641. If the refractive indices of crown glass for red, yellow and violet colours are 1.5140, 1.5170 and 1.5318 respectively and for flint glass are 1.6434, 1.6499 and 1.6852 respectively, then the dispersive power for crown and flint glass are respectively

(a) 0.034 and 0.064 (b) 0.064 and 0.034

(c) 1.3 and 0.064 (d) 0.034 and 1.0

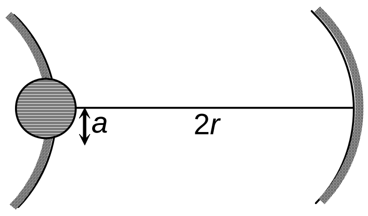
642. The angular position of first diffraction minimum due to single slit diffraction is θ for a light of wavelength 5000Å. If the width of the slit is 1×10^{-4} cm, then the value of 0 is

(a) 30^0 (b) 45^0 (c) 60^0 (d) 15^0

643. The angles of a prism are 30^0, 60^0 and 90^0. What is the refractive index of a liquid to be kept in contact with the longest face so that a ray normally incident on the smallest face gets just internally reflected at the longest face? (Given refractive index of glass of prism is 1.5)

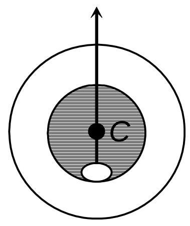
(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{3\sqrt{3}}{4}$ (c) $\frac{\sqrt{3}}{4}$ (d) $\frac{3}{4\sqrt{3}}$

644. Two spherical mirrors-one convex and the other concave are of the same radius *r*. They are arranged co-axially at a distance 2*r* from each other. A small circle of radius *a* is drawn on the convex mirror near the pole. The radii of the first two images are



(a) $\frac{a}{11}, \frac{a}{41}$ (b) $a, \frac{a}{3}$ (c) $\frac{a}{3}, \frac{a}{11}$ (d) a, a

645. A hollow sphere of glass $\left(\mu = \frac{3}{2}\right)$ has its internal radius 2 cm and its external radius 3 cm and is filled with water $\left(\mu = \frac{4}{3}\right)$. A small piece of metal rests at the lowest point of the water and is viewed by an eye situated vertically above the centre of the sphere. The magnification is



(a) $\frac{11}{18}$ (b) $\frac{36}{11}$ (c) $\frac{18}{11}$ (d) $\frac{11}{36}$

646. A person with a defective eye has his far point at infinity. But his near point is at 50 cm from the eye. The lens to be used to bring the near point to 25 cm is

(a) concave lens of power – 2D (b) convex lens of power + 2D

(c) concave lens of power – 0.5 D (d) convex lens of power – 0.5 D

647. A small fish 0.4 m below the surface of a lake is viewed through a simple converging lens of focal length 3 m. The lens is kept 0.2 m above the water surface such that the fish lies on the optical axis of the lens. (Given the refractive index of water is 4/3). The image of the fish will be at a distance

(a) 60 cm from the lens on the same side as the fish

(b) 40 cm from the lens on the same side as the fish

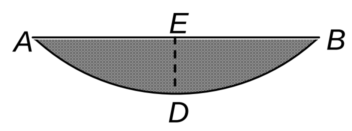
(c) 20 cm from the lens but on the other side of lens (i.e. not on the same side of fish)

(d) infinity

648. A simple 'two-lens telescope' has an objective of focal length 50 cm and an eye-piece of focal length 2.5 cm. The telescope is pointed at an object at a very large distance which subtends an angle of 1 milli radian on the naked eye. The eye-piece is adjusted so that the final virtual image is formed at infinity. The size of the real image formed by the objective is

(a) 5 mm (b) 1 mm (c) 0.5 mm (d) 0.1 mm

649. Diameter of a plano-convex lens *ADBEA* is 6 cm and thickness at the centre is *ED*=3 mm. The speed of light in the material of the lens is 2×10^8 m/s. Then the focal length of the lens is (neglect the term $(ED)^2$ being small



(a) 15 cm (b) 20 cm (c) 30 cm (d) 10 cm

650. The plane surface of a plano-convex lens is silvered and it then acts like a concave mirror of 30 cm focal length. If μ for lens is 1.5, the radius of curvature of the convex surface is

