distance of 30 cm from the mirror. The focal length of the mirror is

A. 15 cm

B. 45 cm

C. 30 cm

D. 20 cm

Answer: A

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5. A convex mirror of focal length f produces an image $(1/n)^{th}$ 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. $\left[\frac{n+1}{n}\right]f$

D. $(n+1)f$

Answer: A

Watch Video Solution

6. The focal length of a concave mirror is 50cm. Where an object be placed so that its image is two times and inverted

A. 75 cm

B. 60 cm

C. 125 cm

D. 50 cm

Answer: A

Watch Video Solution

7. An object of size 7.5 cm is placed in front of a convex mirror of radius of curvature 25 cm at a distance of 40 cm. The size of the image should be

A. 2.3 cm

B. 1.78 cm

C. 1 cm

D. 0.8 cm

Answer: B

Watch Video Solution

8. The image formed by a convex mirror of focal length $30cm$. is a quarter of the object. What is the distance of the object from the mirror ?

A. 30 cm

B. 90 cm

C. 120 cm

D. 60 cm

Answer: B

Watch Video Solution

9. 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

A. 10 cm

B. 15 cm

C. 20 cm

D. 30 cm

Answer: B

Watch Video Solution

10. 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

A. 0.4 cm away from the mirror

B. 0.8 cm away from the mirror

C. 0.4 cm towards the mirror

D. 0.8 cm towards the mirror

Answer: A

Watch Video Solution

Checkpoint 9 3

1. A light wave has a frequency of $4 \times 10^{14} Hz$ and a wavelength of 5×10^{-7} meters in a medium. The refractive index of the medium is

A. 1.5

B. 1.33

C. 1.25

D. 1.7

Answer: A

Watch Video Solution

2. Absolute refractive indices of glass and water are $3/2$ and $4/3$. The ratio of velocity of light in glass and water will be

A. $4:3$

B. $9:8$

C. $8:9$

D. $3:4$

Answer: C

Watch Video Solution

3. The refractive index of a certain glass is 1.5 for light whose wavelength in vacuum is 6000 Å. The wavelength of this light when it passes through glass is

A. 4000 Å

B. 6000 Å

C. 9000Å

D. 15000 Å

Answer: A

Watch Video Solution

4. A ray of light in incident on a glass plate at an angle of 60°. What is the refractive index of glass if the reflected and refracted rays are perpendicular to each other?

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

B. 1.5

C. 1.732

D. 2

Answer: C

Watch Video Solution

5. The refractive index of glass with respect to air is $\frac{3}{2}$ and the refraction index of water with respect to air is $\frac{4}{3}$. The refractive index of glass with respect to water will be:

A. $8/9$

B. $9/8$

C. $7/6$

D. None of these

Answer: B

Watch Video Solution

6. How does refractive (μ) of a material vary with respect to wavelength (λ)? A and B are constants

A. μ=$A+\frac{B}{\lambda^2}$

B. μ=$A + B\lambda^2$

C. μ=$A + \dfrac{B}{\lambda}$

D. μ=$A + B\lambda$

Answer: A

Watch Video Solution

7. ${}_iu_j$ represents refractive index when a light ray goes from medium i to medium j, then the product ${}_2\mu_1 \times {}_3\mu_2 \times {}_4\mu_2$ is equal to

A. ${}_3\mu_1$

B. ${}_3\mu_2$

C. $\dfrac{1}{{}_1\mu_4}$

D. ${}_4\mu_2$

Answer: C

Watch Video Solution

8. μ_1 and μ_2 are the refractive index of two mediums and v_1 and v_2 are the velocity of light in these in two mediums respectively. Then, the relation connecting these quantities is

A. $v_1 = v_2$

B. $\mu_2 v_1 = \mu_1 v_2$

C. $\mu_1^2 v_1 = \mu_2^2 v_2$

D. $\mu_1 v_1 = \mu_2 v_2$

Answer: D

Watch Video Solution

9. When light is refracted into a medium

A. its wavelength and frequency both increase

B. its wavelength increases but frequency remain unchanged

C. its wavelength decreased but frequency remain unchanged

D. its wavelength and frequency both decreased

Answer: C

Watch Video Solution

10. A spot is placed on the bottom of a slab made of transperent material of refractive index 1.5. The spot is viewed vertically from the top when it seems to be raised by 2 cm. Then, the height of the slab is

A. 10 cm

B. 8 cm

C. 6 cm

D. 4 cm

Answer: C

Watch Video Solution

11. An air bubble inside a glass slab ($\mu=1.5$) appears 6 cm when viewed from one side and 4 cm when viewed from the opposite side. The thickness of the slab is

A. 10 cm

B. 6.67 cm

C. 15 cm

D. None of these

Answer: C

Watch Video Solution

12. 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 at a distance from the surface of water equal to

(Refractive Index of water is 4/3)

A. 24 m

B. 12 m

C. 18 m

D. 9 m

Answer: A

Watch Video Solution

13. 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 index 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

Watch Video Solution

14. Three immiscible transparent liquids with refractive indices $3/2, 4/3$ and $6/5$ are arranged one on top of another. The depth of the liquid are $3cm$, $4cm$ and $6cm$ respectively. The apparent depth of the vessel is

A. $10cm$

B. $9cm$

C. $8cm$

D. $7cm$

Answer: A

Watch Video Solution

15. A glass-slab is immersed in water. What will be the critical angle for a light ray at glass-water interface? Where

$_{(a)}n_g = 1.50,_a n_w = 1.33$ and $\sin^{-1}(0.887) = 62.5$

A. 48.8°

B. 72.8°

C. 62.5°

D. 64.5°

Answer: C

Watch Video Solution

16. The wavelength of light in two liquids ' x ' and ' y ' is 3500 Å and 7000 Å, then the critical angle of x relative to y will be

A. 60°

B. 45°

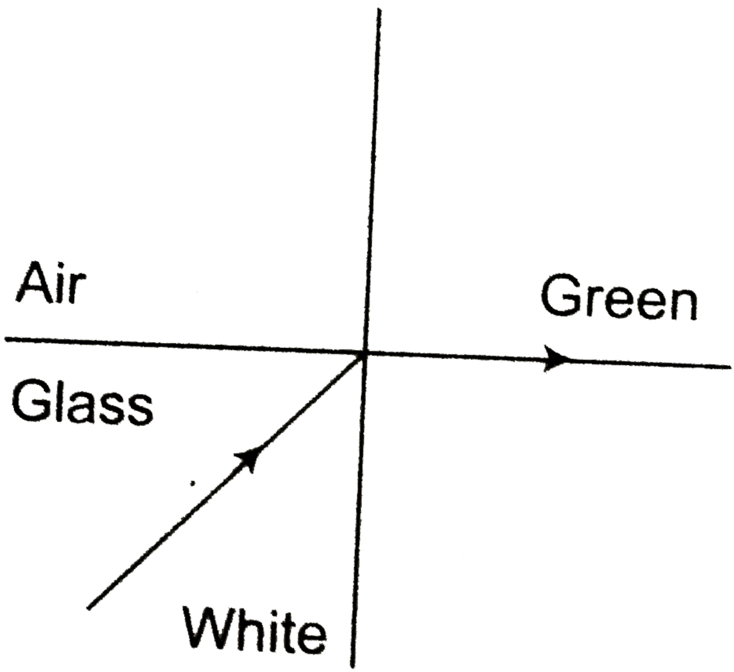
C. 30°

D. 15°

Answer: C

Watch Video Solution

17. White light is incident on the interface of glass and air as shown in 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

Watch Video Solution

18. Calculate the speed of light in a medium whose critical angle is 30°.

A. 1.5×10^{8}m/s

B. 3×10^{8}m/s

C. 4.5×10^{8}m/s

D. None of these

Answer: A

Watch Video Solution

19. A ray of light travelling in a transparant medium falls on a surface separating the medium from air at an angle of incidence of $45degree$. The ray undergoes total internal reflection. If n is the refractive in index of the medium with respect to air, select the possible value (s) of n from the following:

A. 1.2

B. $4/3$

C. 1.4

D. 1.5

Answer: C

Watch Video Solution

20. A glass slab has a critical angle of 30° when placed in air. What will be the critical angle when it is placed in liquid of refractive index $6/5$?

A. 45°

B. 37°

C. 53°

D. 60°

Answer: B

Watch Video Solution

Checkpoint 9 4

1. An air bubble contained inside water. It behaves as

A. concave lens

B. convex lens

C. neither convex nor concave

D. cannot say

Answer: B

View Text Solution

2. A convex lens has a focal length of 20 cm. It is used to form an image of an object placed 15 cm from lens. The image is

A. virtual inverted and enlarge

B. real,inverted and diminished

C. real,inverted and enlarge

D. virtual,erect and enlarge

Answer: D

Watch Video Solution

3. In the figure, an air lens of radii of curvature 10 cm $(R_1 = R_2 = 10cm)$ is cut in a cylinder of glass (μ=2/3). The focal length and the nature of the lens is

A. 15cm,concave

B. 15 cm,convex

C. ∞,neither concave nor convex

D. 0,concave

Answer: A

View Text Solution

4. A plano convex lens is made of glass of refractive index 1.5. The radius of curvature of its convex surface is R. Its focal length is

A. R/2

B. R

C. 2R

D. 1.5R

Answer: C

Watch Video Solution

5. At what distance from a convex lens of focal length $30cm$ an object should be placed so that the size of image be $\frac{1}{4}$ that of object?

A. 30 cm

B. 60 cm

C. 15 cm

D. 150 cm

Answer: D

Watch Video Solution

6. A plano - convex lens is made of flint glass. Its focal length is

A. inversely proportional to the wavelength of light

B. longer for red than for blue

C. longer for blue than for red

D. the same for all colour

Answer: D

Watch Video Solution

7. Distance of an object from a concave lens of focal length 20 cm is 40 cm. Then linear magnification of the image

A. 1

B. < 1

C. > 1

D. zero

Answer: B

Watch Video Solution

8. Where should an object be placed from a converging lens of focal length 20 cm, so as to obtain a real image of magnification 2?

A. 50 cm

B. 60 cm

C. $-50cm$

D. $-30cm$

Answer: D

Watch Video Solution

9. An object is placed at 10 cm from a lens and real image is formed with magnification of 0.5. Then the lens is

A. concave with focal length of 10/3 cm

B. convex with focal length of 10/3 cm

C. concave with focal length of 10 cm

D. convex with focal length of 10 cm

Answer: B

Watch Video Solution

10. The real image which is exactly equal to the size of an object is to be obtained on a screen with the help of a convex glass of focal length 15 cm. For this, what must be in the distance between the object and the screen?

A. 15 cm

B. 30 cm

C. 45 cm

D. 60 cm

Answer: B

Watch Video Solution

11. A plano-convex lens of curvature of $30cm$ and refractive index 1.5 produces a real image of an object kept $90cm$ from it. What is its magnification?

A. 4

B. 0.5

C. 1.5

D. 2

Answer: D

Watch Video Solution

12. The minimum distance between an object and its real image formed by a convex lens is

A. $1.5f$

B. $2f$

C. $2.5f$

D. $4f$

Answer: D

Watch Video Solution

13. A convex lens of refractive index 3/2 has a power of 2.5°. If it is placed in a liqud of refractive index 2,the new power of the lens is

A. 2.5D

B. $-2.5D$

C. 1.25D

D. $-1.25D$

Answer: D

Watch Video Solution

14. Two thin lenses of focal length f_1 and f_2 are in contact and coaxial. The power of the combination is

A. $f_1 + f_2$

B. $\dfrac{f_1 f_2}{f_1 + f_2}$

C. $\dfrac{1}{2}(f_1 + f_2)$

D. $\dfrac{f_1 + f_2}{f_1 f_2}$

Answer: D

Watch Video Solution

15. Two thin lenses, one of focal length + 60 cm and the other of focal length – 20 cm are put in contact. The combined focal length is

A. $= 15cm$

B. $-15cm$

C. $=30cm$

D. $-30cm$

Answer: D

Watch Video Solution

16. 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 is

A. $-1.25D$

B. $-6.5D$

C. $+6.5D$

D. $+1.25D$

Answer: A

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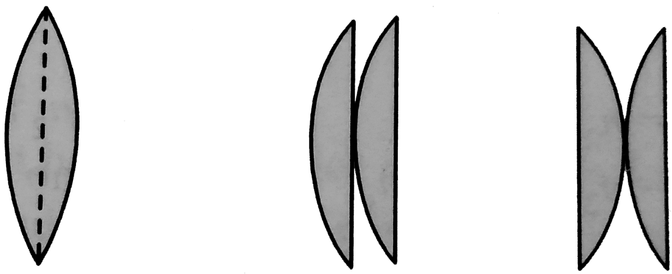
17. Two similar plano-convex lenses are combined together in three different ways as shown in the adjoining figure. The ratio of the focal lengths in three cases will be



A. $2:2:1$

B. $1:1:1$

C. $1:2:2$

D. $2:1:1$

Answer: B

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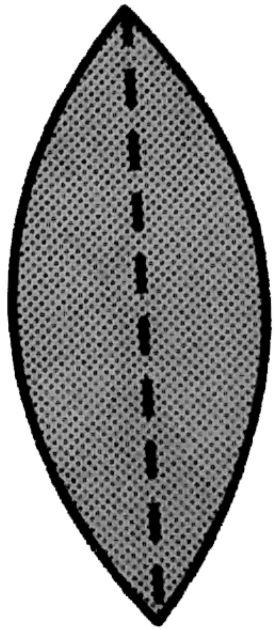
18. A convex lens has a focal length f. It is cut into two parts along the dotted line as shown in figure. The focal length of each part will be



