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EdLoop JEE

PHYSICS · JEE MAIN

Ray Optics

Previous Year Questions with answers

278 questions · **184** papers · **2002–2026** · newest paper first

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What is in this PDF: every Ray Optics question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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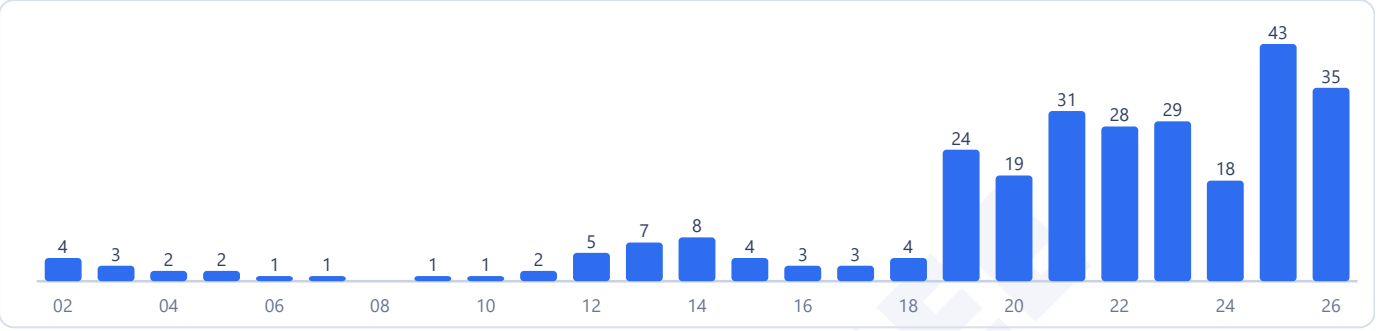
Chapter at a glance

5%	278	150 of 162	214 / 64
of Physics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Rising: 1.7 questions per paper in 2024–2026 against 1.3 in 2019–2023.

Questions per year



Counts are the questions we hold: 278 in 184 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)

Lenses	88
Refraction	77
Reflection & Mirrors	43
Prism & Dispersion	40
Optical Instruments	30

How often it comes up

Ray optics investigates geometric image formation under Unit 16: Optics in the Class 12 physics syllabus, holding rank 6 among all 29 physics chapters with a 5.0 percent share of the subject. During the modern computer-based testing era from 2019 to 2026, ray optics supplied 227 questions in 162 test papers, delivering an average of 1.4 problems per sitting. The chapter appeared in 150 of those 162 test papers, with questions featured in every single exam year. Over the recent 2024 to 2026 cycle, its testing frequency has risen significantly: candidates encountered 96 questions across 58 papers, achieving a rate of 1.7 questions per paper and a 6.2 percent share. This demonstrates a trend that is up compared to the 3.8 percent share recorded from 51 questions in the 2002 to 2018 testing window. In the 2026 exam season alone, examiners set 35 questions across 19 papers, with problems appearing in 19 separate sessions. Across the 2019 to 2026 timeframe, 64 questions were structured as numerical answer questions, meaning students regularly calculate focal lengths, image positions, and magnifications without multiple choices.

Most-asked topics

The question pool spans five distinct geometric optics themes:

- **Lenses**: 88 questions historically, with 75 appearing between 2019 and 2026, tested up to 2026. This topic emphasizes thin lens formula applications, lens maker's equation, combinations of lenses in contact or separated by finite distances, silvered lenses, and beam expanders.
- **Refraction**: 77 problems overall, including 63 from 2019 to 2026, continuing into 2026. Focus areas involve Snell's law at planar and spherical interfaces, apparent depth, critical angle, total internal reflection, and optical fiber transmission.

- **Reflection & Mirrors**: 43 lifetime problems, with 36 asked between 2019 and 2026, tested in 2026. Concepts examine concave and convex spherical mirror formulas, magnification ratios, and real or virtual image placement.
- **Prism & Dispersion**: 40 questions since 2002, with 34 from 2019 to 2026, tested through 2026. Problems evaluate angle of minimum deviation, grazing incidence and emergence, thin prism combinations for dispersion without deviation, and prism refractive indices.
- **Optical Instruments**: 30 questions overall, including 19 between 2019 and 2026, tested in 2026. Questions explore magnifying power and tube length for compound microscopes and astronomical telescopes under normal adjustment and least distance of distinct vision.

