

Ray Optics (for NEET/ JEE Mains) Practice SET1

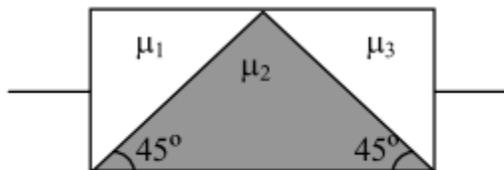
1. An optical device is constructed by fixing three identical convex lenses of focal lengths 10 cm each inside a hollow tube at equal spacing of 30 cm each. One end of the device is placed 10 cm away from a point source. How much does the image shift when the device is moved away from the source by another 10 cm?
 (A) 0 (B) 5 cm (C) 15 cm (D) 45 cm

2. An isosceles glass prism with base angles 40° is chamfered over a tray of water in a position such that the base is just dipped in water. A ray of light incident normally on the inclined face suffers total internal reflection at the base. If the refractive index of water is 1.33 then the condition imposed on the refractive index μ of the glass is -
 (A) $\mu < 2.07$ (B) $\mu > 2.07$ (C) $\mu < 1.74$ (D) $\mu > 1.74$

3. A point source of light is moving at a rate of 2 cm-s^{-1} towards a thin convex lens of focal length 10 cm along its optical axis. When the source is 15 cm away from the lens the image is moving at -
 (A) 4 cm-s^{-1} towards the lens (B) 8 cm-s^{-1} towards the lens
 (C) 4 cm-s^{-1} away from the lens (D) 8 cm-s^{-1} away from the lens

4. A hollow lens is made of thin glass and in the shape of a double concave lens. It can be filled with air, water of refractive index 1.33 or CS_2 of refractive index 1.6. It will act as a diverging lens if it is
 (A) filled with air and immersed in water.
 (B) filled with water and immersed in CS_2 .
 (C) filled with air and immersed in CS_2 .
 (D) filled with CS_2 and immersed in water.

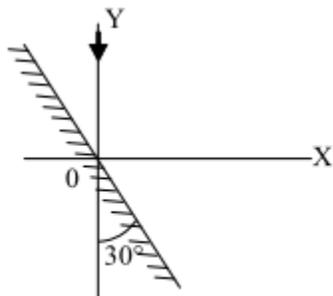
5. A rectangular block is composed of three different glass prisms (with refractive indices μ_1 , μ_2 and μ_3) as shown in the figure below. A ray of light incident normal to the left face emerges normal to the right face. Then the refractive indices are related by



- (A) $\mu_1^2 + \mu_2^2 = 2\mu_3^2$ (B) $\mu_1^2 + \mu_2^2 = \mu_3^2$ (C) $\mu_1^2 + \mu_3^2 = 2\mu_2^2$ (D) $\mu_2^2 + \mu_3^2 = 2\mu_1^2$

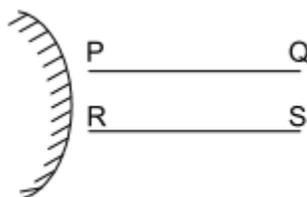
Ray Optics (for NEET/ JEE Mains) Practice SET1

6. A mirror is placed at an angle of 30° with respect to y-axis (see figure). A light ray travelling in the negative y-direction strikes the mirror. The direction of the reflected ray is given by the vector

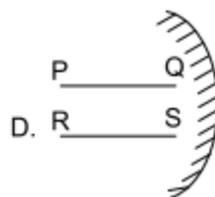
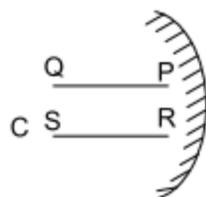
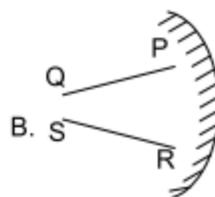
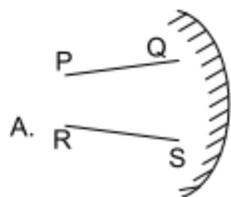


- (A) \hat{i} (B) $\hat{i} - \sqrt{3}\hat{j}$ (C) $\sqrt{3}\hat{i} - \hat{j}$ (D) $\hat{i} - 2\hat{j}$

7. A person looks at the image of two parallel finite length lines PQ and RS in a convex mirror (see figure).



Which of the following represents schematically the image correctly ? (Note : Letters P, Q, R and S are used only to denote the endpoints of the lines.)