A. f/2

B. f

C. (3/2)f

D. 2f

Answer: D

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19. A converging lens is used to form an image on a screen. When the upper half of the lens is covered by an opaque screen

A. half the image will disappear

B. complete image will disappear

C. intensity of image will increase

D. intensity of image will decrease

Answer: D

Watch Video Solution

20. 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

A. 20.5 cm

B. 10 cm

C. 15.5 cm

D. 5 cm

Answer: B

Watch Video Solution

Checkpoint 9 5

1. A ray of light is incident at an angle of 60° on one face of a prism of angle 30°. The ray emerging out of the prism makes an angle of 30° with the incident ray. The emergent ray is

A. normal to the face through which it emerges

B. Incline at 30° to the face through it emerges

C. inclined at 60° to the face through it emerges

D. None of these

Answer: A

Watch Video Solution

2. When light rays are incident on a prism at an angle of 45°, the minimum deviation is obtained. If refractive index of the material of prism is $\sqrt{2}$, then the angle of prism will be

A. 30°

B. 75°

C. 90°

D. 60°

Answer: B

Watch Video Solution

3. A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to 3/4 of the angle of the prism. The angle of deviation is

A. 45°

B. 39°

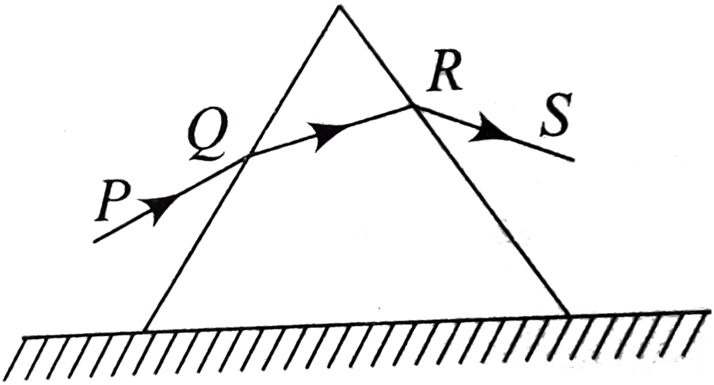
C. 20°

D. 30°

Answer: D

Watch Video Solution

4. An equilateral prism is placed on a horizontal surface. A ray PQ is incident onto it. For minimum deviation,



A. PQ is horizontal

B. QR is horizontal

C. RS is horizontal

D. Either PQ or RS is horizontal

Answer: B

Watch Video Solution

5. In a thin prism of glass (refractive index 1.5), which of the following relations between the angle of minimum deviations δ_m and angle of prism r will be correct?

A. $\delta_m = r$

B. $\delta_m = 1.5r$

C. $\delta_m = 2r$

D. $\delta_m = \frac{r}{2}$

Answer: A

Watch Video Solution

Watch Video Solution

6. The refractive index of a prism for a monochromatic wave is $\sqrt{2}$ and its refracting angle is 60° for minimum deviation, the angle of indidence will be

A. 30°

B. 45°

C. 60°

D. 75°

Answer: B

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7. Angle of minimum deviation for a prism of refractive index 1.5 is equal to the angle of prism The angle of prism is $(\cos 41^\circ = 0.75)$

A. 21°

B. 42°

C. 60°

D. 82°

Answer: D

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8. When light of wavelength λ on an equilateral prism, kept on its minimum deviation position, it is found that the angle of deviation equals the angle the angle of the prism itself. The refractive index of the material of the prism for the wavelength λ is

A. $\sqrt{3}$

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

C. 2

D. $\sqrt{2}$

Answer: A

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9. Dispersive power depends upon

A. the angel of prism

B. material of prism

C. deviation produced by prism

D. height of the prism

Answer: B

Watch Video Solution

10. A thin prism P_1 with angle 6° and made from glass of refractive index 1.54 is combined with another thin prism P_2 of refractive index 1.72 to produce dispersion without deviation. The angle of prism P_2 will be

A. $5^\circ 24'$

B. $4^\circ 30'$

C. 6°

D. 8°

Answer: B

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Checkpoint 9 6

1. For a normal eye, the least distance of distinct vision is

A. 0.25 m

B. 0.50 m

C. 25 m

D. infinite

Answer: A

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2. When we see an object, image formed on the retina is

(i) real (ii) virtual

(iii) erect (iv) inverted

A. real and inverted

B. virtual and erect

C. real and erect

D. virtual and inverted

Answer: A

Watch Video Solution

3. The focal length of a normal eye lens is about

A. 1 mm

B. 2 cm

C. 25 cm

D. 1 m

Answer: B

Watch Video Solution

4. An object is placed at a distance u from a simple microscope of focal length f. The angular magnification obtained depends

A. on f but not on u

B. on u but not on f

C. on f as well as u

D. neither on f nor on u

Answer: A

Watch Video Solution

5. Magnifying power of a simple microscope is (when final image is formed, at D=25cm from eye)

A. $\frac{D}{f}$

B. $1+\frac{D}{f}$

C. $1+\frac{f}{D}$

D. $1-\frac{D}{f}$

Answer: B

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6. In a compound microscope, the intermediate image is

A. virtual erect and magnified

B. real,erect and magnified

C. real,inverted and magnified

D. virtual,erect and reduced

Answer: C

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7. A compound microscope has two lenses. The magnifying power of one is 5 and the combined magnifying power is 100. The magnifying power of the other lens is

A. 10

B. 20

C. 50

D. 25

Answer: B

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8. The length of the compound microscope is $14cm$. The magnifying power for relaxed eye is 25. If the focal length of eye lens is $5cm$, then the object distance for objective lens will be

A. 1.8 cm

B. 1.5 cm

C. 2.1 cm

D. 2.4 cm

Answer: A

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9. If the focal length of objective and eye lens are $1.2cm$ and $3cm$ respectively and the object is put $1.25cm$ away from the objective lens and the final image is formed at infinity. The magnifying power of the microscope is

A. 150

B. 200

C. 250

D. 400

Answer: B

Watch Video Solution

10. The focal length of objective and eye lens of a microscope are $4cm$ and $8cm$ respectively. If the least distance of distinct vision is $24cm$ and object distance is $4.5cm$ from the objective lens, then the magnifying power of the microscope will be

A. 18

B. 32

C. 64

D. 20

Answer: B

Watch Video Solution

11. If the telescope is reversed .i.e., seen seen from the objective side, then

A. object will appear very small

B. object will appear very large

C. there will be no effect on the image formed by the telescope

D. image will be sligtly greater than the earlier one

Answer: A

Watch Video Solution

12. The aperture of a telescope is made large, because

A. increase the intensity of the image

B. decrease the intensity of image

C. have greater magnification

D. have lesser resolution

Answer: A

Watch Video Solution

13. In an astronomical telescope, the focal length of the objective lens is 100 cm and of eye-piece is 2 cm . The magnifying power of the telescope for the normal eye is

A. 50

B. 10

C. 100

D. $\frac{1}{50}$

Answer: A

Watch Video Solution

14. The focal lengths of the objective and eye lenses of a telescope are respectively 200 cm and 5 cm . The maximum magnifying power of the telescope will be

A. -40

B. -48

C. -60

D. -100

Answer: B

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15. The number of lenses in a terrestrial telescope is

A. two

B. three

C. four

D. six

Answer: B

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16. Magnifying power of a Galilean telescope is given by

A. $\dfrac{f_o}{f_e}\left(1-\dfrac{f_e}{D}\right)$

B. $\dfrac{f_o}{f_e}\left(1+\dfrac{f_e}{D}\right)$

C. $\dfrac{f_o}{f_e}\left(1+\dfrac{2f_e}{D}\right)$

D. $\dfrac{f_o}{f_e}\left(1-\dfrac{2f_e}{D}\right)$

Answer: A

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17. In Gallilean telescope, the final image formed is

A. real,erect and enlarged

B. virtual,erect and enlarged

C. real,inverted and enlarge

D. virtual,inverted and enlarged

Answer: A

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18. Reflecting telescope consists of

A. convex mirror of large aperature

B. concave mirror of large aperature

C. Concave lens of small aperature

D. None of these

Answer: B

Watch Video Solution

19. Resolving power of a microscope is given by

A. $\frac{2\mu \sin\theta}{\lambda^2}$

B. $\frac{\mu \sin\theta}{\lambda}$

C. $\frac{2\mu \sin\theta}{\lambda}$

D. $\frac{2\mu \cos\theta}{\lambda}$

Answer: C

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20. The resolving power of a telescope whose lens has a diameter of 1.22 m for a wavelength of 5000Å is

A. 2×10^5

B. 2×10^6

C. 2×10^2

D. 2×10^4

Answer: B

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Checkpoint 9 7

1. For the myopia defect in eye, it can be removed by

A. convex lens

B. concave lens

C. cylindrical lens

D. toric lens

Answer: B

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2. A short sighted person can see distinctly only those objects which lie between 10 cm and 100 cm from him. The power of the spectacle lens required to see a distant object is

A. $+0.5D$

B. $-1.0D$

C. $-10D$

D. $+4.0D$

Answer: B

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3. Which of the following statement is correct for hypometeropia?

A. Near object are not clearly visible

B. Distant object are not clearly visible

C. Concave lens is used for remedy of hypermetropia

D. None of these

Answer: A

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4. A person is suffering from the defect astigmatism. Its main reason is

A. cannot see any object

B. cannot see any object in two perpendicular directions simuletaeously

C. cannot see near by objects

D. cannot see distant objects

Answer: B

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5. Astigmatism for a human eye can be removed by using

A. concave lens

B. convex lens

C. cylindrical lens

D. prismatic lens

Answer: C

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6. Presbyopia can be removed by using

A. convex lens

B. concave lens

C. cylindrical lens

D. bifocal lens

Answer: D

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7. The focal lengths of a converging lens measured for violet, green and red colours of $fv' f_G' f_R$ respectively. We will find

A. $f_v = f_r$

B. $f_v < f_r$

C. $f_v > f_r$

D. $f_g > f_r$

Answer: C

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8. Two lenses have focal lengths f_1 and f_2 and their dispersive powers are ω_1 and ω_2 respectively. They will together form an achromatic combination if

A. $\omega_1 = 2\omega_2 \text{ and } f_1 = 2f_2$

B. $2\omega_1 = \omega_2 \text{ and } f_1 = 2f_2$

C. $\omega_1 = 2\omega_2 \text{ and } f_1 = -2f_2$

D. $2\omega_1 = \omega_2 \text{ and } 2f_1 = f_2$

Answer: C

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9. The rainbow formed after or during the rain is due to

A. Refraction

B. reflection

C. dispersion

D. all of these

Answer: D

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10. Phenomena associated with scattering is/are

A. blue colour of the sky

B. appearance of reddish sun during sunset and sunrise

C. both (a) and (b)

D. None of these

Answer: C

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Exercise

1. When light is passed through a prismm when......... colour shows maximum deviation.

A. red

B. violet

C. yellow

D. green

Answer: B

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2. When the power of eye lens increases, the defect of vision is produced. The defect is known as

A. shortsightedness

B. longsightedness

C. colourblindness

D. None of the above

Answer: A

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3. In human eye the focussing is done by

A. to and fro movement of eye lens

B. to and fro movement of the retina

C. change in the convexity of the lens surface

D. change in the refractive index of the eye fluids

Answer: C

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4. The phenomena involved in the reflected of radiowaves by ionosphere is similar to.

A. reflection of light by a plane mirror

B. total internal reflection of light in air during a mirage

C. dispersion of light by water molecules during the formation of a rainbow

D. scattering of light by the particles of air

Answer: B

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5. A passenger in an aeroplane shall

A. should see a rainbow

B. may see a primary and a secondary rainbow as concentric circles

C. may see a primary and a secondary rainbow as concentric arcs

D. should never see a secondary rainbow

Answer: B

Watch Video Solution

6. Myopia is due to

A. elongation of eye ball

B. irregular change in focal length

C. shortening of eye ball

D. older age

Answer: A

Watch Video Solution

7. The minimum magnifying power of an astronomical telescope is M. If the focal length of its eye-lens is halved, the minimum magnifying power will become:

A. m/2

B. 2m

C. 3m

D. 4m

Answer: B

Watch Video Solution

8. When light wave suffers reflection at the interface from air to glass, the change in phase of the reflected wave is equal to

A. zero

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

C. π

D. 2π

Answer: C

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9. A man has a height of 6m. He observes image of 2m height erect, then mirror used is

A. concave

B. convex

C. plane

D. none of these

Answer: B

Watch Video Solution

10. The firld of view is maximum for

A. plane mirror

B. concave mirror

C. convex mirror

D. cylindrical mirror

Answer: C

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11. A virtual image larger than the object can be obtained by

A. concave mirror

B. convex mirror

C. plane mirror

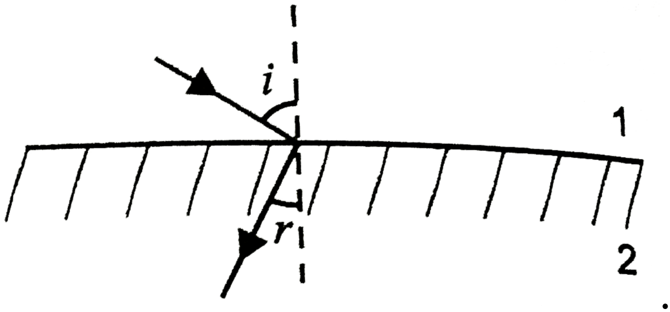
D. concave mirror

Answer: A

Watch Video Solution

12. There are certain materials developed in laboratories which have a negative refractive index, Fig. A ray incident from air (medium 1) into such a medium (medium 2) shall follow a path given by

(a)



A.

