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JEE MAIN RAY OPTICS AND OPTICAL INSTRUMENTS — PYQS

Max. Marks: 384 **Questions:** 96

Section A (MCQ) — 76 questions

Q.1 A thin biconvex lens is prepared from the glass (μ = 1.5) both curved surfaces of which have equal radii of 20 cm each. Left side surface of the lens is silvered from outside to make it reflecting. To have the position of image and object at the same place, the object should be placed, from the lens at a distance of _____ cm.

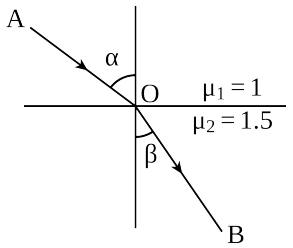
[JEE Main 2026 (Online) 8th April Evening Shift]

(1) 10 (2) 12.5 (3) 13 (4) 13.5

Scan or tap for the full solution

Q.2 Light ray incident along a vector $\vec{AO}$ $(\vec{AO} = 2\hat{i} - 3\hat{j})$ emerges out along vector $\vec{OB}$ $(\vec{OB} = C\hat{i} - 4\hat{j})$ as shown in the figure below. The value of C is _____.

[JEE Main 2026 (Online) 8th April Evening Shift]

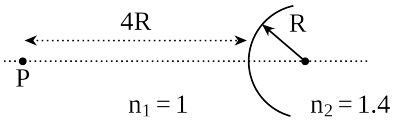


(1) 1.6 (2) 0.16 (3) 11.6 (4) 16

Scan or tap for the full solution

Q.3 A spherical interface lens of radius R separates two media of refractive indices 1 and 1.4 respectively as shown in the figure below. A point source is placed at a distance of 4R in front of spherical interface. The magnitude of the magnification of point source image is _____.

[JEE Main 2026 (Online) 6th April Morning Shift]



(1) 1.66 (2) 2.33 (3) 2.66 (4) 1.33

Scan or tap for the full solution

Q.4 Angle of minimum deviation is equal to the half of the angle of prism in an equilateral prism. The refractive index of the prism is _____.

[JEE Main 2026 (Online) 6th April Evening Shift]

(1) 1.5 (2) $\sqrt{3}$ (3) $\sqrt{2}$ (4) 1.65

Scan or tap for the full solution

Q.5 A ray of light passing through an equilateral prism is having velocity 2.12×10^8 m/s in the prism material, then the minimum angle of deviation is _____ degrees.

[JEE Main 2026 (Online) 5th April Morning Shift]

(1) 45 (2) 30 (3) 28 (4) 58

Scan or tap for the full solution

Q.6 A compound microscope is designed with two symmetric biconvex lenses. The objective lens is cut vertically, creating two identical plano-convex lenses. One of them is used in place of original objective lens. To retain same magnification keeping the object distance unchanged, the tube length has to be

[JEE Main 2026 (Online) 5th April Morning Shift]

(1) increased two times (2) increased $\frac{3}{2}$ times

(3) decreased two times (4) decreased $\frac{3}{2}$ times

Scan or tap for the full solution

Q.7 A thin convex lens and a thin concave lens are kept in contact and are co-axial. Which of the following statements is correct for this combination of two lenses ? [JEE Main 2026 (Online) 5th April Evening Shift]

(1) behaves as concave lens if $|f_{convex}| > |f_{concave}|$

(2) behaves as concave lens if $|f_{convex}| < |f_{concave}|$

(3) behaves as convex lens if $|f_{convex}| > |f_{concave}|$

(4) Focal length of the lens system will change if the positions of two lenses are interchanged

Scan or tap for the full solution

Q.8 An object AB is placed 15 cm on the left of a convex lens P of focal length 10 cm. Another convex lens Q is now placed 15 cm right of lens P. If the focal length of lens Q is 15 cm, the final image is _____.

[JEE Main 2026 (Online) 5th April Evening Shift]

(1) virtual, formed at 7.5 cm right of lens Q, with a size bigger than that of AB

(2) real, formed at 7.5 cm right of lens Q, with a size same as that of AB

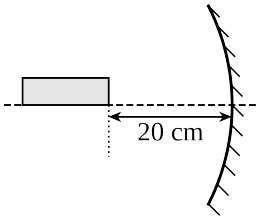
(3) formed at infinity.

(4) real, formed at 7 cm right of lens Q, with a size smaller than that of AB

Scan or tap for the full solution

Q.9 A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm as shown in figure. The length of the image is _____ cm.

[JEE Main 2026 (Online) 4th April Morning Shift]



(1) 2.5 (2) 5 (3) 7.5 (4) 7

Scan or tap for the full solution

Q.10 A convex lens is made from glass material having refractive index of 1.4 with same radius of curvature on both sides. The ratio of its focal length and radius of curvature is _____.

[JEE Main 2026 (Online) 4th April Evening Shift]

(1) 0.5 (2) 2.5 (3) 0.8 (4) 1.25

Scan or tap for the full solution

Q.11 For a thin symmetric prism made of glass (refractive index 1.5), the ratio of incident angle and minimum deviation will be _____.

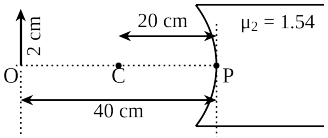
[JEE Main 2026 (Online) 2nd April Morning Shift]

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

Scan or tap for the full solution

Q.12 Refer the figure given below. μ_1 and μ_2 are refractive indices of air and lens material. The height of image will be _____ cm.

[JEE Main 2026 (Online) 2nd April Morning Shift]

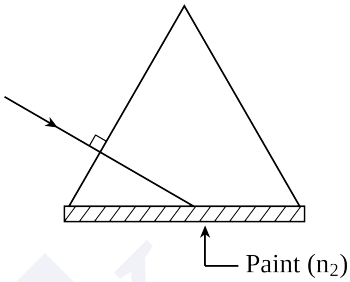


(1) 1 (2) 0.5 (3) 1.2 (4) 0.25

Scan or tap for the full solution

Q.13 One side of an equilateral prism is painted by a transparent material of refractive index n_2. The refractive index of prism is 1.6. The minimum value of n_2 required for total internal reflection from painted face is _____.