What the questions look like

JEE Main problems in ray optics present geometric ray paths requiring Cartesian coordinate conventions and algebraic substitutions:

- **Prisms with grazing emergence**: A light ray passes through a triangular prism and emerges along the boundary face at ninety degrees to the normal. Students apply Snell's law across both faces to find the refracting angle or refractive index.
- **Optical microscope magnification**: Given the focal lengths of objective and eyepiece lenses alongside the overall tube length, candidates calculate magnifying power under specified viewing conditions.
- **Beam expansion through two convex lenses**: A narrow parallel laser beam widens after passing coaxially through two positive lenses separated by the sum of their focal lengths.
- **Wavelength and speed shifts across media**: Calculating the altered wavelength or critical angle as monochromatic light travels between water and higher index glass media.

How to practise it

Enforce strict Cartesian sign conventions from the start. Taking the direction of incident light as the positive coordinate axis prevents sign errors in mirror and lens equations. Remember that focal lengths of concave mirrors and concave lenses are negative, while those of convex mirrors and convex lenses are positive.

Master the single spherical surface refraction formula. The lens maker formula derives directly from two successive refractions at spherical boundaries, so understanding surface curvature signs helps solve composite lenses and liquid container problems.

For optical instruments, focus on normal adjustment where the final image forms at infinity, and the case where the image forms at twenty-five centimeters. Learn the magnifying power formulas for both telescopes and microscopes, noting whether the tube length equals the sum of focal lengths or includes image distance.

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Q1 JEE Main 2026 · 8 Apr · Shift 2 MCQ

A thin biconvex lens is prepared from the glass ($\mu = 1.5$) 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.

(A) 10

(B) 12.5

(C) 13

(D) 13.5

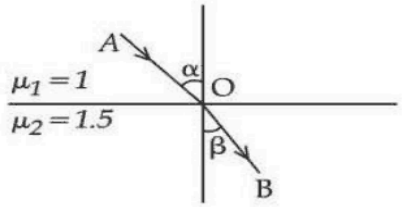
Answer: (A) 10 · Official NTA final key

Q2 JEE Main 2026 · 8 Apr · Shift 2 MCQ

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

(see the figure above)

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



Options :

6911211935. 1.6

6911211936. 0.16

6911211937. 11.6

6911211938. 16

(A) 1.6

(B) 0.16

(C) 11.6

(D) 16

Answer: (A) 1.6 · Official NTA final key

Q3 JEE Main 2026 · 8 Apr · Shift 2 Numerical

Some distant star is to be observed by some telescope of diameter of objective lens a, at an angular resolution of 3.0×10^{-7} radian. If the wavelength of light from the star reaching the telescope is 500 nm, the minimum diameter of the objective lens of the telescope is _____ cm. (nearest interger)

Numerical value type: the answer is a number.

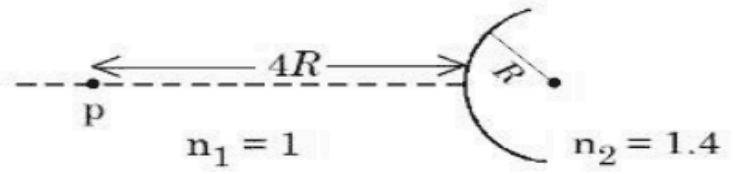
Answer: 203. · Official NTA final key

Q4 JEE Main 2026 · 6 Apr · Shift 1 MCQ

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 _____.

(see the figure above)

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 _____.



Options :

6952787641. 1.66

6952787642. 2.33

6952787643. 2.66

6952787644. 1.33

(A) 1.66
(B) 2.33
(C) 2.66
(D) 1.33

Answer: (A) 1.66 · Official NTA final key

Q5 JEE Main 2026 · 6 Apr · Shift 2 MCQ

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 _____.