B.

C.

D.

Answer: A

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13. Human eyes are most sensitive to the wavelength of

A. 4500 Å

B. 5500 Å

C. 6500 Å

D. Equally sensitive for all wavelengths of visible spectrum

Answer: B

Watch Video Solution

14. The reason for shining of air bubble in water is

A. diffraction of light

B. dispersion of light

C. scattering of light

D. total internal reflection of light

Answer: D

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15. What will be the colour of sky as seen from the earth, if there were no atmosphere

A. Black

B. Blue

C. White

D. Red

Answer: A

Watch Video Solution

16. A short pulse of white light is incident from air to a glass slab at normal incidence. After travelling through the slab, the first colour to emerge is.

A. blue

B. green

C. violet

D. red

Answer: D

Watch Video Solution

17. Which of the following can form a virtual,erect and magnified image?

A. Plane mirror

B. Concave mirror

C. Convex mirror

D. Concave lens

Answer: A

Watch Video Solution

18. Rainbow is observed when the sun is

A. in front of the observer

B. behind the observer

C. vertically above the observer

D. in any of these positions

Answer: B

Watch Video Solution

19. The sky would appear red instead of blue if

A. atmospheric particles scatter blue light more than the red light

B. atmospheric particle scatter all colours equally

C. atmospheric particles scatter red light more than the blue light

D. the sun was much hotter

Answer: C

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20. A ray of light is incident on the surface of seperation of a medium at an angle 45° and is refracted in the medium at an angle 30°. What will be the velocity of light in the medium?

A. 1.96×10^8 m/s

B. 2.12×10^8 m/s

C. 2.65×10^8 m/s

D. 1.24×10^{8} m/s

Answer: B

Watch Video Solution

21. Which of the following quantities increase when wavelength of light is increased? Consider only the magniutude

A. The power of a converging lens

B. The focal length of a converging lens

C. The power of a diverging lens

D. The focal length of a diverging lens

Answer: B::D

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22. Sun is visible a little before the actual sunrise and until a little after a actual sunset. This is due to

A. total internal reflection

B. reflection

C. refraction

D. polarisation

Answer: C

Watch Video Solution

23. In opticle fibres,the refractive index of the core is

A. greater than that of the cladding

B. equal to that of the cladding

C. smaller than that of the cladding

D. independent of that of the cladding

Answer: A

Watch Video Solution

24. An object approaches a convergent lens from the left of the lens with a uniform speed $5m/s$ and stops at the focus. The image.

A. moves away from the lens with an uniform speed 5 m/s

B. moves away from the lens with an uniform acceleration

C. moves away from the lens with a non-uniform acceleration

D. moves towards the lens with a non-uniform acceleration

Answer: C

Watch Video Solution

25. A point object is placed at the center of a glass sphere of radius 6cm and refractive index 1.5. The distance of virtual image from the surface is

A. 2 cm

B. 4 cm

C. 6 cm

D. 12 cm

Answer: C

Watch Video Solution

26. An object has image thrice of its original size when kept at $8cm$ and $16cm$ from a convex lens. Focal length of the lens is

A. less than 8 cm

B. 8 cm

C. 16 cm

D. between 8 and 16 cm

Answer: D

Watch Video Solution

27. If there had been one eye of the man, then

A. image of the object would have been inverted

B. visible region would have decreased

C. image would have not been seen three-dimensional

D. Both (b) and (c)

Answer: D

Watch Video Solution

28. A transparent plastic bag filled with air forms a concave lens. Now, if this bag is completely immersed in water, then it behaves as

A. convergent lens

B. rectangular slab

C. divergent lens

D. equilateral prism

Answer: B

Watch Video Solution

29. A normal eye is not able to see objects closer than 25 cm because

A. the focal length of the eye is 25 cm

B. the distance of the retina from the eye lens is 25 cm

C. the eye is not able to increase the focal length beyond a limit

D. the eye is not able to decrease the focal length beyond a limit

Answer: D

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30. A mark at the bottom of a liquid appears to rise by $0.1m$. The depth of the liquid is $1m$. The refractive index of the liquid is

A. 1.33

B. 43718

C. $\frac{10}{9}$

D. 1.5

Answer: C

Watch Video Solution

31. Under minimum deviation condition in a prism, if a ray is incident at an angle 30°, the angle between the emergent ray and the second refracting surface of the prism is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

Watch Video Solution

32. A prism can have a maximum refracting angle of

$(\theta_C =$ critical angle for the material of prism)

A. 60°

B. C

C. 2C

D. slightly less than than 180°

Answer: C

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33. You are given four sources of light each one providing a light of a single colour-red, blue,green and yellow. Suppose the angle of refraction for a beam of yellow light corresponding to a particular angle of incidence at the interface of two media is

90°. Which of the folowing statements is correct it the source of yellow light is replaced with that of other lights without changing the angle of incidence ?

A. The beam of red light would undergo total internal reflection

B. The beam of red light would bend towards normal while it gets refracted through the second mediurn

C. The beam of blue light would undergo total internal reflection

D. The beam of green light would bend away from the normal as it gets refracted through the second medium

Answer: C

Watch Video Solution

34. A beam of light composed of red and green ray is incident obliquely at a point on the face of rectangular glass slab. When coming out on the opposite parallel face, the red and green ray emerge form

A. two points propagating in two different non-parallel directions

B. two points propagating in two different parallel directions

C. one point propagating in two different directions

D. one point propagating in the same direction

Answer: A

Watch Video Solution

35. Object is placed 15 cm from a concave mirror of focal length 10 cm, then the nature of the image formed will be

A. magnified and inverted

B. magnified and erect

C. small in size and inverted

D. small in size and erect

Answer: A

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36. When a lens of refractive index n_1, then the lens looks to be dissapeared only, if

A. $n_1 = n_2 / 2$

B. $n_1 = 3n_2 / 2$

C. $n_1 = n_2$

D. $n_1 = 5n_2 / 2$

Answer: C

Watch Video Solution

37. If x_1 is the size of the magnified image and x_2 is the size of the diminsghed image in lens displacement method, then the size of the object is

A. $\sqrt{x_1 x_2}$

B. $x_1 x_2$

C. $x_1^2 x_2$

D. $x_1 x_2^2$

Answer: A

Watch Video Solution

38. Mark the correct one.

A. Our eyes can distinguish between real and virtual image

B. Virtual image can also be taken on screen

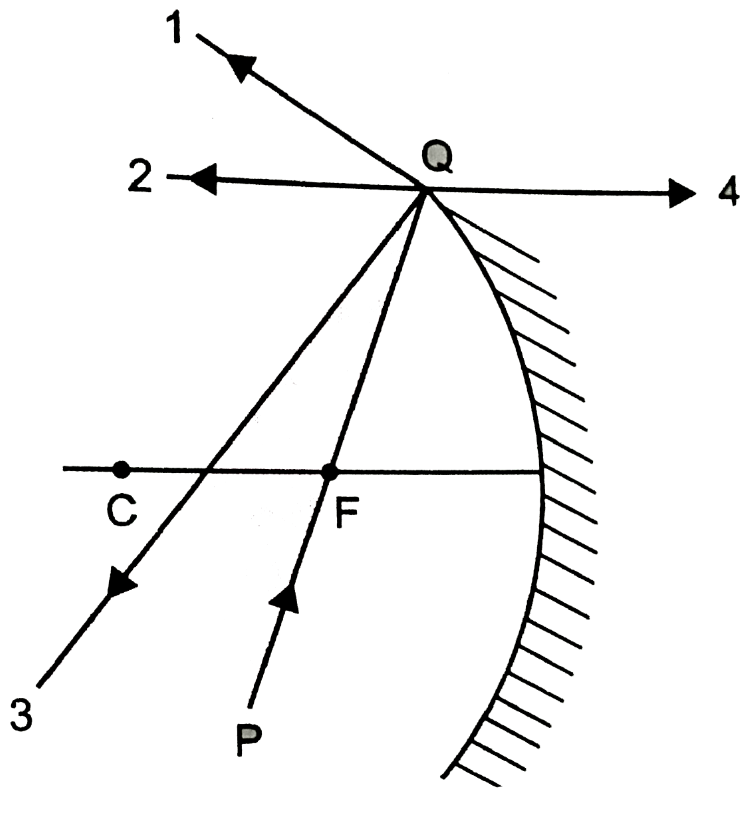
C. If the incident rays are converging at a point, then the object is real

D. None of the above

Answer: D

Watch Video Solution

39. The direction of ray of light incident on a concave mirror is shown by PQ while directions in which the ray would travel after reflection is shown by four rays marked $1, 2, 3$ and 4, Fig. Which of the four rays correctly shows the direction of reflected ray ?



A. 1

B. 2

C. 3

D. 4

Answer: B

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40. Two beams of red and violet colours are made to pass separately through a prism (angle of the prism is $60 degree$). In the position of minimum deviation, the angle of refraction 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

Watch Video Solution

41. When sun light is scatterred by minute particles of atmosphere, then the intensity of light scattered away is proportional to

A. $(\text{wavelength of light})^4$

B. $(\text{frequency of light})^4$

C. $(\text{wavelength of light})^2$

D. $(\text{frequency of light})^2$

Answer: B

Watch Video Solution

42. An object is placed at a distance u from an equiconvex lens such that the distannce between the object and its real image is minimum. The focal length of the lens is f. The value of u is

A. ∞

B. 1.5 f

C. 2f

D. 4f

Answer: C

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43. If the aperature of a telescope is decreased resolving power will

A. increases

B. decreases

C. remain same

D. zero

Answer: B

Watch Video Solution

44. A telescope has an objective of focal length 100 cm and an eye-piece of focal length 5 cm. What is the magnifying power of the telescope when it is in normal adjustment?

A. 0.2

B. 2

C. 20

D. 200

Answer: C

Watch Video Solution

45. Which one of the following is not associated with the total internal reflection?

A. The mirage formation

B. optical fibre communication

C. Te glittering of diamond

D. Dispersion of light

Answer: B

Watch Video Solution

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

A. $10^{-11} s$

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

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

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

Answer: B

Watch Video Solution

47. Electromagnetic radiation of frequency n, wavelength λ, travelling with velocity v in air, enters a glass slab of refractive index μ. The frequency, wavelength and velocity of light in the glass slab will be respectively

A. $\frac{n}{\mu}, \frac{\lambda}{\mu}, \frac{v}{\mu}$

B. $n, \frac{\lambda}{\mu}, \frac{v}{\mu}$

C. $n, \lambda, \frac{v}{\mu}$

D. $\frac{n}{\mu}, \frac{\lambda}{\mu}, v$

Answer: B

Watch Video Solution

48. We combined a convex lens of focal length f_1 and concave lens of focal lengths f_2 and their combined focal length was F . The combination of these lenses will behave like a concave lens, if

A. $f_1 > f_2$

B. $f_1 < f_2$

C. $f_1 = f_2$

D. $f_1 \leq f_2$

Answer: A

Watch Video Solution

49. Wavelength of light in vaccum is 5890 Å, then its wavelength in glass $(\mu = 1.5)$ will be

A. 9372 Å

B. 7932 Å

C. 7548 Å

D. 3927 Å

Answer: A

Watch Video Solution

50. 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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51. The focal length of a thin convex lens for red and blue colours is 100.5 cm and 99.5 cm .The dispersive power of the lens is

A. 0.01

B. 0.02

C. 1.005

D. 0.995

Answer: A

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52. Two mirrors are placed at right angle to each other. A man is standing between them combining his hair. How many images he will see?

A. 2

B. 3

C. 1

D. zero

Answer: B

Watch Video Solution

53. 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

Watch Video Solution

54. If two mirrors are keps at 60° to each other, then the number of images formed by them is

A. six

B. four

C. five

D. three

Answer: C

Watch Video Solution

55. If the focal length of the ey piece of the telescope is doubled, then its magnifying power (m) will be

A. 2m

B. 3m

C. m/2

D. 4m

Answer: C

Watch Video Solution

56. Angular resolving power of human eye is

A. 3.6×10^{3}rad

B. 3.6×10^{2}rad

C. 3.6×10^{4}rad

D. 3.6×10^{6}rad

Answer: A

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57. If the red light is replaced by blue light illuminating the object in a microscope the resolving power of the microscope

A. decreases

B. increases

C. gets halved

D. remain unchanged

Answer: B

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58. A telescope using light having wavelength 5000 Å and using lenses of focal lengths 2.5 cm and 30 cm. If the diameter of the aperature of the objective is 10 cm, then the resolving limit of telescope is

A. 6.1×10^{-6}rad

B. 5.0×10^{-6}rad

C. 8.3×10^{-4}rad

D. 7.3×10^{-3}rad

Answer: A

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59. An astronomical telescope in normal adjustment receives light from a distant source S. The tube length is now decreased slightly

A. no image will be formed

B. a virtual image of S will be formed at finite distance

C. a large, real image of S will be formed behined the eye place,for it

D. a small, real image of S will be formed behind the eye-piece closed to it

Answer: B

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60. An astronomical telescope has an angular magnification of magnitude 5 for distant object. The separation between the objective and the eyepiece is 36 cm and the final image is formed at infinity. The focal length f_0 of the objective and the focal length f_0 of the eyepiece are

A. $f_o = 45cm$ and $f_e = -9cm$

B. $f_o = -7.2cm$ and $f_e = 5cm$

C. $f_o = 50cm$ and $f_e = 10cm$

D.