(a) 15 cm (b) 30 cm (c) 60 cm (d) 90 cm

651. If Young's experiment is performed using two separate identical sources of light instead of using two and one single source, then

(a) the interference fringes will be brighter

(b) the interference fringes will be darker

(c) no fringes will obtained

(d) the distance between bright and dark fringes increases

652. A thin prism P_1 of angle 4^0 and made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 so that ray undergoes no deviation. The angle of prism P_2 is

(a) 5.33^0 (b) 4^0 (c) 3^0 (d) 2.6^0

653. A prism (μ=1.5) has a refractive angle of 30^0. The deviation of a monochromatic ray incident normally on its one surface will be ($\sin 48^0\ 36' = 0.75$)

(a) $18^0\ 36'$ (b) $22^0\ 38'$ (c) 18^0 (d) $22^0\ 1'$

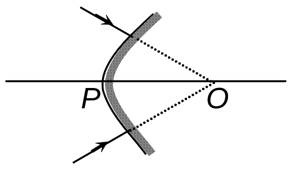
654. A ray of light passes from vacuum into a medium of refractive index μ, the angle of incidence is found to be twice the angle of refraction. Then the angel of incidence is

(a) $\cos^{-1}(\mu/2)$ (b) $2\cos^{-1}(\mu/2)$ (c) $2\sin^{-1}(\mu)$ (d) $2\sin^{-1}(\mu/2)$

655. 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 the system will behave like a concave mirror of radius of curvature

(a) μR (b) $R/(\mu-1)$ (c) R^2/μ (d) $\{(\mu+1)/(\mu-1)\}R$

656. As shown in the figure, a beam of light, converging towards O, is incident on a convex mirror of radius of curvature 60cm. If PO = 50 cm, image will be



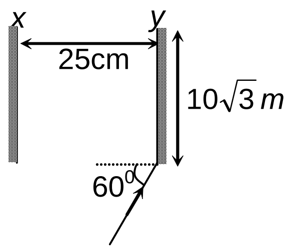
(a) real, enlarged and at a distance 75 cm from P in front in front of the mirror s

(b) virtual, diminished and at a distance 70 cm from P behind the mirror

(c) real, diminished and at a distance 70cm from P in front of the mirror

(d) virtual, enlarged and at a distance 75 cm from P behind the mirror

657. Two plane mirrors X and Y are kept parallel to each other at a separation 25 cm, as shown. A ray of light is incident on the mirror Y at an angle 60^0 at its end/edge. Length of each mirror being $10\sqrt{3}$ m, number of times the ray is reflected, including the initial one, before it emerges is



(a) 41 (b) 26 (c) 31 (d) 39

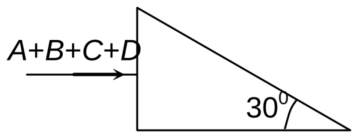
658. Refractive index of air being 1.0005, thickness of air column that will have one more wavelength of blue light (4000 Å) than in equal thickness of vacuum is

(a) 1.4 μm (b) 0.8 μm (c) 0.4 μm (d) 2.2 μm

659. A container has a perfectly reflecting plane bottom. It is filled with water $\left(\mu = \frac{4}{3}\right)$ to a depth 20 cm. An object is kept at a height 15 cm above the surface of water. Distance of the final image from water surface is

(a) 50 cm (b) 60 cm (c) 35 cm (d) 45 cm

660. A parallel beam of light, consisting of four colours(A, B, C and D), is incident the material of prism for the colours A, B , C and D has the values, μ_A = 1.21, μ_B = 1.19, μ_C = 1.14, μ_D = 1.186. Which colour will be separated by the prism from the others?

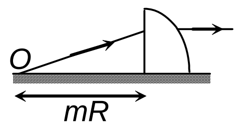


(a) A (b) B (c) C (d) D

661. Refractive indices of crown glass for violet and red colours are, respectively, 1.52 and 1.48 and those of flint glass are 1.77 and 1.73 respectively. A prism of angle 9^0 is made of crown glass and white light is incident on this prism at a small angle. Another flint glass prism is combined with the crown glass prism so that there is no deviation of incident light. Net dispersion of the combined system is

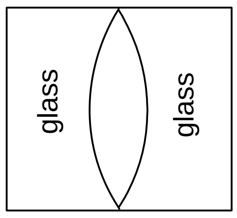
(a) 0.36^0 (b) 0.24^0 (c) 0.12^0 (d) 0.08^0

