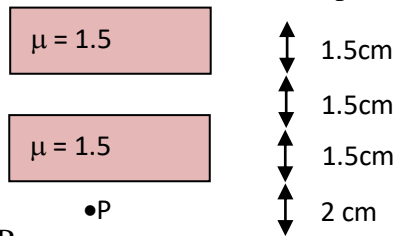


2 PUC: CHAPTER- 09
RAY OPTICS AND OPTICAL INSTRUMENTS

- A ray of light passes from air into a liquid and the angle of incidence is 60° . If the deviation produced is 7° , then the refractive index of the liquid is
 a) $\frac{2\sqrt{3}}{5}$ b) $\frac{\sqrt{3}}{2}$ c) $\frac{5}{4}$ d) $\frac{5\sqrt{3}}{8}$
- If the refractive index of water is $\frac{4}{3}$ and that of glass is $\frac{5}{3}$, then the critical angle of incidence for light tending to go from glass to water is
 a) $\sin^{-1}\left(\frac{3}{4}\right)$ b) $\sin^{-1}\left(\frac{3}{5}\right)$ c) $\sin^{-1}\left(\frac{4}{5}\right)$ d) $\sin^{-1}\left(\frac{2}{3}\right)$
- A ray of light is incident at an angle of 70° into a medium having refractive index μ . The reflected and the refracted rays are found to suffer equal deviations in opposite directions. Then, μ equals
 a) $\tan 70^\circ$ b) $2 \sin 70^\circ$ c) $\operatorname{cosec} 70^\circ$ d) none of these

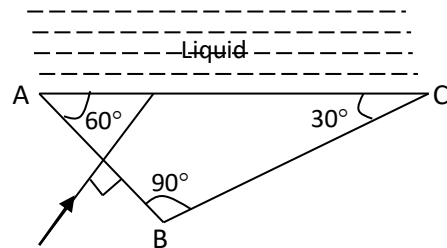
- The image of point P when viewed from top of the slabs will be



- a) 2.0 cm above P b) 1.5 cm above P
 c) 2.0 cm below P d) 1 cm above P

- Light is incident normally on face AB of a prism as shown in fig. A liquid of refractive index μ is placed on face AC of the prism. The prism is made of glass of refractive index $\frac{3}{2}$. The limits of μ for which total internal reflection takes place on face AC is

- a) $\mu > \frac{\sqrt{3}}{2}$ b) $\mu < \frac{3\sqrt{3}}{4}$
 c) $\mu > \sqrt{3}$ d) $\mu < \frac{\sqrt{3}}{2}$



- An object is placed 50 cm in front of a convex surface of radius 20 cm. If the surface separates air from glass of refractive index 1.5, the distance of the image from the lens and its nature are
 a) 3 cm, real b) 30 cm, virtual
 c) 300 cm, real d) 300 cm, virtual

Also, as v is +ve, the emergent rays are converging and hence, the image is real.

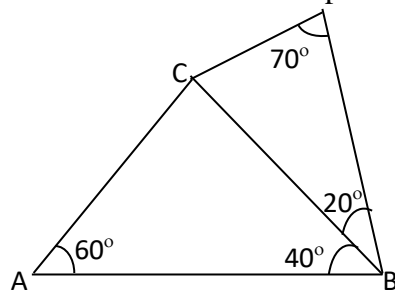
- A thin converging lens of refractive index 1.5 has a power of + 0.5 D. When this lens is immersed in a liquid, it acts as a diverging lens of focal length 200 cm. The refractive index of the liquid is
 a) $\frac{4}{3}$ b) $\frac{3}{2}$ c) 3 d) 2

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

a) $\frac{R}{\mu_1 - \mu_2}$ b) $\frac{2R}{\mu_2 - \mu_1}$ c) $\frac{R}{2(\mu_1 - \mu_2)}$ d) $\frac{R}{2 - (\mu_1 + \mu_2)}$