[JEE Main 2026 (Online) 2nd April Evening Shift]



(1) $\frac{3\sqrt{3}}{1.6}$ (2) $\sqrt{3}$ (3) $\frac{3.2}{\sqrt{3}}$ (4) $\frac{4\sqrt{3}}{5}$

Scan or tap for the full solution

Q.14 The magnitudes of power of a biconvex lens (refractive index 1.5) and that of a plano-concave lens (refractive index = 1.7) are same. If the curvature of plano-concave lens exactly matches with the curvature of back surface of the biconvex lens, then ratio of radius of curvature of front and back surface of the biconvex lens is ____

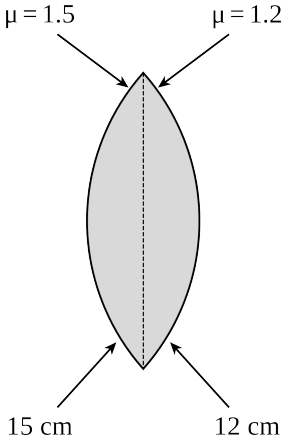
[JEE Main 2026 (Online) 28th January Morning Shift]

(1) 2:5 (2) 5:2 (3) 12:5 (4) 5:12

Scan or tap for the full solution

Q.15 A biconvex lens is formed by using two thin planoconvex lenses, as shown in the figure. The refractive index and radius of curved surfaces are also mentioned in figure. When an object is placed on the left side of lens at a distance of 30 cm from the biconvex lens, the magnification of the image will be :

[JEE Main 2026 (Online) 28th January Evening Shift]



(1) −2 (2) −2.5 (3) +2.5 (4) +2

Scan or tap for the full solution

Q.16 For a transparent prism, if the angle of minimum deviation is equal to its refracting angle, the refractive index n of the prism satisfies.

[JEE Main 2026 (Online) 28th January Evening Shift]

(1) $n \geq 2$ (2) $\sqrt{2} < n < 2$

(3) $1 < n < 2$ (4) $\sqrt{2} < n < 2\sqrt{2}$

Scan or tap for the full solution

Q.17 The exit surface of a prism with refractive index n is coated with a material having refractive index $\frac{n}{2}$. When this prism is set for minimum angle of deviation, it exactly meets the condition of critical angle. The prism angle is _____.

[JEE Main 2026 (Online) 24th January Morning Shift]

(1) 60° (2) 30° (3) 15° (4) 45°

Scan or tap for the full solution

Q.18 In a microscope of tube length 10 cm two convex lenses are arranged with focal lengths of 2 cm and 5 cm. Total magnification obtained with this system for normal adjustment is $(5)^k$. The value of k is _____.

[JEE Main 2026 (Online) 24th January Morning Shift]

(1) 4 (2) 5 (3) 2 (4) 3.5

Scan or tap for the full solution

Q.19 Distance between an object and three times magnified real image is 40 cm. The focal length of the mirror used is _____ cm.

[JEE Main 2026 (Online) 24th January Evening Shift]

(1) −20 (2) −15/2 (3) −10 (4) −15

Scan or tap for the full solution

Q.20 Five persons P_1, P_2, P_3, P_4 and P_5 recorded object distance (u) and image distance (v) using same convex lens having power +5 D as (25, 96), (30, 62), (35, 37), (45, 35) and (50, 32) respectively. Identify correct statement

[JEE Main 2026 (Online) 24th January Evening Shift]

(1) Readings recorded by P_3 and P_2 persons are incorrect

(2) Readings recorded by all persons are correct

(3) Readings recorded by P_3 person are incorrect

(4) Readings recorded by P_4 and P_5 persons are incorrect

Scan or tap for the full solution

Q.21 A thin prism with angle 5° of refractive index 1.72 is combined with another prism of refractive index 1.9 to produce dispersion without deviation. The angle of second prism is _____.

[JEE Main 2026 (Online) 23rd January Morning Shift]

(1) 5° (2) 4° (3) 4.5° (4) 6°

Scan or tap for the full solution

Q.22 Consider light travelling from a medium A to medium B separated by a plane interface. If the light undergoes total internal reflection during its travel from medium A to B and the speed of light in media A and B are 2.4×10^8 m/s and 2.7×10^8 m/s, respectively, then the value of critical angle is :

[JEE Main 2026 (Online) 23rd January Morning Shift]

(1) $\cos^{-1}\left(\frac{8}{9}\right)$ (2) $\sin^{-1}\left(\frac{9}{8}\right)$

(3) $\cot^{-1}\left(\frac{3}{\sqrt{13}}\right)$ (4) $\tan^{-1}\left(\frac{8}{\sqrt{17}}\right)$

Scan or tap for the full solution

Q.23 A prism of angle 75° and refractive index $\sqrt{3}$ is coated with thin film of refractive index 1.5 only at the back exit surface. To have total internal reflection at the back exit surface the incident angle must be _____

$(\sin 15° = 0.25 \text{ and } \sin 25° = 0.43)$

[JEE Main 2026 (Online) 23rd January Evening Shift]

(1) between 15° and 20°

(2) 15°

(3) < 15°

(4) > 25°

Solution

Q.24 A thin convex lens of focal length 5 cm and a thin concave lens of focal length 4 cm are combined together (without any gap) and this combination has magnification m_1 when an object is placed 10 cm before the convex lens. Keeping the positions of convex lens and object undisturbed a gap of 1 cm is introduced between the lenses by moving the concave lens away, which leads to a change in magnification of total lens system to m_2. The value of $\left|\frac{m_1}{m_2}\right|$ is _____ .