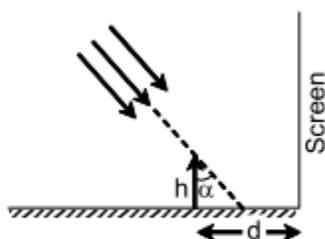
- (A) A (B) B (C) C (D) D

Ray Optics (for NEET/ JEE Mains) Practice SET 1

8. A point source of light is placed at $2f$ from a converging lens of focal length f . A flat mirror is placed on the other side of the lens at a distance d such that rays reflected from the mirror are parallel after passing through the lens again. If $f = 30$ cm, then d is equal to

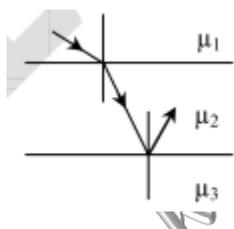
- (A) 15 cm. (B) 30 cm. (C) 45 cm. (D) 75 cm.

9. A long horizontal mirror is next to a vertical screen (See figure). Parallel light rays are falling on the mirror at an angle θ from the vertical. If a vertical object of height h is kept on the mirror at a distance $d > h \tan(\theta)$. The length of the shadow of the object on the screen would be



- (A) $h/2$ (B) $h \tan(\alpha)$ (C) $2h$ (D) $4h$

10. Three transparent media of refractive indices μ_1, μ_2, μ_3 respectively, are stacked as shown. A ray of light follows the path shown. No light enters the third medium.



Then-

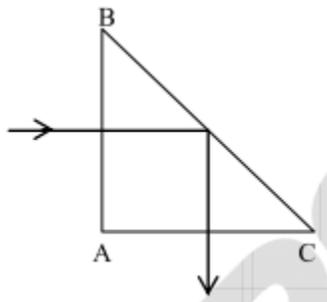
- (A) $\mu_1 < \mu_2 < \mu_3$ (B) $\mu_2 < \mu_1 < \mu_3$ (C) $\mu_1 < \mu_3 < \mu_2$ (D) $\mu_3 < \mu_1 < \mu_2$

11. A convex lens of focal length 15 cm is placed in front of a plane mirror at a distance 25 cm from the mirror. Where on the optical axis and from the Centre of the lens should a small object be placed such that the final image coincides with the object ?

- (A) 15 cm and on the opposite side of the mirror
 (B) 15 cm and between the mirror and the lens
 (C) 7.5 cm and on the opposite side of the mirror
 (D) 7.5 cm and between the mirror and the lens

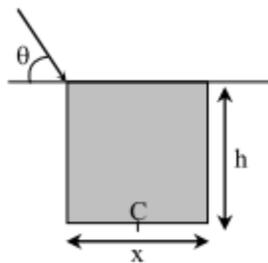
Ray Optics (for NEET/ JEE Mains) Practice SET1

12. Light enters an isosceles right triangular prism at normal incidence through face AB and undergoes total internal reflection at face BC as shown below.



The minimum value of the refractive index of the prism is close to

- (A) 1.10 (B) 1.55 (C) 1.42 (D) 1.72
13. A convex lens is used to form an image of an object on a screen. If the upper half of the lens is blackened so that it becomes opaque, then
- (A) only half of the image will be visible (B) the image position shifts towards the lens
- (C) the image position shifts away from the lens (D) the brightness of the image reduces
14. A student sees the top edge and the bottom center C of a pool simultaneously from an angle θ above the horizontal as shown in the figure. The refraction index of water which fills up to the top edge of the pool is $4/3$. If $h/x = 7/4$ then $\cos\theta$ is



(A) $\frac{2}{7}$

(B) $\frac{8}{3\sqrt{45}}$

(C) $\frac{8}{3\sqrt{53}}$

(D) $\frac{8}{21}$

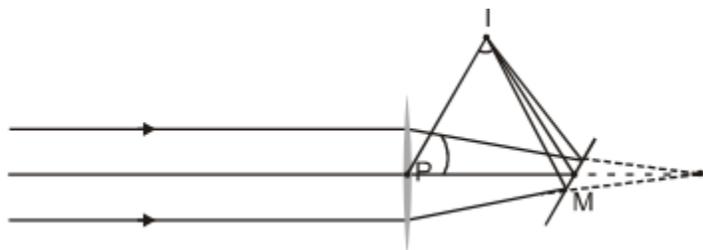
15. The refractive index of a prism measured using three lines of a mercury vapour lamp. If μ_1 , μ_2 , μ_3 are the measured refractive indices for these green, blue and yellow lines respectively, then

- (A) $\mu_2 > \mu_3 > \mu_1$
- (B) $\mu_2 > \mu_1 > \mu_3$
- (C) $\mu_3 > \mu_2 > \mu_1$

Ray Optics (for NEET/ JEE Mains) Practice SET 1

(D) $\mu_1 > \mu_2 > \mu_3$

16. A horizontal parallel beam of light passes through a vertical convex lens of focal length 20 cm and is then reflected by a tilted plane mirror so that it converges to a point I. The distance PI is 10 cm.