Answer: D

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61. Magnification produced by astronominal telescope for normal adjustment is 10 and length of telescope is 1.1m. The magnification when the image is formed at least distance of distinct vision $(D = 25cm)$ is-

A. 6

B. 14

C. 16

D. 18

Answer: B

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62. Where should a person stand straight from the pole of a convex mirror of focal length 2.0 m on its axis, so that the image formed become half of his original height?

A. -2.60 m

B. -4.0 m

C. -0.5 m

D. -2.0m

Answer: D

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63. The radius of curvature of the curved surface of a plano-convex lens is $20cm$. If the refractive index of the material of the lens be 1.5, it will

A. act as a convex lens only for the objects that lie on its curved side

B. act as a concave lens for the objects that lie on its curved side

C. act as a convex lens irrespective of the side on which the object lies

D. act as a concave lens irrespective of side on which the object lies

Answer: C

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64. Wavelength of given light waves in air and in a medium are 6000 Å and 3000 Å, respectively. The critical angle is

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

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

C. $\sin^{-1}(2)$

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

Answer: C

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65. A convex and a concave mirror of radii 10 cm are placed facing each other and 15 cm apart. An object is placed exactly between them. If the reflection first takes place in concave and then in convex mirror the position of the final image will be

A. 7 cm behind concave mirror

B. at the pole of the concave mirror

C. at the pole of the convex mirror

D. 6.7 cm in front of concave mirror

Answer: C

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

A. 45 cm

B. 55 cm

C. $\frac{275}{6}cm$

D. $\frac{325}{6}$cm

Answer: D

Watch Video Solution

67. An object 5 cm tall is placed 1 m from a concave spherical mirror which has a radius of curvature of

20 cm. The size of the image is

A. 0.11 cm

B. 0.5 cm

C. 0.55 cm

D. 0.60 cm

Answer: C

Watch Video Solution

68. Two thin lenses of focal lengths 20 cm and 25 cm are placed in a contact. The effective power of the combination is

A. 9 D

B. 2 D

C. 3 D

D. 7 D

Answer: A

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69. The nearer point of hypermetropic eye is 40 cm. The lens to used for its correction should have the power

A. $+1.5D$

B. $-1.5D$

C. $+2.5D$

D. $+0.5D$

Answer: C

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70. A ray of light passing through a prism of refraction angle 60° has to deviate by atleast 30°. Then, refractive index of prism should be

A. $\leq \sqrt{2}$

B. $\geq \sqrt{2}$

C. $\geq \sqrt{3}$

D. $\leq \sqrt{3}$

Answer: B

Watch Video Solution

71. The angle of minimum deviation measured with a prism is 30° and the angle of prism is 60°. The refractive index of prism material is

A. $\sqrt{2}$

B. 1.5

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

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

Answer: A

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72. When a ray is refracted from one medium into another, the wavelegths changes from 6000Å to 4000Å. The critical angle for a ray from the second medium will be

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

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

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

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

Answer: C

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73. 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

A. 1.5

B. 1.66

C. 1.33

D. 3

Answer: C

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74. The refractive index of the material of prism $\sqrt{3}$, then the angle of minimum deviation of prism is

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C

Watch Video Solution

75. A ray of light is incident at 60° on one face of a prism of angle 30° and the emergent ray makes 30° with the incident ray. The refractive index of the prism is

A. 1.732

B. 1.414

C. 1.5

D. 1.33

Answer: A

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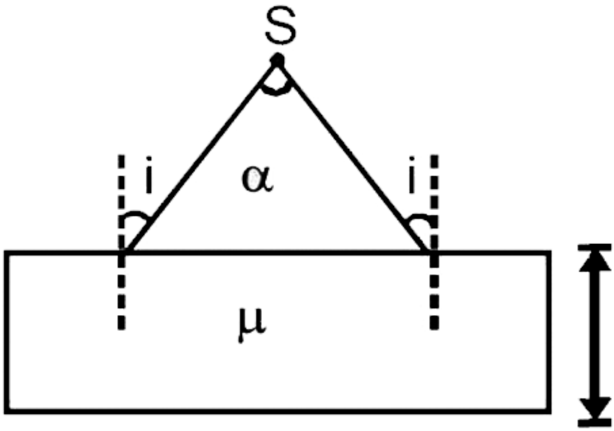

76.

A diverging beam of light from a point source S having devergence angle α, falls symmetrically on a glass slab as shown. The angles of incidence of the two extreme rays are equal. If the thickness of the glass slab is t and the refractive index n, then the divergence angle of the emergent beam is

A. zero

B. α

C. $\frac{\sin^{-1} 1}{n}$

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

Answer: B

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77. A convex lens forms an image of an object on a screen 30 cm from the lens. When the lens is moved 90 cm towards the object, then the image is again formed on the screen. Then, the focal length of the lens is

A. 13 cm

B. 24 cm

C. 33 cm

D. 40 cm

Answer: B

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78. If tube length of astronomical telescope is 105 cm and magnifying power is 20 for normal setting, calculate the focal length of objective

A. 100 cm

B. 10 cm

C. 20 cm

D. 25 cm

Answer: C

Watch Video Solution

79. A double convex lens $(R_1 = R_2 = 10cm)$ having focal length equal to the focal length of a concave mirror. The radius of curvature of the concave mirror

A. 10 cm

B. 20 cm

C. 40 cm

D. 15 cm

Answer: B

Watch Video Solution

80. When a thin convex lens is put in contact with a thin concave lens of the same focal length (f), then the resultant combination has focal length equal to

A. f/2

B. 2f

C. 0

D. ∞

Answer: D

Watch Video Solution

81. If refractive index of glass is 1.50 and of water is 1.33, then criticle angle is

A. $\sin^{-1}\left(\frac{8}{9}\right)$

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

C. $\cos^{-1}\left(\frac{8}{9}\right)$

D. None of the above

Answer: A

Watch Video Solution

82. The radii of curvature of the two surfaces of a lens are 20 cm and 30 cm and the refractive index of the material of the lens is 1.5. If the lens is concave - convex, then the focal length of the lens is

A. 24 cm

B. 10 cm

C. 15 cm

D. 120 cm

Answer: D

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83. The power of a biconvex lens is 10 dioptre and the radius of curvature of each surface is 10 cm. Then the refractive index of the material of the lens is

A. $\frac{3}{2}$

B. $\frac{4}{3}$

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

D. $\frac{5}{3}$

Answer: A

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84. An eye specialist prescribes spectacles having combination of convex lens of focal length 40cm in contact with a concave lens of focal length 25cm. The power of this lens combination in diopters is

A. $+1.5D$

B. $-1.5D$

C. $+6.67$D

D. $-6.67D$

Answer: B

Watch Video Solution

85. Two lenses are placed in contact with each other and the focal length of combination is $80cm$. If the focal length of one is $20cm$, then the power of the other will be

A. 1.66 D

B. 4.00 D

C. $-1.00D$

D. $-3.75D$

Answer: D

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86. A ray of light falls on a denser-rarer boundary from denser side. The critical angle is 45°. The maximum undergo is

A. 20 cm

B. 30 cm

C. 60 cm

D. 80 cm

Answer: C

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87. A plano convex lens of refractive index 1.5 and radius of curvature 30cm. 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 size of the object.

A. $\tan^{-1}\left(\frac{t_1}{t_2}\right)$

B. $\sin^{-1}\left(\frac{t_1}{t_2}\right)$

C. $\sin^{-1}\left(\frac{10t_1}{t_2}\right)$

D. $\tan^{-1}\left(\frac{10t_1}{t_2}\right)$

Answer: A

Watch Video Solution

88. If light travels a distance x in t_1 sec in air and $10x$ distance in t_2 sec in a medium, the critical angle of the medium will be

A. 24 cm

B. 10 cm

C. 15 cm

D. 120 cm

Answer: C

Watch Video Solution

89. A ray of light is directed towards a corner reflector as shown. The incident ray makes an angle of 22° with one of the mirrors. At what angle θ does the ray emerge?

A. 22°

B. 68°

C. 44°

D. 46°

Answer: B

Watch Video Solution

90. The focal lengths of the objective and eye – lens of a microscope are $1cm$ and $5cm$ respectively.

If the magnifying power for the relaxed eye is 45, then the length of the tube is

A. 30 cm

B. 25 cm

C. 15 cm

D. 12 cm

Answer: C

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91. The graph between u and v for a convex mirrorr is

A.

B.

C.

D.

Answer: A

Watch Video Solution

92. A concave lens of focal length 20 cm placed in contact with a plane mirror acts as a

A. convex mirror of focal length 10 cm

B. concave mirror of focal length 40 cm

C. concave mirror of focal length 60 cm

D. concave mirror of focal length 10 cm

Answer: A

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93. A diver at a depth of 12 m in water $(\mu = 4/3)$ sees the sky in a cone of semi-vertical angle

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

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

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

D. 90°

Answer: C

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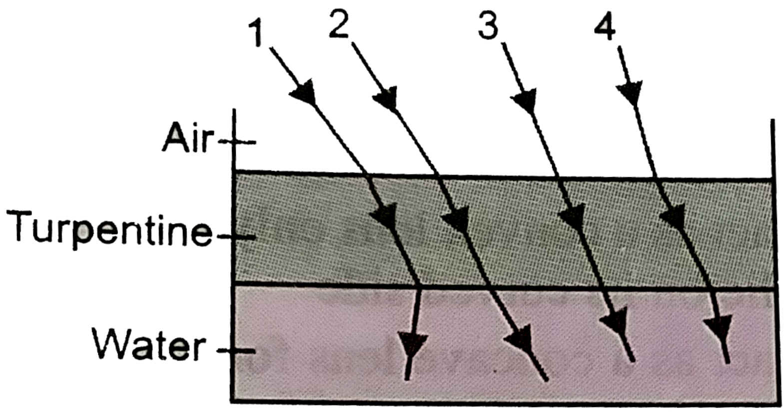
94. The optical density of turpentine is higher than that of water, while its mass density is lower. Fig. shows a layer of turpentine floating over water in a container. For which one of the four rays incident on turpentine in Fig., the path shows is correct ?



A. 1

B. 2

C. 3

D. 4

Answer: B

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95. A plano-convex lens is made of refractive index of 1.6. The focal length of the lens is

A. 400 cm

B. 200 cm

C. 100 cm

D. 50 cm

Answer: C

Watch Video Solution

96. A plano convex lens has focal length $f = 20cm$. If its plano surface is silvered, then new focal length will be.

A. 20 cm

B. 40 cm

C. 30 cm

D. 10 cm

Answer: D

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97. A ray of light incident at an angle θ on a refracting face of a prism emerges from the other face normally. If the angle of the prism is 5° and the prism is made of a material of refractive index 1.5, the angle of incidence is.

A. 7.5°

B. 5°

C. 15°

D. 2.5°

Answer: A

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98. The distance between an object and a divergent lens is m times the focal length of the lens. The linear magnification produced by the lens is

A. m

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

C. m+1

D. $\frac{1}{m+1}$

Answer: D

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99. A plano-concave lens is made of glass of refractive index 1.5 and the radius of curvature of its curved face is 100 cm. What is the power of the lens?

A. $+0.5D$

B. $-0.5D$

C. $-2D$

D. $+2D$

Answer: B

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100. The figure shows and equiconvex lens of focal length f. It the lens is cut along PQ, the focal length of each half will be

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

B. f

C. 2f

D. 4f

Answer: C

101. A glass slab of thickness $4cm$ contains the same number of waves as $5cm$ of water, when both are traversed by the same monochromatic light. If the refractive index of water is $4/3$, then refractive index of glass is

A. $\frac{5}{3}$

B. $\frac{5}{4}$

C. $\frac{16}{15}$

D. $\frac{3}{2}$

Answer: A

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102. A microscope is focussed on an ink mark on the top of a table. If we place a glass slab of 3 cm thick on it, how should the microscope be moved to focus the ink spot again? The refractive index of glass is 1.5

A. 2 cm upwards

B. 2 cm downwards

C. 1 cm upwards

D. 1 cm upwards

Answer: C

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103. The optical path of a monochromatic light is same if it goes through 4.0 cm of glass or 4.5 cm of water. If the refractive index of glass is 1.53, the refractive index of the water is

A. 1.3

B. 1.36

C. 1.42

D. 1.46

Answer: B

Watch Video Solution

104. A ray of light travelling in a transparent medium f refractive index μ, falls on a surface separating the medium from air at an angle of incidence of 45°. For which of the following value of μ the ray can undergo total internal reflection ?

A. $\mu = 1.33$

B. $\mu = 1.41$

C. $\mu = 1.50$

D. $\mu = 1.25$

Answer: B

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105. A ray of light, travelling in a medium of refractive index μ, is incident at an angle i on a composite transparent plate consisting of three plates of refractive indices μ_1, μ_2 and μ_3. The ray emerges from the composite plate into a medium of refractive index μ_4, at angle x. Then,

A. $\sin x = \sin i$

B. $\sin x = \frac{\mu}{\mu_4} \sin i$

C. $\sin x = \frac{\mu_4}{\mu} \sin i$

D. $\sin x = \frac{\mu_1}{\mu_2} \frac{\mu_3}{\mu_2} \frac{\mu}{\mu_4} \sin i$

Answer: B

Watch Video Solution

106. What should be the angle between two plane mirrorrs so that whatever be the angle of incidence, the incident ray and the reflected ray from the two mirrorrs be parallel to each other

A. 60°

B. 90°

C. 120°

D. 45°

Answer: B

Watch Video Solution

107. How much water should be filled in a container of height $21cm$, so that it appears half filled to the observer when viewed from the top of the container $(\mu = 4/3)$.