9. The distance between an object and the screen is 100 cm. A lens produces an image on the screen when placed at either of two position 40 cm apart. The power of the lens is approximately
 a) 3 D b) 5 D c) 7 D d) 9 D

10. Two prisms of same glass ($\mu = \sqrt{3}$) are stuck together without gap as shown. Find the angle of incidence i on the face AC such that the deviation produced by the combination is minimum

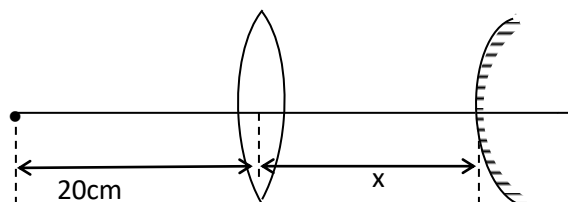


- a) 60° b) 15° c) 30° d) 45°

11. A compound microscope has a magnification of 30. The focal length of the eyepiece is 5 cm. If the final image is formed at the least distance of vision (25 cm), the magnification produced by the objective is
 a) 5 b) 7.5 c) 10 d) 6

12. A point object O is placed at a distance of 20 cm from a convex lens of focal length 10 cm as shown in fig. At what distance x from the lens should a convex mirror of focal length 60 cm, be placed so that final image coincides with the object?

- a) 10 cm
 b) 40 cm
 c) 20 cm



- d) final image can never coincide with the object in the given conditions.

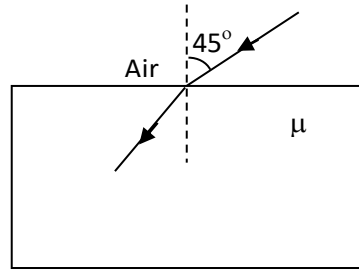
13. A girl stands between two plane mirrors facing each other and inclined to each other at 50° . The number of images that she can see is
 a) 5 b) 8 c) 6 d) 7

14. One face of prism of refracting angle 30° and refractive index 1.414 is silvered. At what angle must a ray of light fall on the unsilvered face so that after refraction into the prism and reflection at the silvered surface it retraces its path?
 a) 45° b) 30° c) 90° d) 0°

24. A man's near point is 0.5 m and far point is 3 m. Power of spectacle lenses required for (i) reading purposes, (ii) seeing distant objects, respectively, are
- a) -2 D and + 3D
 b) +2 D and -3 D
 c) +2 D and - 0.33 D
 d) -2 D and +0.33 D

25. A vessel is half filled with a liquid of refractive index μ . The other half of the vessel is filled with an immiscible liquid of refractive index 1.5μ . The apparent depth of the vessel image is 50% of the actual depth. Then μ is
- a) 1.4
 b) 1.5
 c) 1.55
 d) 1.67

26. In fig. for an angle of incidence of 45° at the top surface, what is the minimum refractive index for total internal reflection at the vertical face?



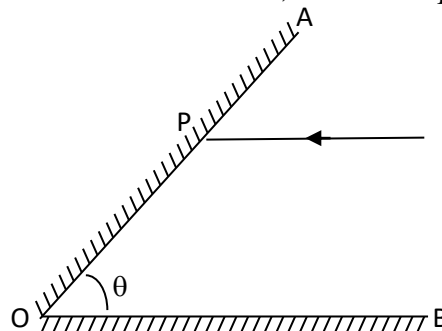
- a) $\frac{\sqrt{2} + 1}{2}$
 b) $\sqrt{3/2}$
 c) $\sqrt{1/2}$
 d) $\sqrt{2} + 1$

27. When a thin planoconvex lens ($\mu=1.5$) polished from its plane surface behave like a concave mirror of focal length 40 cm. The radius of curvature of the lens is
- a) 10 cm
 b) 20 cm
 c) 30 cm
 d) 40 cm