M is a point at which the axis of the lens intersects the mirror. The distance PM is 10 cm. The angle which the mirror makes with the horizontal is

- (A) 15° (B) 30° (C) 45° (D) 60°

17. A ray of light incident on a transparent sphere at an angle $\pi/4$ and refracted at an angle r , emerges from the sphere after suffering one internal reflection. The total angle of deviation of the ray is

- (A) $\frac{3\pi}{2} - 4r$ (B) $\frac{\pi}{2} - 4r$ (C) $\frac{\pi}{4} - r$ (D) $\frac{5\pi}{2} - 4r$

18. In total internal reflection when the angle of incidence is equal to the critical angle for the pair of media in contact, what will be angle of refraction?

- (1) 180° (2) 0° (3) Equal to angle of incidence (4) 90°

19. Two similar thin equi-convex lenses, of focal length f each, are kept coaxially in contact with each other such that the focal length of the combination is F_1 . When the space between the two lenses is filled with glycerine (which has the same refractive index ($\mu = 1.5$) as that of glass) then the equivalent focal length is F_2 . The ratio $F_1 : F_2$ will be :

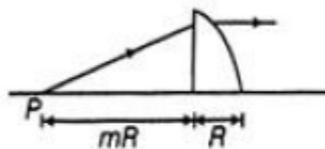
- (1) 2 : 1 (2) 1 : 2 (3) 2 : 3 (4) 3 : 4

20. An equiconvex lens has power P . It is cut into two symmetrical halves by a plane containing the principal axis. The power of one part will be,

- (1) 0 (2) $2P$ (3) $4P$ (4) P

Ray Optics (for NEET/ JEE Mains) Practice SET1

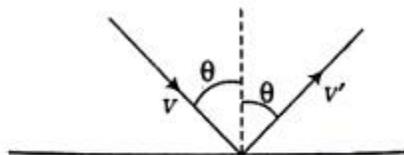
21. A double convex lens has focal length 25 cm. The radius of curvature of one of the surfaces is double of the other. Find the radii if the refractive index of the material of the lens are 1.5.
 (1) 100 cm, 50 cm (2) 25 cm, 50 cm (3) 18.75 cm, 37.5 cm (4) 50 cm, 100 cm
22. A thin symmetrical double convex lens of refractive index is placed between a medium of refractive index to the left and another medium of refractive index to the right. Then, the system behaves as
 (A) A convex lens (B) A concave lens (C) A glass plate (D) A convexo concave lens
23. The plane face of a plano convex lens is silvered. If μ be the refractive index and R the radius of curvature of curved surface, then system will behave like a concave mirror of curvature
 (A) μR
 (B) R^2/μ
 (C) $R/(\mu-1)$
 (D) $[(\mu+1)/(\mu-1)]R$
24. A fish rising vertically to the surface of water in a lake uniformly at the rate of 2m/s observes a kingfisher diving vertically towards the water at a rate of 10m/s. If refractive index of water what will be the actual velocity of the kingfisher
 (A) 10 m/s (B) 8 m/s (C) 6 m/s (D) 9 m/s
25. A square wire of side 2.0cm is placed 20cm in front of a concave mirror of focal length 10cm with its centre on the axis of the mirror and its plane normal to the axis. The area enclosed by the image of wire is
 (A) 7.5 cm² (B) 6 cm² (C) 2 cm² (D) 4 cm²
26. A quarter cylinder of radius R and refractive index 1.5 is placed on a table. A point object P is kept at a distance of mR from it as shown in figure. For what value of m for which a ray from P will emerge parallel to the table?



- (A) $\frac{2}{3}$ (B) $\frac{3}{2}$ (C) $\frac{4}{3}$ (D) $\frac{3}{4}$

Ray Optics (for NEET/ JEE Mains) Practice SET1

27. The magnification produced by a astronomical telescope for normal adjustment is 10 and the length of the telescope is 1.1m. The magnification, when the image is formed atleast distance of distinct vision is
(A) 6 (B) 18 (C) 16 (D) 14
28. A prism of a certain angle deviates the red and blue rays by 8 and 12, respectively. Another prism of the same angle deviates the red and blue rays by 10 and 14, respectively. The prisms are small angled and made of different materials. The dispersive power of the materials of the prisms are in the ratio
(A) 5 : 6 (B) 9 : 11 (C) 6 : 5 (D) 11 : 9
29. A ball of mass hits is the floor with a speed making an angle of incidence with the normal. The coefficient of restitution is e . The speed of reflected ball and the angle of reflection of the ball will be



(A) $v' = v, \theta = \theta'$

(B) $v' = \frac{v}{2}, \theta = 2\theta'$

(C) $v' = 2v, \theta = 2\theta'$

(D) $v' = \frac{3v}{2}, \theta = \frac{2\theta'}{3}$