(A) 1.5
(B) $\sqrt{3}$
(C) $\sqrt{2}$
(D) 1.65

Answer: (C) $\sqrt{2}$ · Official NTA final key

Q6 JEE Main 2026 · 6 Apr · Shift 2 Numerical

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.

Numerical value type: the answer is a number.

Answer: 10. · Official NTA final key

Q7 JEE Main 2026 · 5 Apr · Shift 1 MCQ

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.

(A) 45
(B) 30
(C) 28
(D) 58

Answer: (B) 30 · Official NTA final key

Q8 JEE Main 2026 · 5 Apr · Shift 1 MCQ

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

(A) increased two times
(B) increased $\frac{3}{2}$ times
(C) decreased two times
(D) decreased $\frac{3}{2}$ times

Answer: (A) increased two times · Official NTA final key

Q9 JEE Main 2026 · 5 Apr · Shift 2 MCQ

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 ?

(A) behaves as concave lens if $|f_{\text{convex}}| > |f_{\text{concave}}|$
(B) behaves as concave lens if $|f_{\text{convex}}| < |f_{\text{concave}}|$
(C) behaves as convex lens if $|f_{\text{convex}}| > |f_{\text{concave}}|$
(D) Focal length of the lens system will change if the positions of two lenses are interchanged

Answer: (A) behaves as concave lens if $|f_{\text{convex}}| > |f_{\text{concave}}|$ · Official NTA final key

Q10 JEE Main 2026 · 5 Apr · Shift 2 MCQ

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 _____.

(A) virtual, formed at 7.5 cm right of lens Q, with a size bigger than that of AB
(B) real, formed at 7.5 cm right of lens Q, with a size same as that of AB
(C) formed at infinity.
(D) real, formed at 7 cm right of lens Q, with a size smaller than that of AB

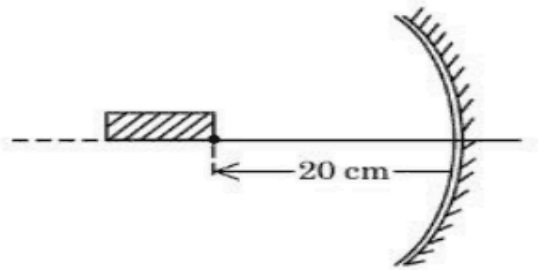
Answer: (B) real, formed at 7.5 cm right of lens Q, with a size same as that of AB · Official NTA final key

Q11 JEE Main 2026 · 4 Apr · Shift 1 MCQ

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

(see the figure above)

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



Options :

695278903. 2.5

695278904. 5

695278905. 7.5

695278906. 7

(A) 2.5
(B) 5
(C) 7.5
(D) 7

Answer: (B) 5 · Official NTA final key

Q12 JEE Main 2026 · 4 Apr · Shift 2 MCQ

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 _____.

(A) 0.5
(B) 2.5
(C) 0.8
(D) 1.25

Answer: (D) 1.25 · Official NTA final key

Q13 JEE Main 2026 · 2 Apr · Shift 1 MCQ

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

(A) $3:4$
(B) $3:2$
(C) $2:1$
(D) $1:2$

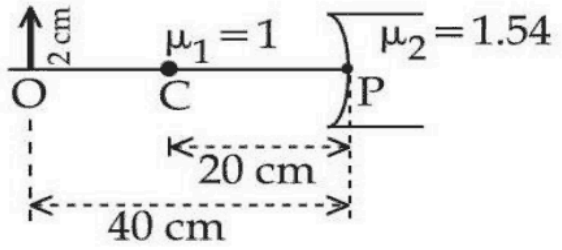
Answer: (B) $3:2$ · Official NTA final key

Q14 JEE Main 2026 · 2 Apr · Shift 1 MCQ

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.

(see the figure above)

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.