[JEE Main 2026 (Online) 22nd January Morning Shift]

(1) $\frac{25}{27}$ (2) $\frac{5}{6}$ (3) $\frac{5}{27}$ (4) $\frac{3}{2}$

Scan or tap for the full solution

Q.25 Consider an equilateral prism (refractive index $\sqrt{2}$). A ray of light is incident on its one surface at a certain angle i. If the emergent ray is found to graze along the other surface then the angle of refraction at the incident surface is close to _____

[JEE Main 2026 (Online) 22nd January Morning Shift]

(1) 30° (2) 20° (3) 40° (4) 15°

Scan or tap for the full solution

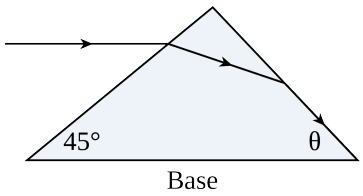
Q.26 The wavelength of light, while it is passing through water is 540 nm. The refractive index of water is 4/3. The wavelength of the same light when it is passing through a transparent medium having refractive index of 3/2 is _____ nm.

[JEE Main 2026 (Online) 22nd January Evening Shift]

(1) 540 (2) 840 (3) 480 (4) 380

Scan or tap for the full solution

Q.27 As shown in the diagram, when the incident ray is parallel to base of the prism, the emergent ray grazes along the second surface.



If refractive index of the material of prism is $\sqrt{2}$, the angle θ of prism is.

[JEE Main 2026 (Online) 21st January Evening Shift]

(1) 75° (2) 90° (3) 60° (4) 45°

Scan or tap for the full solution

Q.28 A convex lens of focal length 30 cm is placed in contact with a concave lens of focal length 20 cm. An object is placed at 20 cm to the left of this lens system. The distance of the image from the lens in cm is _____.

[JEE Main 2025 (Online) 8th April Evening Shift]

(1) $\frac{60}{7}$ (2) 15 (3) 45 (4) 30

Scan or tap for the full solution

Q.29 A concave-convex lens of refractive index 1.5 and the radii of curvature of its surfaces are 30 cm and 20 cm, respectively. The concave surface is upwards and is filled with a liquid of refractive index 1.3. The focal length of the liquid-glass combination will be

[JEE Main 2025 (Online) 8th April Evening Shift]

(1) $\frac{700}{11}$ cm (2) $\frac{600}{11}$ cm (3) $\frac{800}{11}$ cm (4) $\frac{500}{11}$ cm

Scan or tap for the full solution

Q.30 Two thin convex lenses of focal lengths 30 cm and 10 cm are placed coaxially, 10 cm apart. The power of this combination is:

[JEE Main 2025 (Online) 7th April Morning Shift]

(1) 5 D (2) 1 D (3) 20 D (4) 10 D

Scan or tap for the full solution

Q.31 A lens having refractive index 1.6 has focal length of 12 cm, when it is in air. Find the focal length of the lens when it is placed in water. (Take refractive index of water as 1.28)

[JEE Main 2025 (Online) 7th April Morning Shift]

(1) 355 mm (2) 655 mm
(3) 288 mm (4) 555 mm

Scan or tap for the full solution

Q.32 Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Refractive index of glass is higher than that of air.

Reason (R): Optical density of a medium is directly proportional to its mass density which results in a proportionate refractive index.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

[JEE Main 2025 (Online) 7th April Evening Shift]

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(2) (A) is correct but (R) is not correct
(3) (A) is not correct but (R) is correct
(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

Scan or tap for the full solution

Q.33 A mirror is used to produce an image with magnification of $\frac{1}{4}$. If the distance between object and its image is 40 cm, then the focal length of the mirror is _____.

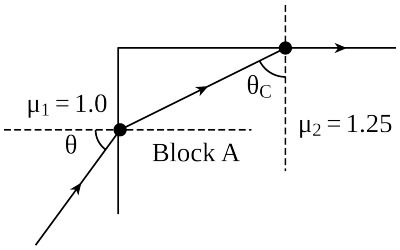
[JEE Main 2025 (Online) 7th April Evening Shift]

(1) 10 cm (2) 12.7 cm
(3) 10.7 cm (4) 15 cm

Scan or tap for the full solution

Q.34 A transparent block A having refractive index $\mu = 1.25$ is surrounded by another medium of refractive index $\mu = 1.0$ as shown in the figure. A light ray is incident on the flat face of the block with incident angle θ as shown in the figure. What is the maximum value of θ for which light suffers total internal reflection at the top surface of the block?

[JEE Main 2025 (Online) 7th April Evening Shift]



(1) $\tan^{-1}(4/3)$ (2) $\sin^{-1}(3/4)$
(3) $\tan^{-1}(3/4)$ (4) $\cos^{-1}(3/4)$

Scan or tap for the full solution

Q.35 When an object is placed 40 cm away from a spherical mirror an image of magnification $\frac{1}{2}$ is produced. To obtain an image with magnification of $\frac{1}{3}$, the object is to be moved :

[JEE Main 2025 (Online) 4th April Morning Shift]

(1) 20 cm away from the mirror.
(2) 20 cm towards the mirror.
(3) 80 cm away from the mirror.
(4) 40 cm away from the mirror.

Solution

Q.36 A finite size object is placed normal to the principal axis at a distance of 30 cm from a convex mirror of focal length 30 cm. A plane mirror is now placed in such a way that the image produced by both the mirrors coincide with each other. The distance between the two mirrors is :

[JEE Main 2025 (Online) 4th April Evening Shift]

(1) 45 cm (2) 15 cm
(3) 22.5 cm (4) 7.5 cm

Solution

Q.37 Consider following statements for refraction of light through prism, when angle of deviation is minimum.

A. The refracted ray inside prism becomes parallel to the base.
B. Larger angle prisms provide smaller angle of minimum deviation.
C. Angle of incidence and angle of emergence become equal.
D. There are always two sets of angle of incidence for which deviation will be same except at minimum deviation setting.
E. Angle of refraction becomes double of prism angle.