A. 8 cm

B. 10.5 cm

C. 12 cm

D. 14 cm

Answer: D

Watch Video Solution

108. When a plane mirror is placed horizontally on level ground at a distance of 60 m from the foot of a tower, the top of the tower and its image in the mirror subtend and angle of 90° at the eye. The height of the tower is

A. 30 m

B. 60 m

C. 90 m

D. 120 m

Answer: B

Watch Video Solution

109. A glass prism has refractive index $\sqrt{2}$ and refracting angle 30° . One of the refracting surface of the prism is silvered. A beam of monchromatic light will retrace it path it its angle of incidence on the unsilvered refracting surface of the prism is

A. 0°

B. 30°

C. 60°

D. 45°

Answer: D

Watch Video Solution

110. Two thin lenses have a combined power of +9D.When they are separated by a distance of 20 cm, then 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

Watch Video Solution

111. Correct exposure for a photographic print is 10 s at a distance of one metre from a point source of 20 cd. For an equal fogging of the print placed at a distance of 2 m from a 16 cd source, the necessary time for exposure is

A. 100 s

B. 25 s

C. 50 s

D. 75 s

Answer: C

View Text Solution

112. rays of light strike a horizontal plane mirror at an angle of 45°. At what angle should be a second plane mirror be placed in order that the reflected ray finally be reflected horizontally from the second mirror.

A. 45°

B. 60°

C. 67.5°

D. 135°

Answer: C

Watch Video Solution

113. A convex lens of focal length 1.0m and a concave lens of focal length 0.25m are 0.75m apart. A parallel beam of light is incident on the convex lens. The beam emerging after refraction from both lenses is

A. parallel to principal axis

B. covergent

C. divergent

D. None of the above

Answer: A

Watch Video Solution

114. What is the angle of incidence for an equilateral prism of refractive index $\sqrt{3}$ so that the ray si parallel to the base inside the prism?

A. 30°

B. 45°

C. 60°

D. 75°

Answer: A

Watch Video Solution

115. A car is moving with a constant speed of $60 kmh^{-1}$ on a straight road. Looking at the rear view mirror, the driver finds that the car following him is at a distance of $100m$ and is approaching with a speed of $5kmh^{-1}$. In order to keep track of the car in the rear, the driver begins to glance alternatively at the rear and side mirror of his car after every $2s$ till the other car overtakes. If the two cars were maintaining their speeds, which of the following statement (s) is/are correct ?

A. The speed of the car in the rear is 65 kmh^{-1}

B. In the side mirror, the car in the rear would appear to approach with a speed of 5 kmh^{-1} to the driver of the leading car

C. In the rear view mirror, the speed of the approaching car would appear to decrease as the distance between the cars decreases

D. In the side mirror, the speed of the approaching car would appear to increase as the distance between the cars decreases

Answer: D

Watch Video Solution

116. A thin prism of angle 6° made up of glass of refractive index 1.5 is combined with anorher prism made up of glass of refractive index 1.75 to produce dispersion without deviation. The angle of second prism is

A. 7°

B. 9°

C. 4°

D. 5°

Answer: C

Watch Video Solution

117. A double convex thin lens made of glass (refractive index $\mu = 1.5$) has both radii of curvature of magnitude 20 cm . Incident light rays parallel to the 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=$\frac{20}{3}$cm

Answer: A

Watch Video Solution

118. When sunlight is scattered by atmospheric atoms and molecules, the amount of scattering of light of wavelength 440 nm is A. The amount of scattering for the light of wavelength 660 nm is approximately

A. $\frac{4}{9}$A

B. 2.25 A

C. 1.5 A

D. $\frac{A}{6}$

Answer: D

Watch Video Solution

119. A prism having refractive index $\sqrt{2}$ and refractive angle 30° has one of the refractive surfaces polished. A beam of light incident on the other surfaces will trace its path if the angle of incidence is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: C

Watch Video Solution

120. When a ray of light is incident normally on one refracting surface of an equilateral prism (Refractive index of the material of the prism $= 1.5$

A. emerging ray is deviated by 30°

B. emerging ray is deviated by 45°

C. emerging ray just grazes the second refracting surface

D. the ray undergoes total internal reflection at the second refracting surface

Answer: D

Watch Video Solution

121. A telescope has an objective of focal length $50cm$ and eye piece of focal length $5cm$. The least distance of distinct vision is $25cm$. The telescope is focussed for distinct vision on a scale $200cm$ away from the objective. Calculate

(i) the separation between objective and eye piece

(ii) the magnification produced.

A. 75 cm

B. 60 cm

C. 71 cm

D. 74 cm

Answer: C

Watch Video Solution

122. A glass prism has a refractive angle of 90° and a refractive index of 1.5. A ray is incident at an angle of 30°. The ray emerges from an adjacent face at an angle of

A. 60°

B. 30°

C. 45°

D. the ray does not emerge

Answer: D

Watch Video Solution

123. An equilateral prism deviates a ray through 45° for the two angles of incidence differing by 20°. The angle of incidence is

A. 62.5°

B. 42.5°

C. Both are correct

D. Both are wrong

Answer: C

Watch Video Solution

124. The focal length of the objective of a terrestrial telescope is 80 cm and it is adjusted for parallel rays, then its magnifying power is 20. If the focal length of erecting lens is 20 cm , then full length of telescope will be

A. 84 cm

B. 100 cm

C. 124 cm

D. 164 cm

Answer: D

Watch Video Solution

125. The length of the tube of a microscope is 10 cm . The focal lengths of the objective and eye lenses are 0.5 cm and 1.0 cm . The magnifying power of the microscope is about

A. 5

B. 23

C. 166

D. 500

Answer: D

Watch Video Solution

126. The magnifying power of a microscope with an objective of $5mm$ focal length is 400. The length of its tube is $20cm$. Then the focal length of the eye $-$ piece is

A. 200 cm

B. 160 cm

C. 2.5 cm

D. 0.1 cm

Answer: C

Watch Video Solution

127. A thin plano-convex lens acts like a concave mirror of radius of curvature $20cm$ when its plane surface is silvered. The radius of curvature of the curved surface if index of refraction of its matarial is 1.5 will be

A. 40 cm

B. 30 cm

C. 10 cm

D. 20 cm

Answer: C

Watch Video Solution

128. One face of a prism with a refractive angle of 30° is coated with silver. A ray of light incident on another face at an angle of 45° is refracted and reflected from the silver coated face and retraces its path. What is the refractive index of the prism?

A. $\sqrt{2}$

B. $3/\sqrt{2}$

C. 1.5

D. 1.33

Answer: A

Watch Video Solution

129. A convex lens has mean focal length of 20 cm. The dispersive power of the material of the lens is

0.02. The longitudinal chromatic aberration for an object at infinity is

A. 10^3

B. 0.8

C. 0.4

D. 0.2

Answer: C

Watch Video Solution

130. A convex lens of focal length f is placed somewhere in between an object and a screen. The distance between the object and the screen is x. If the numerical value of the magnification produced by the lens is m, then the focal lnegth oof the lens is

.

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

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

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

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

Answer: A

Watch Video Solution

131. A square wire of side $3.0cm$ is placed $25cm$ away from a concave mirror of focal length $10cm$. What is the area enclosed by the image of the wire ? The centre of the wire is on the axis of the mirror, with its two sides normal to the axis.

A. 4 cm^2

B. 6 cm^2

C. 16 cm^2

D. 36 cm^2

Answer: A

Watch Video Solution

132. A plano-convex lens has a maximum thickness of 6 cm. When placed on a horizontal table with the curved surface in contact with the table surface, then the apparent depth of the bottom most point of the lens is found to be 4 cm. If the lens is inverted such that the plane face of the lens is in contact with the surface of the table, then the apparent depth of the centre of the plane face is found to be $\frac{17}{3}$ cm. The radius of curvature of the lens is

A. 68 cm

B. 75 cm

C. 128 cm

D. 34 cm

Answer: D

Watch Video Solution

133. An object is 20 cm away from a concave mirror with focal length 15 cm. If the object moves with a speed of 5 m/s along the axis, then the speed of the image will be

A. 45 m/s

B. 27 m/s

C. 9 m/s

D. 10 m/s

Answer: A

Watch Video Solution

134. The dispersive powers of glasses of lenses used in an achromatic pair are in the ratio 5 : 3. If the focal length of the concave lens is 15 cm , then the nature and focal length of the other lens would be

A. convex, 9 cm

B. concave, 9 cm

C. convex, 25 cm

D. concave, 25 cm

Answer: A

Watch Video Solution

135. A ray falls on a prism $ABC(AB = BC)$ and travels as shown in adjoining figure.The minimum refraction index of the prism material should be -

A. 43558

B. $\sqrt{2}$

C. 1.5

D. $\sqrt{3}$

Answer: B

Watch Video Solution

136. If the distances of an object and its virtual image from the focus of a convex lens of focal length f are 1 cm each, then f is

A. 4 cm

B. $(\sqrt{\ } + 1)$cm

C. $2\sqrt{2}$ cm

D. $(2+\sqrt{2})$ cm

Answer: B

Watch Video Solution

137. A hemispherieal paper weight contains a small flower on its axis of symmetry at a distance of 4 cm from its flat surface. Where is the flower appears to an observer when he looks at it along the axis of symmetry from the top? (Index of refraction of glass = 1.5)

A. 15 cm from top

B. 20 cm from top

C. 5 cm from top

D. 25 cm from top

Answer: C

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138. A slab of glass, of thickness 6 cm and refractive index μ=1.5 is placed in front of a concave mirror as shown in the figure. If the radius of curvature of the mirror is 40 cm and the reflected image coincides with the object, then the distance of the object from the mirror is

A. 30 cm

B. 22 cm

C. 42 cm

D. 38 cm

Answer: C

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139. An object is kept at a distance of $16cm$ from a thin lens and the image formed is real. If the object is kept at a distance of $6cm$ from the lens, the image formed is virtual. If the sizes of the images formed are equal, the focal length of the lens will be

A. 19 cm

B. 17 cm

C. 21 cm

D. 11 cm

Answer: D

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140. A short linear object of length b lies along the axis of a concave mirror or focal length f at a distance u from the pole of the mirror. The size of the image is approximately equal to

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

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

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

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

Answer: B

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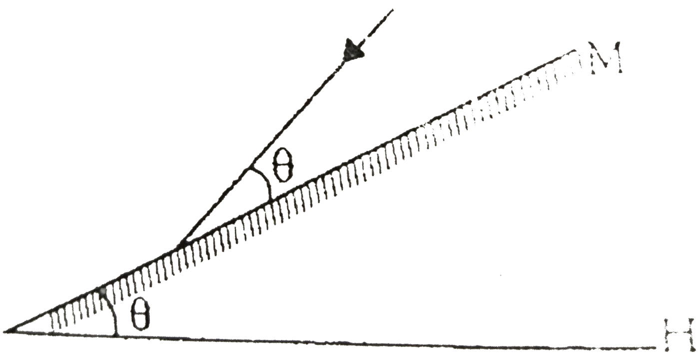
141. A mirror is inclined at an angle of θ with the horizontal. If a ray light is incident at an angle θ as shown , then the angle made by reflected ray with the horizontal is



A. θ

B. 2θ

C. $\theta / 2$

D. None of the above

Answer: D

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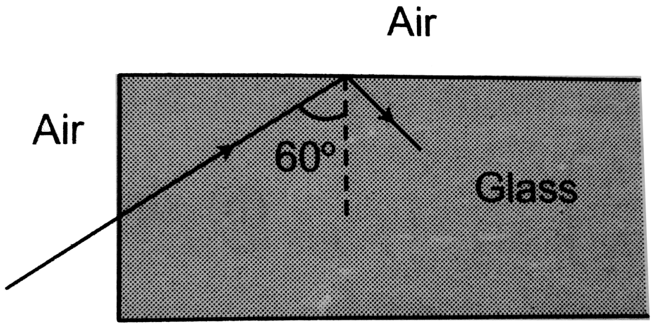
142. A light ray from air is incident (as shown in figure) at one end of a glass fiber (refractive index $\mu = 1.5)$ making an incidence angle of 60° on the lateral surface, so that it undergoes a total internal reflection. How much time would it take to traverse the straight fiber of length $1 km$?



A. 3.3 μs

B. 6.6 μs

C. 5.7 μs

D. 3.85 μs

Answer: D

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143. A thin convergent glass lens $(\mu_g = 1.5)$ has a power of $+5.0D$. When this lens is immersed in a liquid of refractive index μ_1, it acts as a divergent lens of focal length $100cm$. The value of μ_1 is

A. $\frac{3}{2}$

B. $\frac{4}{3}$

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

D. 2

Answer: C

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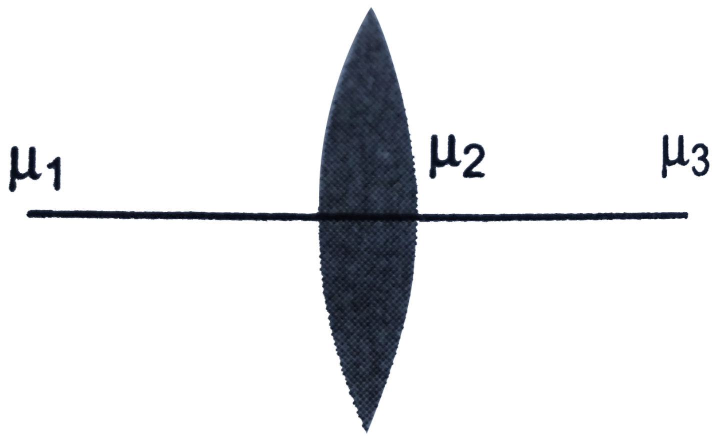
144. The figure shows an equi-convex lens. What should be the condition of the refractive indices so that the lens becomes diverging?



