

JEE MAIN RAY OPTICS AND OPTICAL INSTRUMENTS — REFRACTION AT SPHERICAL SURFACES, THIN LENSES AND LENS MAKER'S FORMULA — PYQS

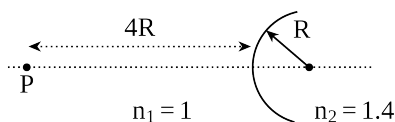
Max. Marks: 104

Questions: 26

Section A (MCQ) — 21 questions

- Q.1** 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.2** 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 ____.

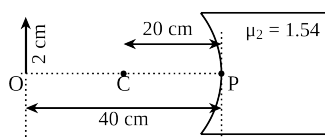
[JEE Main 2026 (Online) 4th April Evening Shift]

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

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full solution


- Q.3** 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

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full solution


- Q.4** 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.5** 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.6** 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]

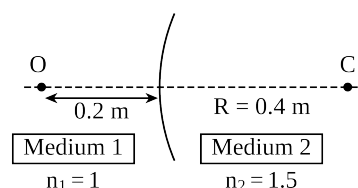
- (1) 355 mm (2) 655 mm
 (3) 288 mm (4) 555 mm

 Scan or tap for the
full solution


- Q.7** 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.8**

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]

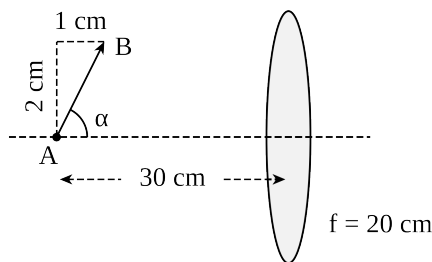
- (1) 0.24 m left to the spherical surface
- (2) 0.24 m right to the spherical surface
- (3) 0.4 m left to the spherical surface
- (4) 0.4 m right to the spherical surface

Scan or tap for the full solution



Q.9 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) $+45^\circ$

Scan or tap for the full solution



Q.10 A bi-convex lens has radius of curvature of both the surfaces same as $\frac{1}{6}$ 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]

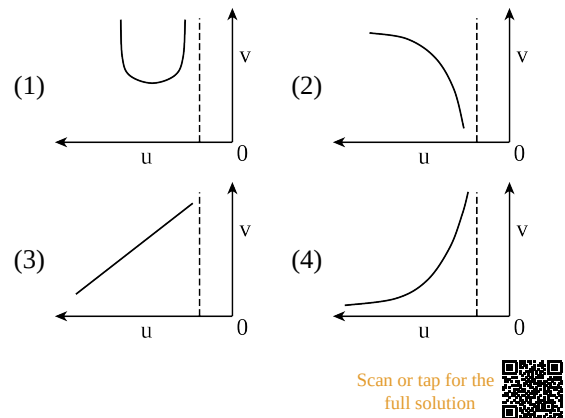
- (1) $\frac{1}{3}$ cm and $\frac{1}{7}$ cm
- (2) $\frac{1}{5}$ cm and $\frac{1}{7}$ cm
- (3) $\frac{1}{3}$ cm and $\frac{1}{3}$ cm
- (4) $\frac{1}{6}$ cm and $\frac{1}{9}$ cm

Scan or tap for the full solution



Q.11 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]



Scan or tap for the full solution



Q.12 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]

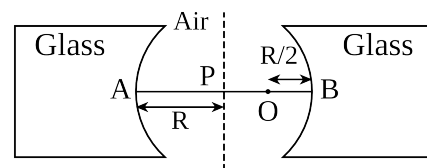
- (1) 96 cm
- (2) 72 cm
- (3) 24 cm
- (4) 48 cm

Scan or tap for the full solution



Q.13 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]



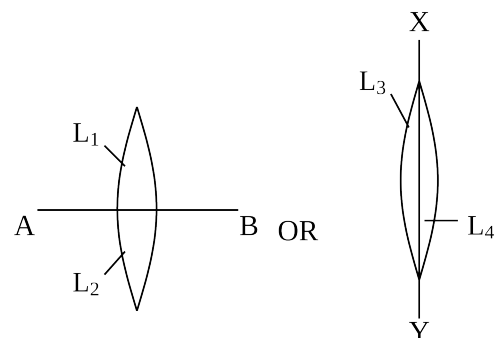
- (1) $0.124R$
- (2) $0.114R$
- (3) $0.411R$
- (4) $0.214R$

Scan or tap for the full solution



Q.14 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.15** 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.16** 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.17** 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.18** 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 $\times$ 2 cm and the area of the landscape photographed is 400 km². 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.19** 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.20** 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.21** 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) $R/(2\mu-1)$
 (3) $R/(2\mu-3)$ (4) μR

Scan or tap for the full solution



Section B (Numerical) — 5 questions

- Q.22** 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.23** 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 $\alpha \times f$. The value of α is _____. (refractive index of water = $4/3$)

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

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- Q.24** 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]

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full solution



- Q.25** 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]

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full solution



- Q.26** Light from a point source in air falls on a spherical glass surface (refractive index, $\mu = 1.5$ 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]

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full solution



ANSWER KEY

Section A (MCQ) — 21 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	1	4	1	2	3	3	3	3	3	2	4
Ques.	12	13	14	15	16	17	18	19	20	21	
Ans.	1	2	1	1	2	2	4	1	4	2	

Section B (Numerical) — 5 questions

Ques.	22	23	24	25	26		
Ans.	20	3	16	100	4		