Choose the correct answer from the options given below : [JEE Main 2025 (Online) 3rd April Morning Shift]

(1) A, B and E Only (2) B, C and D Only
(3) B, D and E Only (4) A, C and D Only

Scan or tap for the full solution

Q.38 The radii of curvature for a thin convex lens are 10 cm and 15 cm respectively. The focal length of the lens is 12 cm. The refractive index of the lens material is

[JEE Main 2025 (Online) 3rd April Morning Shift]

(1) 1.4 (2) 1.8 (3) 1.5 (4) 1.2

Scan or tap for the full solution

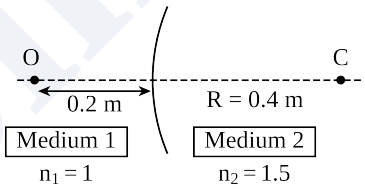
Q.39 A monochromatic light of frequency 5×10^{14} Hz travelling through air, is incident on a medium of refractive index '2'. Wavelength of the refracted light will be:

[JEE Main 2025 (Online) 3rd April Evening Shift]

(1) 400 nm (2) 300 nm (3) 600 nm (4) 500 nm

Scan or tap for the full solution

Q.40



A spherical surface separates two media of refractive indices 1 and 1.5 as shown in figure. Distance of the image of an object 'O', is :
(C is the center of curvature of the spherical surface and R is the radius of curvature)

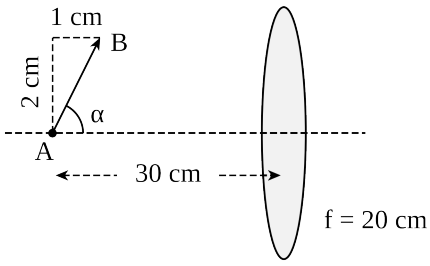
[JEE Main 2025 (Online) 2nd April Morning Shift]

(1) 0.24 m left to the spherical surface
(2) 0.24 m right to the spherical surface
(3) 0.4 m left to the spherical surface
(4) 0.4 m right to the spherical surface

Scan or tap for the full solution

Q.41 A slanted object AB is placed on one side of convex lens as shown in the diagram. The image is formed on the opposite side. Angle made by the image with principal axis is :

[JEE Main 2025 (Online) 2nd April Morning Shift]



(1) $-\alpha$ (2) $-\frac{\alpha}{2}$ (3) $-45°$ (4) $+45°$

Scan or tap for the full solution

Q.42 Two identical objects are placed in front of convex mirror and concave mirror having same radii of curvature of 12 cm, at same distance of 18 cm from the respective mirrors. The ratio of sizes of the images formed by convex mirror and by concave mirror is :

[JEE Main 2025 (Online) 2nd April Evening Shift]

(1) 2 (2) 1/2 (3) 1/3 (4) 3

Scan or tap for the full solution

Q.43 A bi-convex lens has radius of curvature of both the surfaces same as 1/6 cm. If this lens is required to be replaced by another convex lens having different radii of curvature on both sides ($R_1 \neq R_2$), without any change in lens power then possible combination of R_1 and R_2 is :

[JEE Main 2025 (Online) 2nd April Evening Shift]

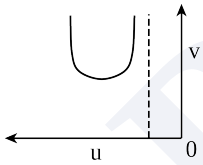
(1) $\frac{1}{3}$ cm and $\frac{1}{7}$ cm (2) $\frac{1}{5}$ cm and $\frac{1}{7}$ cm

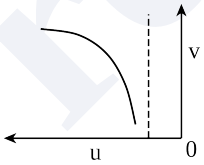
(3) $\frac{1}{3}$ cm and $\frac{1}{3}$ cm (4) $\frac{1}{6}$ cm and $\frac{1}{9}$ cm

Scan or tap for the full solution

Q.44 Let u and v be the distances of the object and the image from a lens of focal length f. The correct graphical representation of u and v for a convex lens when $|u| > f$, is

[JEE Main 2025 (Online) 29th January Morning Shift]

(1)


(2)


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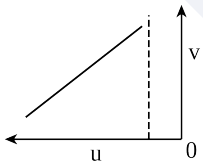
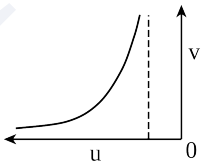


(4)


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Q.45 At the interface between two materials having refractive indices n_1 and n_2, the critical angle for reflection of an em wave is θ_{1C}. The n_2 material is replaced by another material having refractive index n_3 such that the critical angle at the interface between n_1 and n_3 materials is θ_{2C}. If $n_3 > n_2 > n_1$; $\frac{n_2}{n_3} = \frac{2}{5}$ and $\sin\theta_{2C} - \sin\theta_{1C} = \frac{1}{2}$, then θ_{1C} is :

[JEE Main 2025 (Online) 29th January Morning Shift]

(1) $\sin^{-1}\left(\frac{1}{6n_1}\right)$ (2) $\sin^{-1}\left(\frac{1}{3n_1}\right)$

(3) $\sin^{-1}\left(\frac{5}{6n_1}\right)$ (4) $\sin^{-1}\left(\frac{2}{3n_1}\right)$

Scan or tap for the full solution

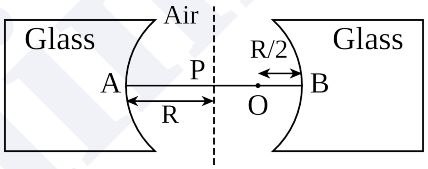
Q.46 A convex lens made of glass (refractive index = 1.5) has focal length 24 cm in air. When it is totally immersed in water (refractive index = 1.33), its focal length changes to

[JEE Main 2025 (Online) 29th January Evening Shift]

(1) 96 cm (2) 72 cm (3) 24 cm (4) 48 cm

Scan or tap for the full solution

Q.47 Two concave refracting surfaces of equal radii of curvature and refractive index 1.5 face each other in air as shown in figure. A point object O is placed midway, between P and B. The separation between the images of O, formed by each refracting surface is : [JEE Main 2025 (Online) 29th January Evening Shift]