662. A quarter cylinder of radius *R* and made of a glass of refractive index 1.4 is kept on a table. A point object *O* is placed at a distance *mR* from it as shown. Determine *m* so that a ray from *P* emerges parallel to the table



(a) $\frac{25}{14}$ (b) $\frac{35}{18}$ (c) $\frac{21}{12}$ (d) 2

663. Two plano-concave lenses made of glass of refractive index $\frac{3}{2}$ have radii of curvature of their curved surfaces as 20 cm and 40 cm. They are kept in contact with their curved surfaces facing each other as shown in the figure. The space between them is filled with water $\left(\mu = \frac{4}{3}\right)$. System behaves as a



(a) convergent lens of focal length 75 cm
(b) divergent lens of focal length 80 cm
(c) convergent lens of focal length 40 cm
(d) divergent lens of focal length 75 cm

664. A convex lens of focal length 50 cm and a concave lens of focal length 10 cm are placed with their optic centres on the same axis and with a distance *d* between them. For what value of *d* will a parallel beam of light incident on the convex lens leave the concave lens as a parallel beam?

(a) 50 cm (b) 10 cm (c) 30 cm (d) 40 cm

665. Magnifying power of an Astronomical Telescope for distant objects is 8. If the objective and the eye lens are at a separation 45 cm and the final image is formed at infinity, focal lengths of objective and the eye lens are

(a) 40 cm, 5 cm (b) 30 cm, 3.75 cm (c) 36 cm, 4.5 cm (d) 35 cm , 10 cm

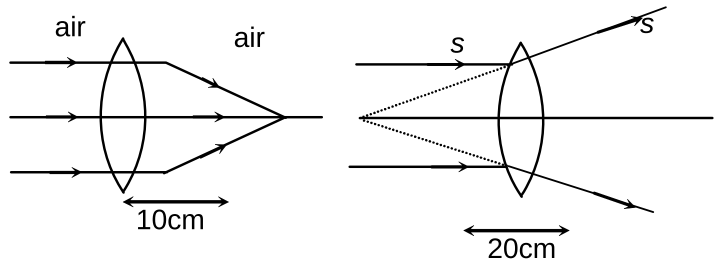
666. Dispersive powers of the materials of two lenses *A* and *B* are in the ratio 5 : 4. If the achromatic combination of these two lenses placed in contact is a convergent lens of focal lengths of lenses *A* and *B*, respectively are

(a) 20 cm, – 30 cm (b) –20 cm, 30 cm (c) –15 cm, 12 cm (d) 40 cm, –120 cm

667. A lens of unknown nature (convex/concave) and of focal length 20 cm forms an erect image 4 times the size of an object. Determine the nature of lens and also the distance of object from the lens.

(a) convex, 15 cm (b) convex, 40 cm (c) concave, 15 cm (d) concave, 40 cm

668. A lens made of material of refractive index 3/2 when placed in air behaves as shown in the figure (i) and when placed in a surrounding of refractive index μ_s, it behaves as shown in figure (ii), μ_s is



(a) 1.75 (b) 1.6 (c) 2 (d) 1.45

669. A 100 W bulb is hanging at a height of 4m above the centre of a table 6m × 6m. Ratio of intensities of illumination at the centre of any edge and at any corner is

(a) $\left(\frac{17}{13}\right)^{\frac{3}{2}}$ (b) $\left(\frac{34}{25}\right)^{\frac{3}{2}}$ (c) 2 : 1 (d) $\left(\frac{9}{7}\right)^{\frac{2}{3}}$

670. In a Young's double slit experiment, light consisting of two wavelengths 7000Å and 6000Å is used to obtain interference fringes. If the distance between the two slits is 1 mm and the distance between the plane slits and screen is 100cm, what is the minimum distance from central maximum where bright fringes due to both the wavelength coincide?