Options :

691121146. 1

691121147. 0.5

691121148. 1.2

691121149. 0.25

(A) 1
(B) 0.5
(C) 1.2
(D) 0.25

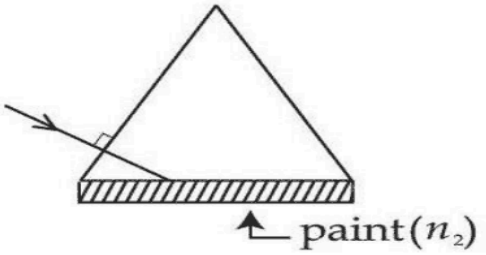
Answer: (A) 1 · Official NTA final key

Q15 JEE Main 2026 · 2 Apr · Shift 2 MCQ

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 _____.

(see the figure above)

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 _____.



Options :

691121656. $3\sqrt{3}/1.6$

691121657. $\sqrt{3}$

691121658. $3.2/\sqrt{3}$

691121659. $4\sqrt{3}/5$

(A) $3\sqrt{3}/1.6$
(B) $\sqrt{3}$
(C) $3.2/\sqrt{3}$
(D) $4\sqrt{3}/5$

Answer: (D) $4\sqrt{3}/5$ · Official NTA final key

Q16 JEE Main 2026 · 2 Apr · Shift 2 Numerical

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 _____.

Numerical value type: the answer is a number.

Answer: 20. · Official NTA final key

Q17 JEE Main 2026 · 28 Jan · Shift 1 MCQ

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 _____.

(A) 5 : 2
(B) 5 : 12
(C) 12 : 5
(D) 2 : 5

Answer: (A) 5 : 2 · Official NTA final key

Q18 JEE Main 2026 · 28 Jan · Shift 1 · Numerical

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)

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q19 JEE Main 2026 · 28 Jan · Shift 2 · MCQ

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

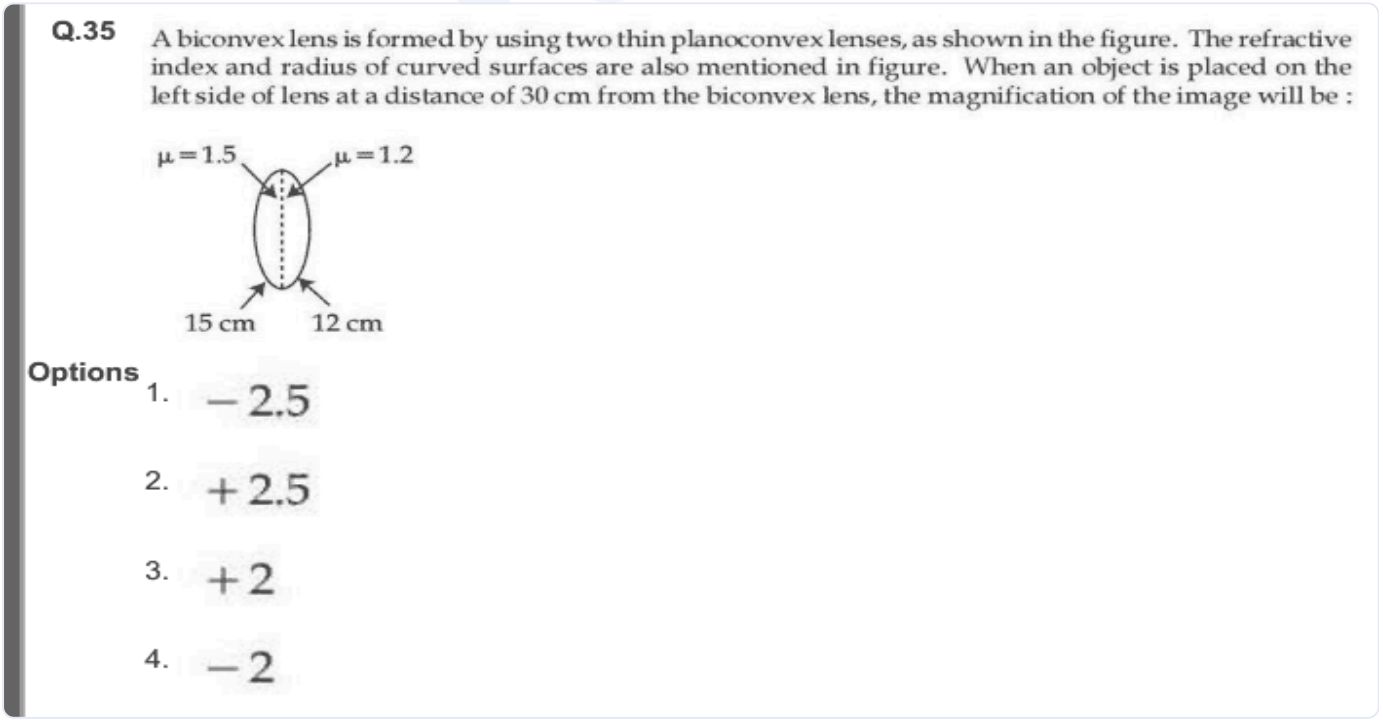
(A) $\sqrt{2} < n < 2$
(B) $\sqrt{2} < n < 2\sqrt{2}$
(C) $n \geq 2$
(D) $1 < n < 2$