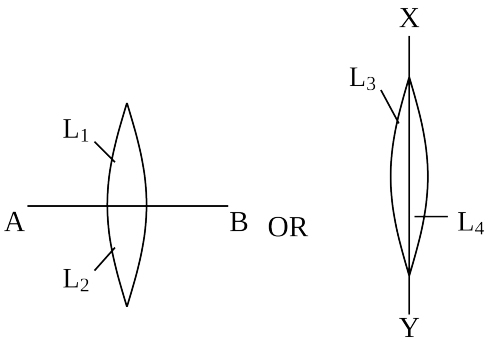


(1) 0.124R (2) 0.114R (3) 0.411R (4) 0.214R

Scan or tap for the full solution

Q.48 Two identical symmetric double convex lenses of focal length f are cut into two equal parts L_1, L_2 by AB plane and L_3, L_4 by XY plane as shown in figure respectively. The ratio of focal lengths of lenses L_1 and L_3 is

[JEE Main 2025 (Online) 29th January Evening Shift]



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

Scan or tap for the full solution

Q.49 A thin prism P_1 with angle 4° made of glass having refractive index 1.54, is combined with another thin prism P_2 made of glass having refractive index 1.72 to get dispersion without deviation. The angle of the prism P_2 in degrees is

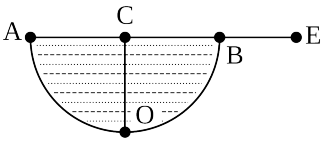
[JEE Main 2025 (Online) 28th January Morning Shift]

(1) 1.5 (2) 16/3 (3) 3 (4) 4

Scan or tap for the full solution

Q.50 A hemispherical vessel is completely filled with a liquid of refractive index μ. A small coin is kept at the lowest point (O) of the vessel as shown in figure. The minimum value of the refractive index of the liquid so that a person can see the coin from point E (at the level of the vessel) is _____.

[JEE Main 2025 (Online) 28th January Morning Shift]



(1) $\frac{3}{2}$ (2) $\frac{\sqrt{3}}{2}$ (3) $\sqrt{3}$ (4) $\sqrt{2}$

Scan or tap for the full solution

Q.51 A concave mirror produces an image of an object such that the distance between the object and image is 20 cm. If the magnification of the image is −3, then the magnitude of the radius of curvature of the mirror is :

[JEE Main 2025 (Online) 28th January Evening Shift]

(1) 3.75 cm (2) 15 cm
(3) 7.5 cm (4) 30 cm

Solution

Q.52 In a long glass tube, mixture of two liquids A and B with refractive indices 1.3 and 1.4 respectively, forms a convex refractive meniscus towards A. If an object placed at 13 cm from the vertex of the meniscus in A forms an image with a magnification of −2, then the radius of curvature of meniscus is :

[JEE Main 2025 (Online) 28th January Evening Shift]

(1) $\frac{2}{3}$ cm (2) $\frac{4}{3}$ cm (3) $\frac{1}{3}$ cm (4) 1 cm

Scan or tap for the full solution

Q.53 What is the relative decrease in focal length of a lens for an increase in optical power by 0.1 D from 2.5 D ? ['D' stands for dioptre]

[JEE Main 2025 (Online) 24th January Morning Shift]

(1) 0.04 (2) 0.1 (3) 0.40 (4) 0.01

Scan or tap for the full solution

Q.54 A thin plano convex lens made of glass of refractive index 1.5 is immersed in a liquid of refractive index 1.2. When the plane side of the lens is silver coated for complete reflection, the lens immersed in the liquid behaves like a concave mirror of focal length 0.2 m. The radius of curvature of the curved surface of the lens is

[JEE Main 2025 (Online) 24th January Morning Shift]

(1) 0.15 m (2) 0.10 m (3) 0.25 m (4) 0.20 m

Scan or tap for the full solution

Q.55 A plano-convex lens having radius of curvature of first surface 2 cm exhibits focal length of f_1 in air. Another plano-convex lens with first surface radius of curvature 3 cm has focal length of f_2 when it is immersed in a liquid of refractive index 1.2. If both the lenses are made of same glass of refractive index 1.5, the ratio of f_1 and f_2 will be

[JEE Main 2025 (Online) 24th January Morning Shift]

(1) 2:3 (2) 1:3 (3) 1:2 (4) 3:5

Scan or tap for the full solution

Q.56 A photograph of a landscape is captured by a drone camera at a height of 18 km. The size of the camera film is 2 cm × 2 cm and the area of the landscape photographed is 400 km^2. The focal length of the lens in the drone camera is :

[JEE Main 2025 (Online) 24th January Evening Shift]

(1) 2.8 cm (2) 0.9 cm (3) 2.5 cm (4) 1.8 cm

Scan or tap for the full solution

Q.57 What is the lateral shift of a ray refracted through a parallel-sided glass slab of thickness ' h ' in terms of the angle of incidence ' i ' and angle of refraction ' r ', if the glass slab is placed in air medium?

[JEE Main 2025 (Online) 23rd January Morning Shift]

(1) h (2) $\frac{h\cos(i-r)}{\sin r}$
(3) $\frac{h\tan(i-r)}{\tan r}$ (4) $\frac{h\sin(i-r)}{\cos r}$

Scan or tap for the full solution

Q.58 A spherical surface of radius of curvature R, separates air from glass (refractive index = 1.5). The centre of curvature is in the glass medium. A point object 'O' placed in air on the optic axis of the surface, so that its real image is formed at 'I' inside glass. The line OI intersects the spherical surface at P and PO = PI. The distance PO equals to

[JEE Main 2025 (Online) 23rd January Morning Shift]

(1) 5R (2) 2R (3) 1.5R (4) 3R

Scan or tap for the full solution

Q.59 Given a thin convex lens (refractive index μ_2), kept in a liquid (refractive index μ_1, $\mu_1 < \mu_2$) having radii of curvatures $|R_1|$ and $|R_2|$. Its second surface is silver polished. Where should an object be placed on the optic axis so that a real and inverted image is formed at the same place?

