4 Optics

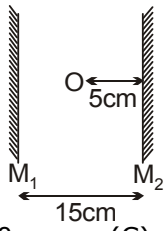
EXERCISE

403. An object is placed between two plane mirrors inclined at an angle to each other. If the number of images formed is 7 then the angle of inclination is -
(A) 15º (B) 30º (C) 45º (D) 60º

404. A plane mirror rotating at an angular velocity of 3 radian/s reflects a light beam. The angular velocity of the reflected beam is -
(A) 3 rad/s (B) 6 rad/s (C) 9 rad/s (D) 12 rad/s

405. In case of image formation by plane mirrors -
(A) Object can be real and image virtual (B) Both object and image can be virtual
(C) Both object and image can be real (D) None of these

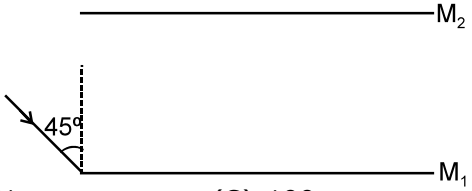
406. Two plane mirrors parallel to each other and an object O placed between them. Then the distance of the first three images from the mirror M_2 will be (in cm) –



(A) 5, 10, 15 (B) 5, 15, 30 (C) 5, 25, 35 (D) 5, 15, 25

407. A man moves towards a plane mirror with a velocity v in a direction making an angle θ with the normal to the mirror. The magnitude of velocity of the image relative to man normal to mirror will be
(A) 2v (B) 2v cosθ (C) 2v sinθ (D) 2v/cosθ

408. Two plane mirrors M_1 and M_2 each have length 1m and are separated by 1cm. A ray of light is incident on one end of mirror M_1 at angle 45º. How many reflections the ray will have before going from the other end ?



(A) 50 (B) 51 (C) 100 (D) 101

409. A convex mirror of focal length f (in air) is immersed in water $\left(\mu = \frac{4}{3}\right)$. The focal length of the mirror in water will be -
(A) f (B) $\left(\frac{4}{3}\right)$f (C) $\left(\frac{3}{4}\right)$f (D) $\left(\frac{7}{3}\right)$f

410. Image formed by a concave mirror radius of curvature 40 cm is half the size of the object. Then distance of object and its image from the mirror will be -
(A) 30 cm and 60 cm (B) 60 cm and 120 cm
(C) 60 cm and 30 cm (D) 120 cm and 60 cm

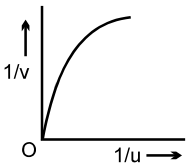
411. A small piece of wire bent into on L shape with upright and horizontal portions of equal lengths, is placed with the horizontal portion along the axis of the concave mirror whose radius of curvature is
10 cm. If the bend is 20 cm from the pole of the mirror, then the ratio of the lengths of the images of the upright and horizontal portions of the wire is
(A) 1 : 2 (B) 3 : 1 (C) 1 : 3 (D) 2 : 1

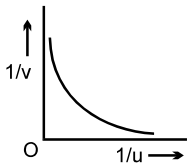
412. A point object is placed on the principal axis of a concave mirror quite far away from the pole and moved at a constant speed 0.5 cm/sec towards the pole. Its image also moves. It is found that the object and the image cross each other at a point which is at a distance 50 cm from the pole. Focal length of the mirror is -
(A) 50 cm (B) 35 cm (C) 25 cm (D) 15 cm

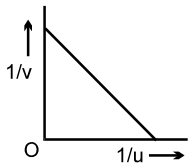
413.* Position of the image when the object is at a distance 30 cm from the pole is -
(A) 150 cm from the pole in front of the reflecting surface
(B) 120 cm from the pole behind the mirror
(C) 150 cm from the pole behind the mirror
(D) 120 cm from the pole in front of the reflecting surface

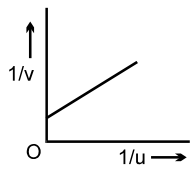
414.* An object is placed at a distance u cm from a concave mirror of focal length f cm. The real image of the object is received on a screen placed at a distance of v cm from the mirror. The values of u are changed and the corresponding values of v are measured.

Which one of the graphs shown in the figure represents the variation of $\frac{1}{v}$ with $\frac{1}{u}$?