Answer: (A) $\sqrt{2} < n < 2$ · Official NTA final key

Q20 JEE Main 2026 · 28 Jan · Shift 2 · MCQ

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 :

(see the figure above)



(A) -2.5
(B) $+2.5$
(C) $+2$
(D) -2

Answer: (D) -2 · Official NTA final key

Q21 JEE Main 2026 · 24 Jan · Shift 1 MCQ

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 _____.

(A) 30°
(B) 60°
(C) 15°
(D) 45°

Answer: (B) 60° · Official NTA final key

Q22 JEE Main 2026 · 24 Jan · Shift 1 MCQ

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

(A) 4
(B) 5
(C) 3.5
(D) 2

Answer: (D) 2 · Official NTA final key

Q23 JEE Main 2026 · 24 Jan · Shift 2 MCQ

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

(A) $-15/2$
(B) -10
(C) -20
(D) -15

Answer: (D) -15 · Official NTA final key

Q24 JEE Main 2026 · 24 Jan · Shift 2 MCQ

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

(A) Readings recorded by P_4 and P_5 persons are incorrect
(B) Readings recorded by P_3 and P_2 persons are incorrect
(C) Readings recorded by all persons are correct
(D) Readings recorded by P_3 person are incorrect

Answer: (D) Readings recorded by P_3 person are incorrect · Official NTA final key

Q25 JEE Main 2026 · 23 Jan · Shift 1 MCQ

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 _____.

(A) 4.5°
(B) 5°
(C) 4°
(D) 6°

Answer: (C) 4° · Official NTA final key

Q26 JEE Main 2026 · 23 Jan · Shift 1 MCQ

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 :

(A) $\sin^{-1}\left(\frac{9}{8}\right)$
(B) $\cos^{-1}\left(\frac{8}{9}\right)$
(C) $\tan^{-1}\left(\frac{8}{\sqrt{17}}\right)$
(D) $\cot^{-1}\left(\frac{3}{\sqrt{13}}\right)$

Answer: (C) $\tan^{-1}\left(\frac{8}{\sqrt{17}}\right)$ · Official NTA final key

Q27 JEE Main 2026 · 23 Jan · Shift 2 MCQ

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 _____.

($\sin 15^\circ = 0.25$ and $\sin 25^\circ = 0.43$)

(A) $> 25^\circ$
(B) 15°
(C) between 15° and 20°
(D) $< 15^\circ$

Options (2) or (3) or (4) were accepted. More than one answer was accepted. · Official NTA final key

Q28 JEE Main 2026 · 23 Jan · Shift 2 Numerical

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.

Numerical value type: the answer is a number.

Answer: 16. · Official NTA final key

Q29 JEE Main 2026 · 22 Jan · Shift 1 MCQ

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 _____.