[JEE Main 2025 (Online) 23rd January Morning Shift]

(1) $\frac{(\mu_2+\mu_1)|R_1|}{(\mu_2-\mu_1)}$

(2) $\frac{\mu_1|R_1|\cdot|R_2|}{\mu_2(2|R_1|+|R_2|)-\mu_1\sqrt{|R_1|\cdot|R_2|}}$

(3) $\frac{\mu_1|R_1|\cdot|R_2|}{\mu_2(|R_1|+|R_2|)-\mu_1|R_1|}$

(4) $\frac{\mu_1|R_1|\cdot|R_2|}{\mu_2(|R_1|+|R_2|)-\mu_1|R_2|}$

Scan or tap for the full solution

Q.60 A concave mirror of focal length f in air is dipped in a liquid of refractive index μ. Its focal length in the liquid will be:

[JEE Main 2025 (Online) 23rd January Evening Shift]

(1) μf (2) f (3) $\frac{f}{\mu}$ (4) $\frac{f}{(\mu-1)}$

Scan or tap for the full solution

Q.61 The refractive index of the material of a glass prism is $\sqrt{3}$. The angle of minimum deviation is equal to the angle of the prism. What is the angle of the prism?

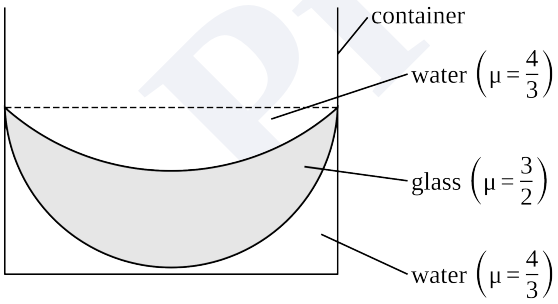
[JEE Main 2025 (Online) 23rd January Evening Shift]

(1) 60° (2) 50° (3) 58° (4) 48°

Scan or tap for the full solution

Q.62 In the diagram given below, there are three lenses formed. Considering negligible thickness of each of them as compared to $|R_1|$ and $|R_2|$, i.e., the radii of curvature for upper and lower surfaces of the glass lens, the power of the combination is

[JEE Main 2025 (Online) 22nd January Morning Shift]



(1) $-\frac{1}{6}\left(\frac{1}{|R_1|}-\frac{1}{|R_2|}\right)$ (2) $-\frac{1}{6}\left(\frac{1}{|R_1|}+\frac{1}{|R_2|}\right)$

(3) $\frac{1}{6}\left(\frac{1}{|R_1|}+\frac{1}{|R_2|}\right)$ (4) $\frac{1}{6}\left(\frac{1}{|R_1|}-\frac{1}{|R_2|}\right)$

Scan or tap for the full solution

Q.63 Given is a thin convex lens of glass (refractive index μ) and each side having radius of curvature R. One side is polished for complete reflection. At what distance from the lens, an object be placed on the optic axis so that the image gets formed on the object itself?

[JEE Main 2025 (Online) 22nd January Morning Shift]

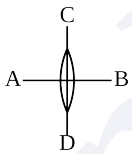
(1) R/μ (2) R/(2μ − 1)

(3) R/(2μ − 3) (4) μR

Scan or tap for the full solution

Q.64 A symmetric thin biconvex lens is cut into four equal parts by two planes AB and CD as shown in figure. If the power of original lens is 4D then the power of a part of the divided lens is

[JEE Main 2025 (Online) 22nd January Evening Shift]



(1) 2D (2) 8D (3) 4D (4) D

Scan or tap for the full solution

Q.65 Given below are two statements :

Statement-I: When an object is placed at the centre of curvature of a concave lens, image is formed at the centre of curvature of the lens on the other side.

Statement-II: Concave lens always forms a virtual and erect image.

In the light of the above statements, choose the correct answer from the options given below :

[JEE Main 2024 (Online) 9th April Morning Shift]

(1) Statement-I is false but Statement-II is true

(2) Both Statement-I and Statement-II are false

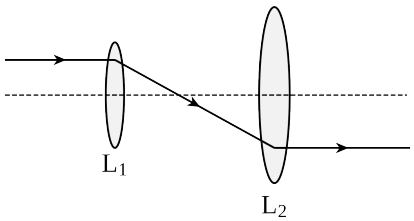
(3) Both Statement-I and Statement-II are true

(4) Statement-I is true but Statement-II is false

Scan or tap for the full solution

Q.66 The following figure represents two biconvex lenses L_1 and L_2 having focal length 10 cm and 15 cm respectively. The distance between L_1 & L_2 is :

[JEE Main 2024 (Online) 9th April Evening Shift]



(1) 25 cm (2) 35 cm (3) 10 cm (4) 15 cm

Scan or tap for the full solution

Q.67 Critical angle of incidence for a pair of optical media is 45°. The refractive indices of first and second media are in the ratio:

[JEE Main 2024 (Online) 8th April Morning Shift]

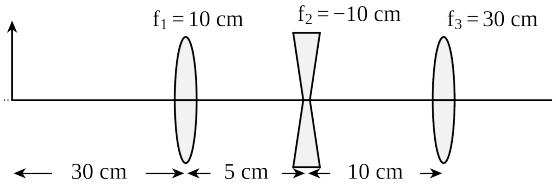
(1) 1:2 (2) $1:\sqrt{2}$

(3) 2:1 (4) $\sqrt{2}:1$

Scan or tap for the full solution

Q.68 The position of the image formed by the combination of lenses is :

[JEE Main 2024 (Online) 8th April Evening Shift]



(1) 15 cm (right of second lens)

(2) 30 cm (right of third lens)

(3) 30 cm (left of third lens)

(4) 15 cm (left of second lens)

Solution

Q.69 For the thin convex lens, the radii of curvature are at 15 cm and 30 cm respectively. The focal length of the lens is 20 cm. The refractive index of the material is :

[JEE Main 2024 (Online) 6th April Evening Shift]

(1) 1.2 (2) 1.5 (3) 1.4 (4) 1.8

Scan or tap for the full solution

Q.70 Given below are two statements :

Statement-I: When the white light passed through a prism, the red light bends lesser than yellow and violet.

Statement-II: The refractive indices are different for different wavelengths in dispersive medium.