A. $2\mu_3 > \mu_1 - \mu_2$

B. $2\mu_2 < \mu_1 + \mu_3$

C. $2\mu_2 > 2\mu_1 - \mu_3$

D. None of the above

Answer: B

Watch Video Solution

145. A ray of light makes an angle of 10° with the horizontal and strikes a plane mirror which is inclined at an angle θ to the horizontal. The angle θ for which the reflected ray becomes vertical, is

A. 40°

B. 50°

C. 80°

D. 100°

Answer: A

Watch Video Solution

146. In the measurement of the angle of a prism using a spectrometer, the readings of first reflected image are vernier I : $320^\circ 40'$, vernier II : $140^\circ 30'$ and those of the second reflected image are vernier I : $80^\circ 38'$, vernier II : 260° 24'. Then, the angle of the prism is

A. $59^\circ 58'$

B. $59^\circ 56'$

C. $60^\circ 2'$

D. $60^\circ 4'$

Answer: A

Watch Video Solution

147. A thin rod of length $d/3$ is placed along the principal axis of a concave mirror of focal length = d such that its image, which is real and elongated, just touches the rod. Find the length of the image ?

A. f

B. $\frac{1}{2}f$

C. 2f

D. $\frac{1}{4}f$

Answer: B

Watch Video Solution

148. The graph shown part of variation of v with change in u for a concave mirror. Points plotted above the point P on the curve are for values of v

A. smaller than f

B. smaller than 2f

C. larger than 2f

D. larger than f but less than 2f

Answer: C

View Text Solution

149. When an object is at distances x and y from a lens, a real image and a virtual image is formed respectively having same magnification. The focal length of the lens is

A. $\frac{x+y}{2}$

B. x-y

C. $\sqrt{xy}$

D. x+y

Answer: A

Watch Video Solution

150. A symmetric doule convex lens is cut in two equal parts by a plane perpendiculr to the pricipal axis. If the power of the original lens was 4D, the power of a cut lens will be

A. 2D

B. 3D

C. 4D

D. 5D

Answer: A

Watch Video Solution

151. A ray incident at a point at an angle of incidence of 60° enters a glass sphere with refractive index $\sqrt{3}$ and it is reflected and refracted at the farther surface of the sphere. The angle between the reflected and refracted rays at this surface is:

A. 50°

B. 60°

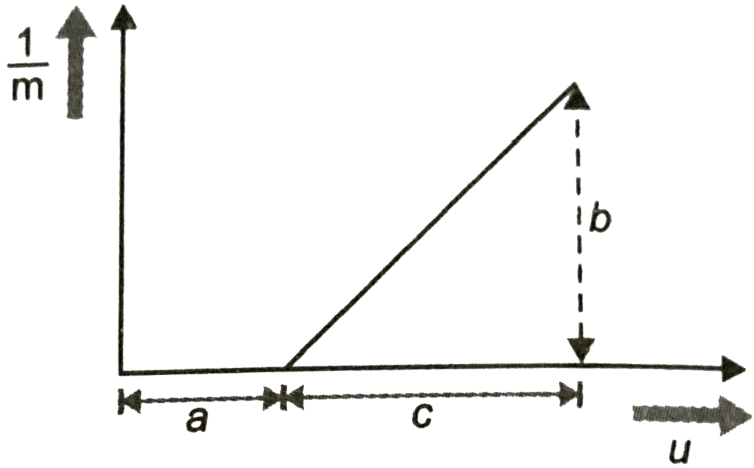
C. 90°

D. 40°

Answer: C

Watch Video Solution

152. The graph in Fig. shows how the inverse of magnification $1/m$ produced by a convex thin lens varies with object distance u. What was the focal length of the lens used ?



A. $\frac{b}{c}$

B. $\frac{b}{ca}$

C. $\frac{bc}{a}$

D. $\frac{c}{b}$

Answer: D

Watch Video Solution

153. A convex lens of focal length 30 cm forms a real image three times larger than the object on a screen. Object and screen are moved until the image becomes twice the size of the object. If the shift of the object is 6 cm. The shift of screen is

A. 28 cm

B. 14 cm

C. 18 cm

D. 16 cm

Answer: A

Watch Video Solution

154. An object is placed at 21 cm in front of a concave mirror of radius of a curvature 10 cm. A glass slab of thickness 3 cm and u 15 is then placed close to the mirror in the space between the object and the mirror. The position of final image formed is

A. $-3.94cm$

B. 4.3 cm

C. -4.93

D. 3.94 cm

Answer: C

View Text Solution

155. A thin prism P with angle 4° and made from glass of refractive index 1.54 is combined with another thin prism P made from glass of refractive index 1.72 to produce dispersion without deviation The angle of prism P is

A. 5.33°

B. 4°

C. 2.6°

D. 3°

Answer: D

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156. A convex lens produces an image of a real object on a screen with a magnification of 1/2. When the lens is moved 30 cm away from the object, the magnification of the image on the screen is 2. The focal length of the lens is

A. 30 cm

B. 60 cm

C. 20 cm

D. 15 cm

Answer: C

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157. An infinitely long rod lies along the axis of a concave mirror of focal length f. The near end of the rod is distance $u > f$ from the mirror. Its image will have length

A. $\frac{f^2}{u-f}$

B. $\frac{uf}{u-f}$

C. $\dfrac{f^2}{u+f}$

D. $\dfrac{uf}{u+f}$

Answer: A

Watch Video Solution

158. A plane mirror is placed horizontally inside water (μ=4/3). A ray falls normally on it. Then mirror is rotated through an angle θ. The minimum value of θ for which ray does not come out of the water surface is

A. $\pi / 4$

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

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

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

Answer: C

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159. A point object is moving with a speed v before an arrangement of two mirrors as shown in figure.

Find the velocity of image in mirror M_1 with respect to image in mirror M_2

A. 2v sin ($\theta/2$)

B. v sin ($\theta/2$)

C. 2v cos ($\theta/2$)

D. v cos ($\theta/2$)

Answer: A

View Text Solution

160. If a ray of light in a denser medium strikes a rarer medium at an angle of incidence i, the angles of reflection and refraction are respectively, r and r'

If the reflected and refraction rays are at right angles to each other, the critical angle for the given pair of media is

A. $\sin^{-1}(\tan r')$

B. $\sin^{-1}(\tan r)$

C. $\tan^{-1}(\sin i)$

D. $\cot^{-1}(\tan i)$

Answer: B

Watch Video Solution

161. A ray PQ incident on the refracting face BA is refracted in the prism BAC as shown in the figure and emerges from the other refracting face AC as RS such that AQ = AR. If the angle of prism $A = 60^\circ$ and the refractive index of the material of prism is 3, then the angle of deviation of the ray is

A. 60°

B. 45°

C. 30°

D. None of the above

Answer: A

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162. The xz plane separates two media A and B with refractive indices μ_1 & μ_2 respectively. A ray of light travels from A to B. Its directions in the two media are given by the unut vectors, $\overrightarrow{r}_A = a\hat{i} + b\hat{j}$ & $\overrightarrow{r}_B \alpha\hat{i} + \beta\hat{j}$ respectively where $\hat{i}$ & $\hat{j}$ are unit vectors in the x & y directions. Then :

A. $\mu_1 a = \mu_2 \alpha$

B. $\mu_1 \alpha = \mu_2 a$

C. $\mu_1 b = \mu_2 \beta$

D. None of the above

Answer: A

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163. A thin lens made of glass of refractive index $\mu u = 1.5$ has a focal length equal to 12 cm in air. It is now immersed in water $\left(\mu = \frac{4}{3}\right)$. Its new focal length is

A. 48 cm

B. 36 cm

C. 24 cm

D. 12 cm

Answer: A

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164. 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 $1/\sqrt{3}$, the angle of refraction produced is

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

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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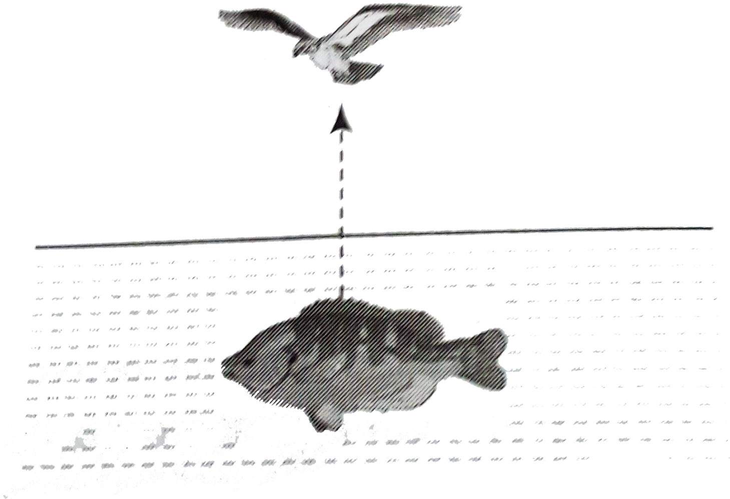
165. A fish rising up vertically toward the surface of water with speed $3ms^{-1}$ observes a bird diving down vertically towards it with speed $9ms^{-1}$. The actual velocity of bird is



A. 3.6 m/s

B. 4.5 m/s

C. 6.0 m/s

D. 12.0 m/s

Answer: B

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Watch Video Solution

166. A circular beam of light (diameter d) falls on a plane surface of a liquid. The angle of incidence is 45° and refractive index of the liquid is μ. The diameter of the refracted beam is

A. d

B. $(\mu - 1)d$

C. $\dfrac{\sqrt{2\mu^2 - 1}}{d}d$

D. $\dfrac{\sqrt{\mu^2 - 1}}{\mu}d$

Answer: C

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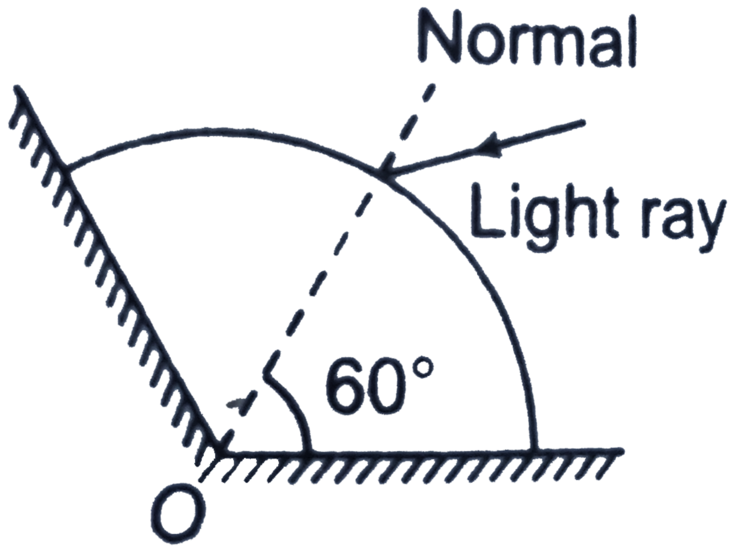
167. Consider the situation as shown in figure. The point O is the centre. The light ray forms an angle of 60° with the horizontal and each mirror makes an angle 60° with the normal. The value of refractive index of that spherical portion so that light ray retraces its path is



A. $\sqrt{2}$

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

C. 43526

D. $\sqrt{3}$

Answer: D

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168. A concave mirror is placed at the bottom of an empty tank with face upwards and axis vertical. When sunlight falls normally on the mirror, it is focussed at distance of $32cm$ from the mirror. If the tank filled with water $(\mu = 4/3)$ up to a height of $20cm$, then the sunlight will now get focussed at

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169. Given a slab with index n=1.33 and incident light striking the top horizontal face at angle i as shown

in figure. The maximum value of i for which total internal reflection occurs is

A. $\sin^{-1}(\sqrt{0.77})$

B. $\cos^{-1}(\sqrt{0.77})$

C. $\sin^{-1}(0.77)$

D. $\sin^{-1}(0.38)$

Answer: A

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170. The apparent depth of water in cylindrical water tank of diameter $2Rcm$ is reducing at the rate of $xcm / \min$ when water is being drained out at a constant rate. The amount of water drained in $c. c.$ per minute is $(n_1 =$ refractive index of air, $n_2 =$ refractive index of water $)$

A. $\frac{x\pi R^2 n_1}{n_2}$

B. $\frac{x\pi R^2 n_2}{n_1}$

C. $\frac{2\pi R n_1}{n_2}$

D. $\pi R^2 x$

Answer: B

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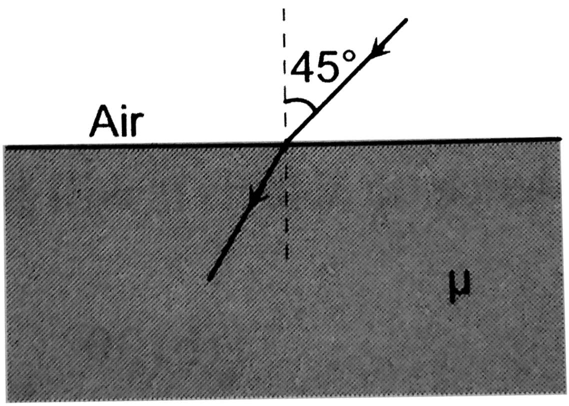
171. In the figure shown , for an angle of incidence 45°, at the top surface , what is the minimum refractive index needed for the internal reflection at vertical face ?