(A) 15°
(B) 40°
(C) 20°
(D) 30°

Answer: (A) 15° · Official NTA final key

Q30 JEE Main 2026 · 22 Jan · Shift 1 MCQ

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 lead to a change in magnification of total lens system to m_2. The value of $\left|\frac{m_1}{m_2}\right|$ is _____.

(A) $\frac{25}{27}$
(B) $\frac{3}{2}$
(C) $\frac{5}{27}$
(D) $\frac{5}{9}$

Dropped by NTA. Full marks to everyone. · Official NTA final key

Q31 JEE Main 2026 · 22 Jan · Shift 1 Numerical

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 the curvature of the spherical surface. The value of x is _____ cm.

Numerical value type: the answer is a number.

Answer: 100. · Official NTA final key

Q32 JEE Main 2026 · 22 Jan · Shift 2 MCQ

The wavelength of light, while it is passing through water is 540 nm. The refractive index of water is $\frac{4}{3}$. The wavelength of the same light when it is passing through a transparent medium having refractive index of $\frac{3}{2}$ is _____ nm.

(A) 480
(B) 840
(C) 380
(D) 540

Answer: (A) 480 · Official NTA final key

Q33 JEE Main 2026 · 21 Jan · Shift 1 Numerical

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 _____.

Numerical value type: the answer is a number.

Answer: 100. · Official NTA final key

Q34 JEE Main 2026 · 21 Jan · Shift 1 Numerical

A collimated beam of light of diameter 2 mm is propagating along x-axis. The beam is required to be expanded into 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.

Numerical value type: the answer is a number.

Answer: 280. · Official NTA final key

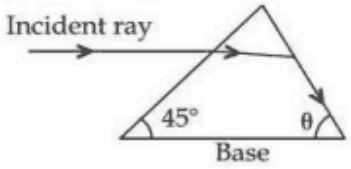
Q35 JEE Main 2026 · 21 Jan · Shift 2 MCQ

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

(see the figure above)

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

Q.34 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.

Options

1. $90°$
2. $45°$
3. $75°$
4. $60°$

(A) 90°
(B) 45°
(C) 75°
(D) 60°

Answer: (D) 60° · Official NTA final key

Q36 JEE Main 2025 · 8 Apr · Shift 2 MCQ

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 _____.

(A) 30
(B) 45
(C) 15
(D) $\frac{60}{7}$

Answer: (C) 15 · Key from source paper

Q37 JEE Main 2025 · 8 Apr · Shift 2 MCQ

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

(A) $\frac{700}{11}$ cm
(B) $\frac{600}{11}$ cm
(C) $\frac{800}{11}$ cm
(D) $\frac{500}{11}$ cm

Answer: (B) $\frac{600}{11}$ cm · Key from source paper

Q38 JEE Main 2025 · 7 Apr · Shift 1 MCQ

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)

(A) 288 mm
(B) 655 mm
(C) 355 mm
(D) 555 mm

Answer: (A) 288 mm · Key from source paper

Q39 JEE Main 2025 · 7 Apr · Shift 1 MCQ

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

(A) 20 D
(B) 10 D
(C) 5 D
(D) 1 D

Answer: (B) 10 D · Key from source paper

Q40 JEE Main 2025 · 7 Apr · Shift 1 Numerical

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)

Numerical value type: the answer is a number.

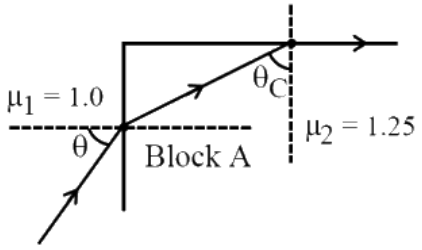
Answer: 80. · Key from source paper

Q41 JEE Main 2025 · 7 Apr · Shift 2 MCQ

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

(see the figure above)

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



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

(A) $\tan^{-1}(4/3)$
(B) $\cos^{-1}(3/4)$
(C) $\sin^{-1}(3/4)$
(D) $\tan^{-1}(3/4)$

Answer: (C) $\sin^{-1}(3/4)$ · Key from source paper

Q42 JEE Main 2025 · 7 Apr · Shift 2 MCQ

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 proportionate 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 :