In the light of the above statements, choose the correct answer from the options given below :

[JEE Main 2024 (Online) 5th April Evening Shift]

(1) Both Statement-I and Statement-II are true

(2) Statement-I is true but Statement-II is false

(3) Statement-I is false but Statement-II is true

(4) Both Statement-I and Statement-II are false

Scan or tap for the full solution

Q.71 An effective power of a combination of 5 identical convex lenses which are kept in contact along the principal axis is 25D. Focal length of each of the convex lens is:

[JEE Main 2024 (Online) 4th April Morning Shift]

(1) 50 cm (2) 20 cm (3) 25 cm (4) 500 cm

Scan or tap for the full solution

Q.72 The refractive index of a prism with apex angle A is $\cot A/2$. The angle of minimum deviation is :

[JEE Main 2024 (Online) 31st January Morning Shift]

(1) $\delta_m = 180° - 3A$ (2) $\delta_m = 180° - 4A$

(3) $\delta_m = 180° - 2A$ (4) $\delta_m = 180° - A$

Scan or tap for the full solution

Q.73 A convex mirror of radius of curvature 30 cm forms an image that is half the size of the object. The object distance is :

[JEE Main 2024 (Online) 29th January Morning Shift]

(1) −45 cm (2) −15 cm (3) 45 cm (4) 15 cm

Scan or tap for the full solution

Q.74 A biconvex lens of refractive index 1.5 has a focal length of 20 cm in air. Its focal length when immersed in a liquid of refractive index 1.6 will be:

[JEE Main 2024 (Online) 29th January Morning Shift]

(1) −16 cm (2) +16 cm

(3) +160 cm (4) −160 cm

Scan or tap for the full solution

Q.75 If the distance between object and its two times magnified virtual image produced by a curved mirror is 15 cm, the focal length of the mirror must be: [JEE Main 2024 (Online) 29th January Evening Shift]

(1) −10 cm (2) −12 cm (3) 15 cm (4) 10/3 cm

Scan or tap for the full solution

Q.76 If the refractive index of the material of a prism is $\cot\left(\frac{A}{2}\right)$, where A is the angle of prism then the angle of minimum deviation will be

[JEE Main 2024 (Online) 27th January Morning Shift]

(1) $\pi - 2A$ (2) $\frac{\pi}{2} - 2A$

(3) $\pi - A$ (4) $\frac{\pi}{2} - A$

Scan or tap for the full solution

Section B (Numerical) — 20 questions

Q.77 A concave mirror of focal length 10 cm forms an image which is double the size of object when the object is placed at two different positions. The distance between the two positions of the object is _____ cm.

[JEE Main 2026 (Online) 6th April Evening Shift]

Scan or tap for the full solution

Q.78 If sunlight is focused on a paper using convex lens, it starts burning the paper in shortest time when the lens is kept at 30 cm above the paper. If the radius of curvature of the lens is 60 cm then the refractive index of the lens material is $\frac{\alpha}{10}$. The value of α is _____. [JEE Main 2026 (Online) 2nd April Evening Shift]

Scan or tap for the full solution

Q.79 A convex lens of refractive index 1.5 and focal length f = 18 cm is immersed in water. The difference in focal lengths of the given lens when it is in water and in air is α × f. The value of α is ____. (refractive index of water = 4/3)

[JEE Main 2026 (Online) 28th January Morning Shift]

Scan or tap for the full solution

Q.80 The size of the images of an object, formed by a thin lens are equal when the object is placed at two different positions 8 cm and 24 cm from the lens. The focal length of the lens is _____ cm.

[JEE Main 2026 (Online) 23rd January Evening Shift]

Scan or tap for the full solution

Q.81 A parallel beam of light travelling in air (refractive index 1.0) is incident on a convex spherical glass surface of radius of curvature 50 cm. Refractive index of glass is 1.5. The rays converge to a point at a distance x cm from the centre of curvature of the spherical surface. The value of x is _____ cm.

[JEE Main 2026 (Online) 22nd January Morning Shift]

Scan or tap for the full solution

Q.82 In a microscope the objective is having focal length f_o = 2 cm and eye-piece is having focal length f_e = 4 cm. The tube length is 32 cm. The magnification produced by this microscope for normal adjustment is _____.

[JEE Main 2026 (Online) 21st January Morning Shift]

Scan or tap for the full solution

Q.83 A collimated beam of light of diameter 2 mm is propagating along x-axis. The beam is required to be expanded in a collimated beam of diameter 14 mm using a system of two convex lenses. If first lens has focal length 40 mm, then the focal length of second lens is _____ mm.

[JEE Main 2026 (Online) 21st January Morning Shift]

Scan or tap for the full solution

Q.84 A container contains a liquid with refractive index of 1.2 up to a height of 60 cm and another liquid having refractive index 1.6 is added to height H above first liquid. If viewed from above, the apparent shift in the position of bottom of container is 40 cm. The value of H is _____ cm. (Consider liquids are immiscible)

[JEE Main 2025 (Online) 7th April Morning Shift]

Scan or tap for the full solution

Q.85 Distance between object and its image (magnified by $-\frac{1}{3}$) is 30 cm. The focal length of the mirror used is $\left(\frac{x}{4}\right)$cm, where magnitude of value of x is _____. [JEE Main 2025 (Online) 4th April Morning Shift]

Scan or tap for the full solution

Q.86 Light from a point source in air falls on a spherical glass surface (refractive index, μ = 1.5 and radius of curvature = 50 cm). The image is formed at a distance of 200 cm from the glass surface inside the glass. The magnitude of distance of the light source from the glass surface is _____ m.

[JEE Main 2025 (Online) 3rd April Evening Shift]

Scan or tap for the full solution

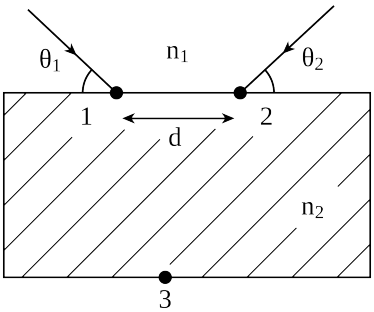
Q.87 A ray of light suffers minimum deviation when incident on a prism having angle of the prism equal to 60°. The refractive index of the prism material is $\sqrt{2}$. The angle of incidence (in degrees) is _____

[JEE Main 2025 (Online) 2nd April Evening Shift]

Scan or tap for the full solution

Q.88 Two light beams fall on a transparent material block at point 1 and 2 with angle θ_1 and θ_2, respectively, as shown in figure. After refraction, the beams intersect at point 3 which is exactly on the interface at other end of the block. Given : the distance between 1 and 2, $d = 4\sqrt{3}$ cm and $\theta_1 = \theta_2 = \cos^{-1}\left(\frac{n_2}{2n_1}\right)$, where refractive index of the block n_2 > refractive index of the outside medium n_1, then the thickness of the block is _____ cm.