A. $\dfrac{\sqrt{2}+1}{2}$

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

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

D. $\sqrt{2}$

Answer: B

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Medical Entrance Special Format Question

1. Assertion The formula connecting u, v and f for a spherical mirror is valid only for mirrors sizes which are very small compared to their radii of curvature.

Reason Laws of reflection are stricity valid for plane surface, but not for large spherical.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

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2. Assertion Reflected image always travels in opposite direction of object.

Reason Speed of point image formed by reflected rays is always equal to the speed of its point object.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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3. Assertion Image formed by a convex mirror can never be real.

Reason Convex mirror is diverging in nature.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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4. Assertion : There is no dispersion of light refracted through a rectangular glass slab.

Reason : Dispersion of light is the phenomenon of splitting of a beam of white light into its constituent colours.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

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5. Assertion : The images formed by total internal reflections are much brighter than those formed by mirrorrs or lenses.

Reason : There is no loss of intensity in total internal reflection.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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6. Assertion: In refraction from a plane surface, if object is virtual, then its image will be real.

Reason: Plane surface always makes opposite natured image. If object is real, then image is virtual and vice-versa.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.
C. If Assertion is true but Reason is false.
D. If Assertion is false but Reason is true.

Answer: A

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7. Assertion Shining of diamond is due to the phenomenon of total internal reflection.

Reason Refractive index of diamond is large. Hence,critical angle is small.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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8. Assertion Sun appears red during sunrise and sunset due to the phenomenon of refraction.

Reason In refraction of light frequency of light remains unchanged.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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9. Assertion A mirror has only one focus, while that of lens has two focii.

Reason Both the focii of a mirror coincide at one point.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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10. Assertion Lens formula can be applied only for thin lenses.

Reason For thick lenses one cannot find image position.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

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11. Assertion : The refractive index of diamond is $\sqrt{6}$ and that of liquid is $\sqrt{3}$. If the light travels from diamond to the liquid, it will totally reflected when the angle of incidence is 30°.

Reason : $\mu = \frac{1}{\sin C}$, where μ is the refractive index of diamond with respect to liquid.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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12. Assertion A ray of light travels from first medium to second medium. In first medium, angle of ray with normal is $i_1 = 30^\circ$ and in second medium i_2 = 60° Then, second medium is rarer medium.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

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13. Assertion When a wave travels from a denser to a rarer medium, its amplitude increases.

Reason In a rarer medium, speed of wave is more

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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14. Assertion In front of a concave mirror, a point object is placed between focus and centre of curvature. If a glass slab is placed between object and mirror, then image from mirror may become virtual.

Reason Glass slab always makes a virtual image of a real object.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

View Text Solution

15. Assertion: If a lens is immersed in a liquid its nature will change ie., convex will behave concave and vice-versa.

Reason: If both sides of a lens medium is same, then object can be placed on either side of the lens, image distance remains same

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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16. Assertion A diverging lens (in air) cannot be made more diverging whatever be the medium we choose completely immerse the lens.

Reason The minimum refractive index of any medium is 1.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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17. Assertion:Although the surfaces of goggle lens are curved, It does not have any power.

Reason: In case of goggles, both the curved surfaces have equal radii of curvature and have centre of curvature on the same side.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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18. Assertion Focal length of a lens depends on the wavelength of light used.

Reason The more the wavelengths, lesser is the focal length.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

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19. Assertion: A hollow lens behaves like a thin glass plate.

Reason: Power of this lens becomes zero.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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20. Assertion: If angle of incidence in case of a prism is gradually increased, then deviation produced by prism will first decrease, then increase.

Reason: At minimum deviation, $r_1 = \frac{A}{2}$.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are true but Reason is not correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

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21. Regarding the power of an optical instruments match the following two cloumns.

View Text Solution

22. Magnitude of focal lengths of a convex lens, a concave lens, a convex mirror and a concave mirror are 20 cm each. An object is placed 30 cm from pole/optical centre of each. Regarding the image match the following two columns.

View Text Solution

23. Focal length of a biconvex lens is f. Regarding the focal lengths and match the following two columns.

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24. Match Column I (Phenomenon) with Column II (Principle) and select the correct answer using the codes given below the Column.

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25. A thin convex lens has focal length f_1 and a concave lens has focal length f_2. They are kept in contact. Now, match the following two columns.

View Text Solution

Medical Entrance Gallary

1. Two identical glass $\left(\mu_g = 3/2\right)$ equi- convex lenses of focal length f each are kept in contact. The space between the two lenses is also filled with water $\left(\mu_g = 4/3\right)$. The focal length of the combination is

A. f/3

B. f

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

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

Answer: D

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2. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is $5cm$ deep when viewed from one surface and $3cm$ deep when viewed from the opposite face. The thickness (in cm) of the slab is

A. 8

B. 10

C. 12

D. 16

Answer: C

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3. A person can see clearly objects only when they lie between 50 cm and 400 cm from his eyes. In order to increase the miximum distance of distinct vision to infinity , the person has to use, will be

A. convex,+2.25D

B. convex,+0.25D

C. convex,+0.2D

D. convex,+0.15D

Answer: B

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4. An astronomical telesope has objective and eyepiece of focal lengths $40cm$ and $4cm$ respectively. To view an object $200cm$ away from the objective, the lenses must be separated by a distance :

A. 46.0cm

B. 50.0cm

C. 54.0cm

D. 37.3cm

Answer: C

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5. Match the corresponding entries of Column I with Column II.

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6. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are :

A. $30^{\circ}, \sqrt{2}$

B. $45^{\circ}, \sqrt{2}$

C. $30^{\circ}, \frac{1}{\sqrt{2}}$

D. $45^{\circ}, \frac{1}{\sqrt{2}}$

Answer: A

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7. Two identical thin planoconvex glass lenses (refractive index 1.5) each having radius of curvature of 20 cm are placed with their convex sufaces in contact at the centre. The intervening space is filled with oil of refractive index 1.7 The focal length of the combination is

A. $-20cm$

B. $-25cm$

C. $-50cm$

D. 50cm

Answer: C

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8. The refracting angle of a prism is A and refractive index of the material of prism is $\cot(A/2)$. The angle of minimum deviation will be

A. $-180cm - 3A$

B. $-180cm - 2A$

C. $-90cm - 2A$

D. $-180cm + 2A$

Answer: B

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9. The near point and far point of a person are 40cm and 250cm, respectively. Determine the power of lens he/she should use while reading a bool kept at distance 25cm away from it,

A. 2.5D

B. 5D

C. 1.5D

D. 3.5D

Answer: C

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10. An object is seen thorugh a simple microscope of focal length 12 c. Find the angular mgnification produced if the image is formed at the near pointofhe eye which is 25 cm away from it.

A. 6.08

B. 3.08

C. 9.03

D. 5.09

Answer: B

Watch Video Solution

11. Angle of minimum deviation for a prism of refractive index 1.5 is equal to the angle of prism of given prism. Then, the angle is prism is....

$(\sin 48^\circ 36' = 0.75)$

A. 80°

B. $41^\circ 24'$

C. 60°

D. $82^\circ 48'$

Answer: D

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12. A ray of light passes from a medium A having refractive index 1.6. to the medium B having refractive index 1.5. The value of critical angle of medium

A is....

A. $\sin^{-1}\sqrt{\frac{16}{15}}$

B. $\sin^{-1}\left(\frac{16}{15}\right)$

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

D. $\sin^{-1}\left(\frac{15}{16}\right)$

Answer: D

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13. The focal length of a converting lens are f_v and f_r for violet and red lights, respectively. Which of the following is correct?

A. $f_v < F_r$

B. $f_v = F_r$

C. $f_v > F_r$

D. It depends on the average refractive index

Answer: A

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14. Aperture of human eye is 0.2cm. The minimum magnifying power of a visal telescope, whose objective has diameter100cm is.

A. 500

B. 0.002

C. 2

D. 100

Answer: A

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15. An object is located 4cm from the first of two thin converging lenses of focal lengths 2m and 1m. Respectively. The lenses are separated by 3m. The final image formed by the second lens is located from the source at a distance of

A. 8M

B. 5.5m

C. 6m

D. 6.5

Answer: B

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16. If $\mu_v = 1.530$ and $\mu_R = 1.5145$, then disperisve power of a crown glass is

A. 0.0164

B. 0.00701

C. 0.0132

D. 0.032

Answer: A

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17. Disperion of light is caused due to

A. intensity of light

B. density of medium

C. wavelength

D. None of these

Answer: C

Watch Video Solution

18. Calculate the focal length of a reading glass of a person, if the distance of distinct vision is 75cm.

A. 75.2cm

B. 25.6cm

C. 100.4cm

D. 37.5cm

Answer: D

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19. A person wants a real image of his own, 3 times enlarged. Where should he stand in front of a concave mirror of radius of curvature of 30cm.

A. 90cm

B. 10cm

C. 20cm

D. 30cm

Answer: C

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20. The magnification power of a convex lens of focal length 10cm, when the image is formed at the near point is

A. 6

B. 5.5

C. 4

D. 3.5

Answer: D

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21. The velocity of image object and mirror both are moving towards each other with velocities $4ms^{-1}$ and $5ms^{-1}$ respectively, is

A. $-14ms^{-1}$

B. $15ms^{-1}$

C. $-9ms^{-1}$

D. $14ms^{-1}$

Answer: A

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22. Refractive index of a prism is $\sqrt{\frac{7}{3}}$ and the angle of prism is 60°. The limiting angle of incidence of a ray that will be transmitted through the prism is approximately

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

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

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

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

Answer: B

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23. A ray incident at a point at an angle of incidence of 60° enters a glass sphere with refractive index $\sqrt{3}$ and it is reflected and refracted at the farther surface of the sphere. The angle between the reflected and refracted rays at this surface is:

A. 50°

B. 60°

C. 90°

D. 40°

Answer: C

Watch Video Solution

24. To measure the roughenss of the surface of a material, which of the following micrscope is preferred for better result ooutput?

A. Compound micropsope

B. Electron microscope

C. Atomic force microscope

D. None of these

Answer: C

Watch Video Solution

25. 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

Watch Video Solution

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

A. 15cm

B. 6.6cm

C. 10cm

D. 7.5cm

Answer: A

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27. A glass slab consists of thin uniform layers of progressively decreasing refractive indices refractive index such that the refractive index of any layer is $\mu - m\Delta\mu$. Here μ and $\Delta\mu$ denotes the refractive index of 0th layer and the difference in refractive index betweeen any two consecutive layers, resepctively. The integer $m = 0, 1, 2, 3...$ denotes the number of the suscessive layers. A ray of light from the 0th layers enters the 1st layer at an angle of incidence of 30°. After undergoing the mth refraction, the ray emerges paralllel to the interaface. If $\mu = 1.5$ and $\Delta\mu = 0.15$, then the value of m is

A. 20

B. 30

C. 40

D. 50

Answer: D

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28. In vacum, to travel distance d, light takes time t and in medium to travel distance 5d, it takes time T. The critical angle of the medium is

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

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

C. $\sin^{-1}\left(\frac{5T}{T}\right)$

D. $\sin^{-1}\left(\frac{3t}{5T}\right)$

Answer: C

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29. 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. Refraction index of the material of prism is

A. $2 \sin A$

B. $2 \cos A$

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

D. tan A

Answer: B

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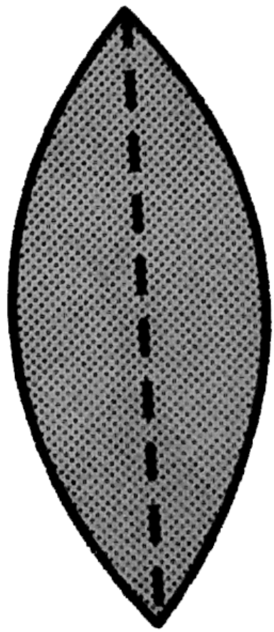
30. A convex lens has a focal length f. It is cut into two parts along the dotted line as shown in figure.

The focal length of each part will be



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

B. f

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

D. 2f

Answer: D

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31. Two lenses of power 15D and -3D are placed in contact. The focal length of the combination is a

A. 10cm

B. 15cm

C. 12cm

D. 18cm

Answer: D

32. A luminous object is separated from a screen by distance d. A convex lends is placed between the object and the screeen such that it forms a distinct image on the screen. The maximum possible focal length of this convex lens is.

A. 4d

B. 2d

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

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

Answer: D

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33. An object is placed 30cm away from a convex lens of focal length 10cm and a sharp image is formed on a screen. Now, a convex lens is placed In contact with the convex lens. The screen now has to be moved by 45cm to get a sharp image again. The magnitude of focal length of the convex lends in (in cm)

A. 72

B. 60

C. 36

D. 20

Answer: D

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34. A thin glass (refractive index 1.5) lens has optical power of $-5D$ in air. Its optical power in a liquid medium with refractive index 1.6 will be

A. 1D

B. $-1D$

C. 25D

D. 20

Answer: A

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35. A convex lens of focal length f forms an image which is 13/ times the size of the object. Then, the distance of object from the lends is

A. 2f

B. f

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

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

Answer: A

Watch Video Solution

36. A focal length of a lens 10cm. What is power of a lens in dipotre?

A. 0.1D

B. 10D

C. 15D

D. 1D

Answer: B

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37. If the focal length of the objective lens is increased then

A. microscope will increase but that of electroscope decrease

B. microscope and telescope both will increase

C. microscope and telescope both will decrease

D. microscope will decrease but that of telescope will increase

Answer: D

Watch Video Solution

38. Astigmation is correct by using

A. culindrical lens

B. plano convex lens

C. plano concave lens

D. convex lens

Answer: A

Watch Video Solution

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

A. real, inverted and magnified

B. real, erect and magnified

C. virtual,erect and magnified

D. virtual, inverted and magnified

Answer: A

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40. An astronomical telescope arranged for normal adjustment has a magnification of 6. If the length of the telescope is 35cm, then the focal lengths of objective and euye piece respectivley =, are

A. 30cm,5cm

B. 5cm,30cm

C. 40cm,5cm

D. 30cm,6cm

Answer: A

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41. A microscope is having objective of focal length and eye piece of focal length 6cm. If tube length 30cm and image is formed at the least distance of distant vision, what is the magnification prodcut by the microscope. (take D=25cm)

A. 6

B. 150

C. 25

D. 125

Answer: B

Watch Video Solution

42. Diameter of the objective of a telescope is 200cm. What is the resolving power of a telescope? Take wavelength of light =5000Å.