(A) (A) is correct but (R) is not correct
(B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(C) (A) is not correct but (R) is correct
(D) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Answer: (A) (A) is correct but (R) is not correct · Key from source paper

Q43 JEE Main 2025 · 7 Apr · Shift 2 MCQ

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

(A) 10 cm
(B) 15 cm
(C) 12.7 cm
(D) 10.7 cm

Answer: (D) 10.7 cm · Key from source paper

Q44 JEE Main 2025 · 4 Apr · Shift 1 MCQ

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 :

(A) 20 cm towards the mirror.
(B) 40 cm away from the mirror.
(C) 80 cm away from the mirror.
(D) 20 cm away from the mirror.

Answer: (B) 40 cm away from the mirror. · Key from source paper

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Q45 JEE Main 2025 · 4 Apr · Shift 1 Numerical

Distance between object and its image (magnified by $-\frac{1}{3}$) is 30 cm . The focal length of the mirror 74 used is $\left|\left(\frac{x}{4}\right)\right|$cm , where magnitude of value of x is _____

Numerical value type: the answer is a number.

Answer: 45. · Key from source paper

Q46 JEE Main 2025 · 4 Apr · Shift 2 MCQ

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 :

(A) 7.5 cm
(B) 22.5 cm
(C) 45 cm
(D) 15 cm

Answer: (A) 7.5 cm · Key from source paper

Q47 JEE Main 2025 · 3 Apr · Shift 1 MCQ

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 becomes 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:

(A) B, D and E Only
(B) B, C and D Only
(C) A, C and D Only
(D) A, B and E Only

Answer: (C) A, C and D Only · Key from source paper

Q48 JEE Main 2025 · 3 Apr · Shift 1 MCQ

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

(A) 1.8
(B) 1.4
(C) 1.5
(D) 1.2

Answer: (C) 1.5 · Key from source paper

Q49 JEE Main 2025 · 3 Apr · Shift 2 MCQ

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

(A) 500 nm
(B) 400 nm
(C) 300 nm
(D) 600 nm

Answer: (C) 300 nm · Key from source paper

Q50 JEE Main 2025 · 3 Apr · Shift 2 Numerical

Light from a point source in air falls on a spherical glass surface (refractive index, $\mu = 1.5$ and radius of curvature $= 50cm$). 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.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

EdLoop JEE

Q51 JEE Main 2025 · 2 Apr · Shift 1 MCQ

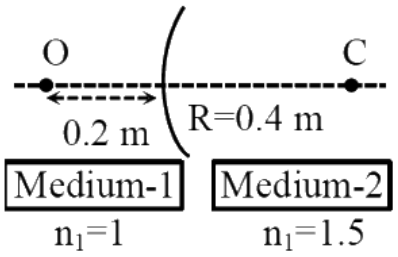
A spherical surface separates two media of refractive indices 1 and 1.5 as shown in figure. Distance of the image of an object ' O ', is :

(C is the center of curvature of the spherical surface and R is the radius of curvature)

(see the figure above)

1. 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)



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

(A) 0.24 m left to the spherical surface
(B) 0.4 m right to the spherical surface
(C) 0.24 m right to the spherical surface
(D) 0.4 m left to the spherical surface

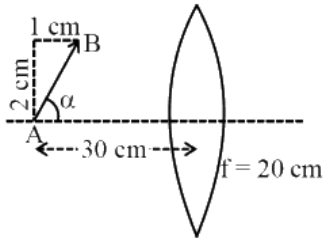
Answer: (D) 0.4 m left to the spherical surface · Key from source paper

Q52 JEE Main 2025 · 2 Apr · Shift 1 MCQ

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 :

(see the figure above)

16. 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 :



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

(A) -45°
(B) $-\frac{\alpha}{2}$
(C) $+45^\circ$
(D) $-\alpha$

Answer: (A) -45° · Key from source paper

Q53 JEE Main 2025 · 2 Apr · Shift 2 MCQ

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 :