28. A point object O is placed on the principal axis of a convex lens of $f = 20\text{cm}$ at a distance of 40cm to the left of it. The diameter of the lens is 10cm. An eye is placed 60cm to the right of the lens and a distance h below the principal axis. The maximum value of h to see the image is
- a) 0
 b) 2.5cm
 c) 5cm
 d) 10cm

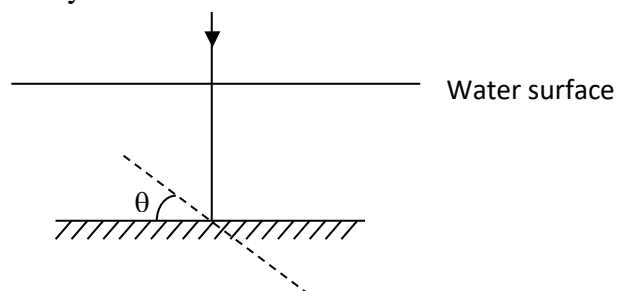
29. Two plane mirrors are inclined at angle θ as shown in fig. If a ray parallel to OB strikes the other mirror at P and finally emerges parallel to OA after two reflection, then θ is equal to

- a) 90°
 b) 60°
 c) 45°
 d) 30°



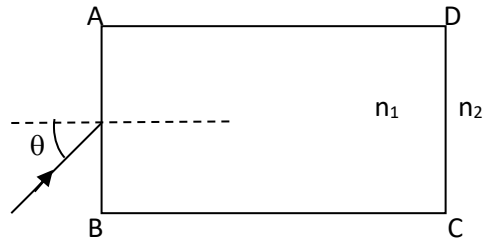
30. A plane mirror is placed horizontally inside water ($\mu = 4/3$). A ray falls normally on it. The mirror is rotated by angle θ such that after reflection, the ray does not come out of water. The minimum value of θ is

- a) $\frac{\pi}{4}$
 b) $\sin^{-1}\left(\frac{3}{4}\right)$
 c) $\frac{1}{2} \sin^{-1}\left(\frac{3}{4}\right)$
 d) $2 \sin^{-1}\left(\frac{3}{4}\right)$



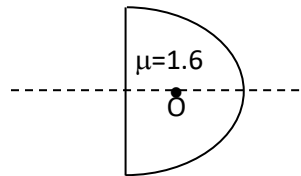
31. A rectangular glass slab ABCD of refractive index n_1 is immersed in water of refractive index n_2 ($n_1 > n_2$). A ray of light is incident at the surface AB of the slab as shown. The maximum value of the angle of incidence θ , such that the ray comes out only from the outer surface CD is given by

- a) $\sin^{-1}\left(\sqrt{\frac{n_1^2 - n_2^2}{n_2}}\right)$
 b) $\sin^{-1}\left(\frac{n_1}{n_2}\right)$
 c) $\sin^{-1}\left(\sqrt{\frac{n_1^2 - n_2^2}{n_1}}\right)$
 d) $\sin^{-1}\left(\frac{n_2}{n_1}\right)$



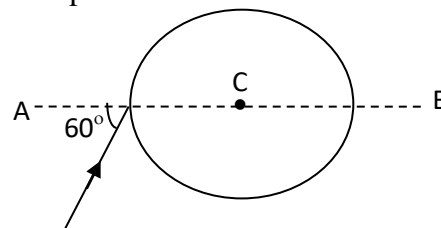
32. A plastic hemisphere has a radius of curvature of 8 cm and refractive index of 1.6. On the axis halfway between the plane surface and the spherical one (4 cm from each) is a small object O. The distance between the two images when viewed along the axis from the two sides of the hemisphere is approximately

- a) 1.0 cm b) 1.5 cm
 c) 3.75 cm d) 2.5 cm



33. A ray of light falls on a transparent sphere with centre at C as shown in fig. The ray emerges from the sphere parallel to line AB. The refractive index of the sphere is