A. 6.56×10^6

B. 3.28×10^5

C. 1×10^6

D. 3.28×10^6

Answer: D

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43. A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If the lenses are made of different materials refractive indices μ_1 and μ_2 and R is the radius curvature of the curved surface of the lenses, the focal length of the combination is

A. $\dfrac{R}{2(\mu_1 + \mu_2)}$

B. $\dfrac{R}{2(\mu_1 - \mu_2)}$

C. $\dfrac{R}{(\mu_1 - \mu_2)}$

D. $\dfrac{2R}{(\mu_2 - \mu_1)}$

Answer: C

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44. For a normal eye, the cornea of eye provides a converging power of $40D$ and the least converging power of the eye lens behind the cornea is $20D$. Using this information, the distance between the retina and the cornea eye lens can be estimated to be

A. 5cm

B. 2.5cm

C. 1.67cm

D. 1.5cm

Answer: C

Watch Video Solution

45. An object is 8cm high. It is desired to form a real image 4cm high at 20cm from the lens. The focal length and power of lends are

A. convex mirror with focal length f=40cm

B. convex mirror with focal length f=20cm

C. convex mirror with focal length f=-40cm

D. convex mirror with focal length f=-240cm

Answer: A

Watch Video Solution

46. When an object is placed 40cm from a diverging lens, its virtual image is formed 20cm from the lens. The focal length and power of lens are

A.

B.

C.

D.

Answer: C

Watch Video Solution

47. A magnifying glass of focal length 5cm is used to view an object by a person whose smallest distance of distinct vision is 25cm. If he holds the glass close to eye, then the magnification is

A. 5

B. 6

C. 2.5

D. 3

Answer: B

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48. A person has a minimum distance of distinct vision as 50cm. The power of lenses required to read a book at a distance of 25cm is

A. 3D

B. 1D

C. 2D

D. 4D

Answer: C

Watch Video Solution

49. The distance of moon form the earth is 3.8×10^5 km. Supposing that the eye is most sensitive to the ight of wavelength 550nm, the separation of two points on the moon that can be resolved by a 500cm

A. 50m

B. 55m

C. 51m

D. 60m

Answer: B

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50. A small angled prism of refractive index 1.4 is combined with another small angled prism of refractive index 1.6 to produce disperison without deviation. If the angle of first prism is $6(\circ)$, then the angle of the second prism is

A. 8°

B. 6°

C. 4°

D. 2°

Answer: C

Watch Video Solution

51. The magnifytion power of the astronomical telescope for normal adjustment is 50cm. The focal length of the eyepiece is 2cm. The required length of the telescope for normal adjustment is

A. 102cm

B. 100cm

C. 98cm

D. 25cm

Answer: C

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52. The speed of light in media M_1 and M_2 are $1.5 \times 10^8 m/s$ and $2.0 \times 10^8 m/s$ respectively. A ray of light enters from medium M_1 to M_2 at an incidence angle i. If the ray suffers total internal reflection, the value of i is.

A.

B.

C.

D.

Answer: A

Watch Video Solution

53. Radii of curvature of a canverging lends are in the ration 1:2. Its focal length is 6cm and refractive index is 1:5. Then, its radii of curvature are...

A. 9cm and 18cm

B. 6cm and 12cm

C. 3cm and 6cm

D. 4.5cm and 9cm

Answer: D

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54. The sun light reaches us as white and not as its components because

A. air medium is dispersive

B. air medium is non dispersive

C. air medium scatter the sunlight

D. spped of light depends on wavelength in vaccum

Answer: B

Watch Video Solution

55. The radius of curvature of the convex face of a plano convex lens is 12cm and the refractive index of the material of the lends 1.5. Then, the focal length of the lens is

A. 6cm

B. 12cm

C. 18cm

D. 24cm

Answer: D

Watch Video Solution

56. Two thin lenses of focal lengths f_1 and f_2 are in contact. The focal length of this combination is

A. $f_1 + f_2$

B. $\dfrac{1}{f_1 + f_2}$

C. $\dfrac{f_1 f_2}{f_1 + f_2}$

D. $\dfrac{f_1 + f_2}{f_1 f_2}$

Answer: C

Watch Video Solution

57. The mirror are inclined at angle of 50°. The number of images formed for an object placed in between the mirrors is

A. 5

B. 6

C. 7

D. 8

Answer: B

Watch Video Solution

58. If c is the velocity of light in free space, then the time taken by light to travel a distance x in a medium refractive index μ is

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

B. $(\mu x) / (c)$

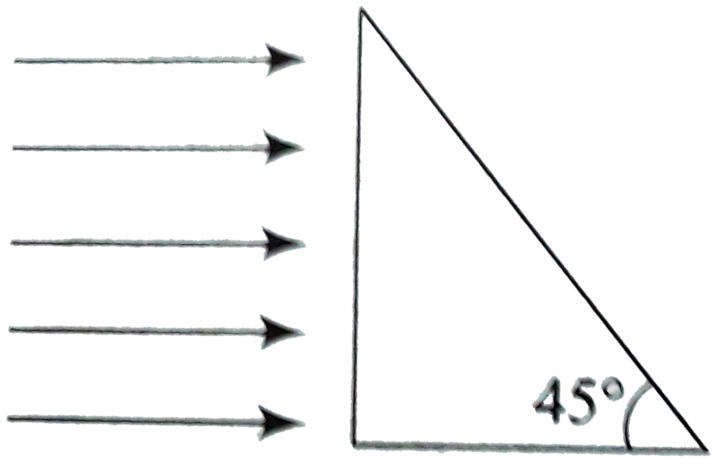
C. $(x) / (\mu c)$

D. $(c) / (\mu x)$

Answer: B

Watch Video Solution

59. A beam of light consisting of red, green, and blue colors is incident on a right-angled prism. The refractive indices of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47, respectively. The prism will



A. Separate part of the blue colour from the red and green

B. Separate part of the red colour from the greem and blue colours

C. Separate all the three colours from one another

D. None of these

Answer: B

Watch Video Solution

60. A vessel consists of two plane mirrors at right angles as shown in figure. The vessel is filled with water. The toal deviation in incident ray is

A. 0°

B. 60°

C. 90°

D. 180°

Answer: D

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61. For having large magnification power of a compound microscope

A. length of the microscope tube must be small

B. focal length of objective lens and eye piece should be large

C. focal length of the objective lens and eye piece should be small

D. focal length of eye piece must be smaller than the focal length of objective lens

Answer: D

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62. A beam of light is incident on a glass slab $(\mu = 1.54)$ in a direction as shown in the figure. The reflected light is analysed by a polaroid prism. On rotating the polaroid, $(\tan 57^\circ = 1.54)$

` (##DPP_PHY_CP24_E01_002_Q01.png" width="80%">

A. the intensity remains unchanged

B. the intensity is reduced to zero and remains at zero

C. the intensity gradually reduced to zero and then again increases

D. the intensity increase continously

Answer: C

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63. The focal length of lens of refractive index 1.5 in air is $30cm$ When it is immersed in water of refractive index $\frac{4}{3}$,then its focal length will be

A. 0.15m

B. 0.30m

C. 0.45m

D. 1.20m

Answer: D

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64. The focal length of a concave mirror is 50cm. Where an object be placed so that its image is two times and inverted

A. 55cm

B. $-75cm$

C. 65cm

D. 85cm

Answer: B

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65. The diameter of the eye ball of a normal eye is about 2.5cm. The power of the eye lens varies from

A. 9D to 8D

B. 40D to 32D

C. 44D to 40D

D. None of these

Answer: C

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66. Two thin lenses, when in contact, produce a combination of power $+10$ diopters. When they are 0.25m apart, the power reduces to $+6$diopters. The focal lengths of the lenses are m and ________________ m

A. 0.5 and 0.125

B. 0.5 and 0.75

C. 0.125.and 0.75

D. Botha have the same focal length 1.25

Answer: A

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67. A ray of light is incident at small angle I on the surface of prism of small angle A and emerges normally from the oppsite surface. If the refractive index of the material of the prism is mu, the angle of incidence is nearly equal to

A. μA

B. $\frac{\mu A}{2}$

C. A / μ

D. $A / 2\mu$

Answer: A

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68. A concave mirrorr of focal length f_1 is placed at a distance of d from a convex lens of focal length f_2. A beam of light coming from infinity and falling on this convex lens-concave mirrorr combination returns to infinity. The distance d must equal.

A. $f_1 + f_2$

B. $- f_1 + f_2$

C. $2f_1 + f_2$

D. $-2f_1 + f_2$

Answer: C

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69. The image formed by a convex mirror of focal length $30cm$. is a quarter of the object. What is the distance of the object from the mirror ?

A. 30cm

B. 60cm

C. 90cm

D. 120cm

Answer: C

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70. In a compound microscope, the focal length of the objective and the eye lens are $2.5cm$ and $5cm$ respectively. An object is placed at $3.75cm$ before the objective and image is formed at the least distance of distinct vision, then the distance between two lenses will be $(i.e.$ length of the microscope tube)

A. 11.67cm

B. 12cm

C. 12.75cm

D. 13cm

Answer: A

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71. A thin convex lens of refractive index 1.5cm has 20cm focal length in air. If the lens in completely immersed in a liquid of refractive index. 1.6, then its focal length will be

A. $-160cm$

B. $-100cm$

C. $+10cm$

D. $+100cm$

Answer: A

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72. Assertion : The resolving power of a telescope is more if the diameter of the objective lens is more.

Reason : Objective lens of large diameter collectd more light.

A. If both Assertion and Reason are true and Reason is the correct explantion of Asssertion

B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion

C. If Assertion is ture but Reason is false

D. If both Assertion and Reason are false

Answer: A

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73. On the axis of a spherical mirror of focal length f a short linear object of length L lies on the axis at a distance μ from the mirror. Its image has an axial length L' equal to

A. $L\left[\frac{f}{u-f}\right]^{1/2}$

B. $L\left[\frac{u+f}{f}\right]^{1/2}$

C. $L\left[\frac{u-f}{f}\right]^{2}$

D. $L\left[\frac{f}{u-f}\right]^{2}$

Answer: D

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74. An object is placed at a distance of 10cm form a co-axial combination of two lenses A and B in contact. The combination forms a real image three times the size of the object. If lens B is concave with a focal length of 30cm. The nature and focal length of lens A is

A. convex,12cm

B. concave,12cm

C. convex,6cm

D. convex,18cm

Answer: C

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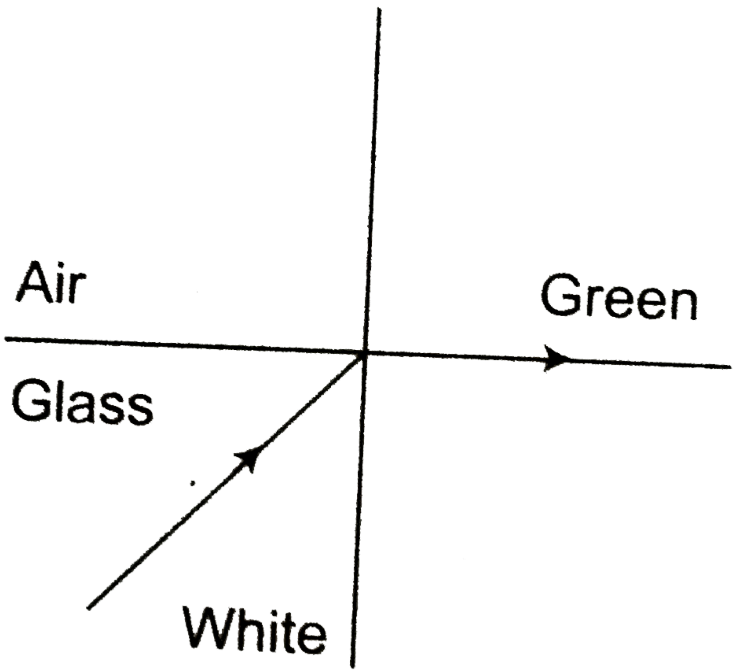
75. White light is incident on the interface of glass and air as shown in figure. If green ligth is just totally internally reflected then the emerging ray in air contains



A. yellow, orange ad red colours

B. violet, indigo and blue colours

C. All colours

D. All colours except green

Answer: D

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76. The focal length of the objective of a terrestrial telescope is 80 cm and it is adjusted for parallel rays, then its magnifying power is 20. If the focal length of erecting lens is 20 cm , then full length of telescope will be

A. 164cm

B. 124cm

C. 100cm

D. 100cm

Answer: A

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