(a) 0.54 cm (b) 0.62 cm (c) 0.42 cm (d) 0.28 cm

671. In a young's interference experiment with light of wavelength 6000 Å, one of the slits is covered by a thin glass plate of refractive index 1.5 while the other slits is coved by another glass plate of same thickness but of refractive index 1.75 *O* is a point on the screen where the central maximum fell before inserting the glass plates, its intensity being I_0. It is found that what used to be the fifth maximum earlier, now falls at *O*. Assuming negligible absorption of light by the glass plates, find the thickness of glass plates and also the intensity at *O* (after the glass plates are inserted)

(a) 1.2×10^{-3} cm, I_0 (b) 2.8×10^{-3} cm, I_0 (c) 6.4×10^{-2} cm, $\frac{I_0}{2}$ (d) 7.2×10^{-2} cm, $\frac{I_0}{2}$

672. In a single slit Frauhofer diffraction with light of wavelength 5000 Å, distance between the first and the fourth minima in the diffraction pattern formed on the screen is 4.5 mm. What is the distance between the first dark fringes on each side of the central maximum?

(a) 4.5 mm (b) 3.5 mm (c) 3.0 mm (d) 2.0 mm

673. In a Fraunhofer diffraction pattern obtained with a single slit, phase different between secondary wavelets from the ends of the slit, at the position of first secondary minimum is

(a) 2π (b) π (c) $\pi/2$ (d) $\pi/4$

674. *A* and *B* are two polarisers having their transmission axes perpendicular to each other. Another polarizer *C* is placed between the two such that when unpolarised light of intensity I_0 falls on *A*, the intensity of light that emerges from *B* is $\frac{I_0}{32}$. Angle between the transmission axes of *A* and *C*

(a) 60^0 (b) 45^0 (c) 30^0 (d) 15^0

675. In a certain double slit experimental arrangement, interference fringes of width 1.0 mm each are observed when light of wavelength 5000 Å is used. Keeping the set up unaltered if the source is replaced by another of wavelength 6000Å, the fringe width will be

(a) 0.5 mm (b) 1.00 mm (c) 1.2 mm (d) 1.5 mm

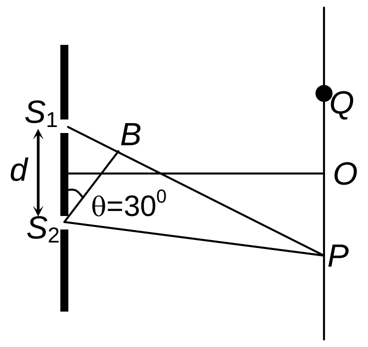
676. In the Young's doubles slits experiment, if the phase of each light wave coming from the two slits is changed by π, the fringe pattern will

(a) remain unchanged (b) shift downwards by half fringe width
(c) disappear (d) shift upwards by half fringe width

677. A small mirror of area A and mass m is suspended in a vertical plane by means of weightless thread. A beam of light intensity I falls normally on the mirror and the string is deflected by a small angle α. If the mirror is perfectly reflecting then α is

(a) $\frac{2IA}{mgc}$ (b) $\frac{2IA}{c}$ (c) $\frac{mgc}{2IA}$ (d) zero

678. Two coherent sources of different intensities send waves which interfere. The ratio of maximum intensity to the minimum intensity is 25. The intensities of the sources are in the ratio

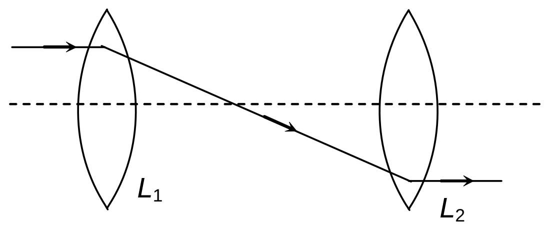


(a) 25 : 1 (b) 5 : 1
(c) 9 : 4 (d) 625 : 1

679. A lens is placed between a source of light and a wall. It forms images of area A_1 and A_2 on the wall for its two different position. The area of the source of light is

(a) $\sqrt{(A_1 A_2)}$ (b) $\frac{A_1 + A_2}{2}$ (c) $\left(\frac{1}{A_1} + \frac{1}{A_2}\right)^{-1}$ (d) $\left(\frac{\sqrt{A_1} + \sqrt{A_2}}{2}\right)^2$

680. In the figure given below there are two convex lens L_1 and L_2 having focal lengths F_1 and F_2 respectively. The distance between L_1 and L_2 will be



(a) F_1 (b) F_2
(c) $F_1 + F_2$ (d) $F_1 - F_2$