[JEE Main 2025 (Online) 29th January Morning Shift]



Scan or tap for the full solution

Q.89 The driver sitting inside a parked car is watching vehicles approaching from behind with the help of his side view mirror, which is a convex mirror with radius of curvature R = 2 m. Another car approaches him from behind with a uniform speed of 90 km/hr. When the car is at a distance of 24 m from him, the magnitude of the acceleration of the image of the car in the side view mirror is ' a '. The value of 100a is _____ m/s^2.

[JEE Main 2025 (Online) 22nd January Morning Shift]

Scan or tap for the full solution

Q.90 The refractive index of prism is $\mu = \sqrt{3}$ and the ratio of the angle of minimum deviation to the angle of prism is one. The value of angle of prism is _____°.

[JEE Main 2024 (Online) 6th April Morning Shift]

Scan or tap for the full solution

Q.91 A light ray is incident on a glass slab of thickness $4\sqrt{3}$ cm and refractive index $\sqrt{2}$. The angle of incidence is equal to the critical angle for the glass slab with air. The lateral displacement of ray after passing through glass slab is _____ cm.
(Given $\sin 15° = 0.25$)

[JEE Main 2024 (Online) 4th April Evening Shift]

Scan or tap for the full solution

Q.92 The distance between object and its 3 times magnified virtual image as produced by a convex lens is 20 cm. The focal length of the lens used is _____ cm.

[JEE Main 2024 (Online) 1st February Morning Shift]

Scan or tap for the full solution

Q.93 Light from a point source in air falls on a convex curved surface of radius 20 cm and refractive index 1.5. If the source is located at 100 cm from the convex surface, the image will be formed at _____ cm from the object.

[JEE Main 2024 (Online) 31st January Evening Shift]

Scan or tap for the full solution

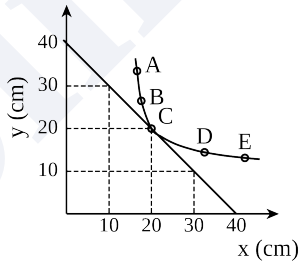
Q.94 The distance between object and its two times magnified real image as produced by a convex lens is 45 cm. The focal length of the lens used is _____ cm.

[JEE Main 2024 (Online) 30th January Morning Shift]

Scan or tap for the full solution

Q.95 In an experiment to measure the focal length (f) of a convex lens, the magnitude of object distance (x) and the image distance (y) are measured with reference to the focal point of the lens. The y-x plot is shown in figure.
The focal length of the lens is _____ cm.

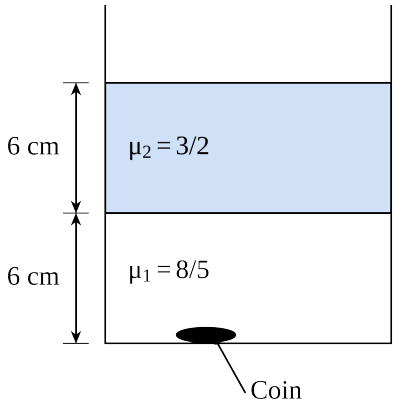
[JEE Main 2024 (Online) 30th January Evening Shift]



Scan or tap for the full solution

Q.96 Two immiscible liquids of refractive indices $\frac{8}{5}$ and $\frac{3}{2}$ respectively are put in a beaker as shown in the figure. The height of each column is 6 cm. A coin is placed at the bottom of the beaker. For near normal vision, the apparent depth of the coin is $\frac{\alpha}{4}$ cm. The value of α is _____.

[JEE Main 2024 (Online) 27th January Morning Shift]



Scan or tap for the full solution

ANSWER KEY

Section A (MCQ) — 76 questions

Ques.	1	2	3	4	5	6	7
Ans.	**1**	**1**	**1**	**3**	**2**	**1**	**1**
Ques.	8	9	10	11	12	13	14
Ans.	**2**	**2**	**4**	**2**	**1**	**4**	**2**
Ques.	15	16	17	18	19	20	21
Ans.	**1**	**2**	**1**	**3**	**4**	**3**	**2**
Ques.	22	23	24	25	26	27	28
Ans.	**4**	**1, 2, 3**	**2**	**4**	**3**	**3**	**2**
Ques.	29	30	31	32	33	34	35
Ans.	**2**	**4**	**3**	**2**	**3**	**2**	**4**
Ques.	36	37	38	39	40	41	42
Ans.	**4**	**4**	**3**	**2**	**3**	**3**	**2**
Ques.	43	44	45	46	47	48	49
Ans.	**2**	**4**	**—**	**1**	**2**	**1**	**3**
Ques.	50	51	52	53	54	55	56
Ans.	**4**	**2**	**1**	**1**	**2**	**2**	**4**
Ques.	57	58	59	60	61	62	63
Ans.	**4**	**1**	**4**	**2**	**1**	**1**	**2**
Ques.	64	65	66	67	68	69	70
Ans.	**1**	**2**	**1**	**4**	**2**	**2**	**1**
Ques.	71	72	73	74	75	76	
Ans.	**2**	**3**	**2**	**4**	**1**	**1**	

Section B (Numerical) — 20 questions

Ques.	77	78	79	80	81	82	83
Ans.	**10**	**20**	**3**	**16**	**100**	**100**	**280**
Ques.	84	85	86	87	88	89	90
Ans.	**80**	**45**	**4**	**45**	**6**	**8**	**60**
Ques.	91	92	93	94	95	96	
Ans.	**2**	**15**	**200**	**10**	**20**	**31**	

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