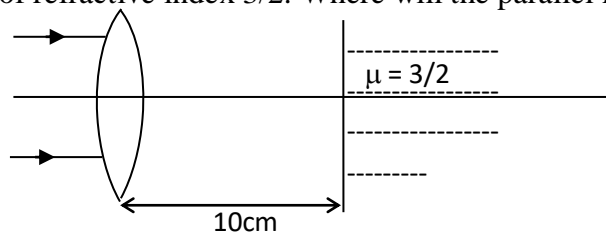
- a) $\sqrt{2}$ b) $\sqrt{3}$
 c) $3/2$ d) 2



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

- a) $b\left(\frac{u-f}{f}\right)^{1/2}$ b) $b\left(\frac{f}{u-f}\right)^{1/2}$ c) $b\left(\frac{u-f}{f}\right)$ d) $b\left(\frac{f}{u-f}\right)^2$

35. Focal length of a thin convex lens is 30 cm. At a distance of 10 cm from the lens, there is a plane refracting surface of refractive index $3/2$. Where will the parallel rays incident on lens converge?

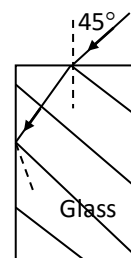


- a) At a distance of 27.5 cm from the lens
 b) At a distance of 25 cm from the lens
 c) At a distance of 45 cm from the lens
 d) At a distance of 40 cm from the lens

41. One face of rectangular glass plate 6 cm thick is silvered. An object held 8 cm in front of the first face, forms an image 12 cm behind the silvered face. The refractive index of the glass is
 a) 0.4 b) 0.8 c) 1.2 d) 1.6
42. A luminous object is placed at a distance of 30 cm from the convex lens of focal length 20 cm. On the other side of the lens, at what distance from the lens a convex mirror of radius of curvature 10 cm be placed in order to have an upright image of the object coincident with it?
 a) 12 cm b) 30 cm c) 50 cm d) 60 cm
43. The radius of curvature of a thin plano-convex lens is 10 cm (of curved surface) and the refractive index is 1.5. If the plane surface is silvered, then it behaves like a concave mirror of focal length
 a) 10 cm b) 15 cm c) 20 cm d) 5 cm
44. An air bubble in a glass slab ($\mu = 1.5$) is 5 cm deep when viewed from one face and 2 cm deep when viewed from the opposite face. The thickness of the slab is
 a) 7.5 cm b) 10.5 cm c) 7 cm d) 10 cm

45. A light ray falls on a rectangular glass slab as shown. The index of refraction of the glass, if total internal reflection is to occur at the vertical face, is

- a) $\sqrt{3/2}$ b) $\frac{(\sqrt{3} + 1)}{2}$
 c) $\frac{(\sqrt{2} + 1)}{2}$ d) $\sqrt{5}/2$



46. As the position of an object (u) reflected from a concave mirror is varied, the position of the image (v) also varies. By letting u change from $-\infty$ to 0, the graph between v versus u will be

- a)
- b)
- c)
- d)

47. A biconvex lens has a radius of curvature of magnitude 20 cm. Which one of the following options best describe the image formed of an object of height 2 cm placed 30 cm from the lens?
 a) Virtual, upright, height = 1 cm
 b) Virtual, upright, height = 0.5 cm
 c) Real, inverted, height = 4 cm
 d) Real, inverted, height = 1 cm
48. For a given lens, the magnification was found to be twice as large as when the object was shifted to next line 0.15 m distant from it as when the distance was 0.2 m. The focal length of the lens is
 a) 1.5 m b) 0.20 m c) 0.10 m d) 0.05 m

49. An object is placed 1.5 m in front of the curved surface of a plano convex lens whose flat surface is silvered. A real image is formed 300 cm in front of the lens. The focal length of the lens is
- a) 100 cm b) 200 cm c) 150 cm d) 300 cm
50. An object is placed at a distance of 40 cm in front of a concave mirror of focal length 20 cm. The image produced is
- a) real, inverted and smaller in size b) real, inverted and of same size
c) real and erect d) virtual and inverted