(A) 

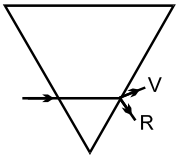
(B) 

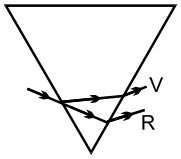
(C) 

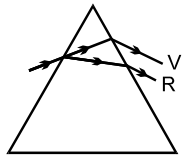
(D) 

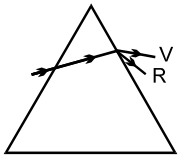
415. A man standing in a swimming pool looks at a stone lying at the bottom. The depth of the swimming pool is h. At what distance from the surface of water is the image of the stone formed -
(A) h/μ (B) $h\mu$ (C) μ/h (D) h

416. A ray of light enters a rectangular glass slab of refractive index $\sqrt{3}$ at angle of incidence 60º. It travels a distance of 5 cm inside the slab and emerges out of the slab. The perpendicular distance between the incident and the emergent rays is
(A) $5\sqrt{3}$ cm (B) $\frac{5}{2}$ cm (C) $5\sqrt{\frac{3}{2}}$ cm (D) 5 cm

417. Which of the following diagrams shows correctly the dispersion of white light by a prism ?
(A) 

(B) 

(C) 

(D) 

418. An equilateral prism is placed on the prism table of a spectrometer in the position of minimum deviation. If the angle of incidence is 60º, the angle of deviation of the ray is :
(A) 90º (B) 60º (C) 45º (D) 30º

419. The refractive index of the material of the prism for a monochromatic beam of light is $\sqrt{2}$ and its refracting angle is 60º . The angle of incidence corresponding to which this beam of light suffers minimum deviation is :
(A) 30º (B) 45º (C) 60º (D) 75º

420. A lense behaves as a converging lens is air and diverging lens in water. The refractive index of the lens material is -
(A) equal to 1.33 (B) equal to unity
(C) greater than 1.33 (D) between unity and 1.33

421. A convergent lens is placed inside a cell filled with a liquid. The lens has a focal length +20 cm when in air and its material has a refractive index 1.50. If the liquid has a refractive index 1.60, the focal length of the system -
(A) –160 cm (B) –24 cm (C) –80 cm (D) + 80 cm

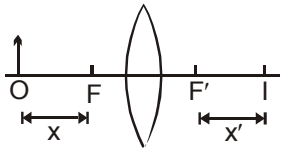
422. The radius of curvature of a thin plane-convex lens is 10 cm (of curved surface) and the refractive index is 15. If the plane surface is silvered, then the focal length will be -
(A) 15 cm (B) 20 cm (C) 5 cm (D) 10 cm

423. An object is placed at a distance of 15 cm from a convex lens of focal length 10 cm. On the other side of the lens, a convex mirror is placed at its focus such that the image formed by the combination coincides with the object itself. The focal length of the convex mirror is
(A) 20 cm (B) 10 cm (C) 15 cm (D) 30 cm

424. A thin equiconvex lens has focal length 10 cm and refractive index 1.5 . One of its faces is now silvered and for an object placed at a distance u in front of it, the image coincides with the object. The value of u is
(A) 10 cm (B) 5 cm (C) 20 cm (D) 15 cm

425.* A convex lens of focal length f produces a virtual image n times the size of the ojbect, then the distance of the object from the lens, is
(A) (n– 1) f (B) (n + 1) f (C) $\left(\frac{n-1}{n}\right)f$ (D) $\left(\frac{n+1}{n}\right)f$

426.* An object is placed at a point distant x from the focus of a convex lens and its imge is formed at I as shown in the figure. The distance x, x' satisfy the relation
(A) $\frac{x+x'}{2} = f$ (B) f = x x
(C) x + x' ≤ 2f (D) x + x' ≥ 2f



427.* A convex lens froms a real image of a point object placed on its principal axis. If the upper half of the lens is painted black, the image will :
(A) be shifted downwards (B) be shifted upwards
(C) not be shifted (D) shift on the principal axis

428.* Phase difference between two waves having same frequency (ν) and same amplitude (A) is $2\pi/3$. If these waves superimpose each other, then resultant amplitude will be–
(A) 2A (B) 0 (C) A (D) A^2