(A) 1 / 3
(B) 1 / 2
(C) 3
(D) 2

Answer: (B) 1 / 2 · Key from source paper

Q54 JEE Main 2025 · 2 Apr · Shift 2 MCQ

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

(A) $\frac{1}{5}cm$ and $\frac{1}{7}cm$
(B) $\frac{1}{3}cm$ and $\frac{1}{3}cm$
(C) $\frac{1}{6}cm$ and $\frac{1}{9}cm$
(D) $\frac{1}{3}cm$ and $\frac{1}{7}cm$

Answer: (A) $\frac{1}{5}cm$ and $\frac{1}{7}cm$ · Key from source paper

Q55 JEE Main 2025 · 2 Apr · Shift 2 Numerical

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 _____

Numerical value type: the answer is a number.

Answer: 45. · Key from source paper

Q56 JEE Main 2025 · 29 Jan · Shift 1 MCQ

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

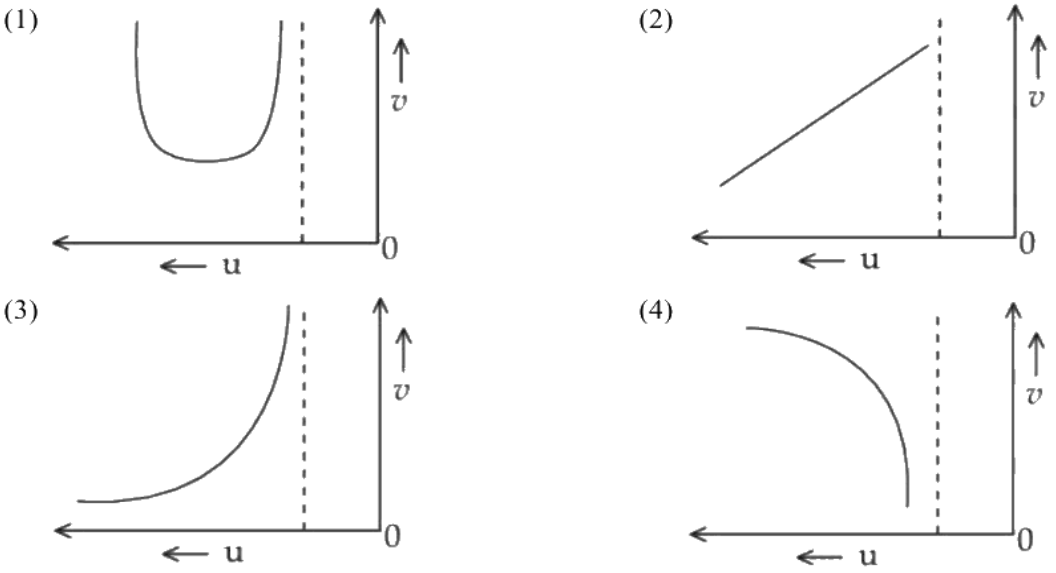
(A) $\sin^{-1}\left(\frac{1}{6}\right)$
(B) $\sin^{-1}\left(\frac{1}{3}\right)$
(C) $\sin^{-1}\left(\frac{-5}{6}\right)$
(D) $\sin^{-1}\left(\frac{2}{3}\right)$

Answer: (C) $\sin^{-1}\left(\frac{-5}{6}\right)$ · Key from source paper

Q57 JEE Main 2025 · 29 Jan · Shift 1 MCQ

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**| >, is

Q36. 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 $|\mathbf{u}|$ >, is



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

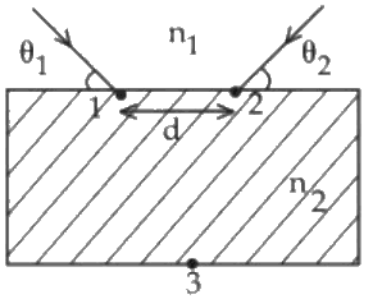
Answer: (C) · Key from source paper

Q58 JEE Main 2025 · 29 Jan · Shift 1 Numerical

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.

(see the figure above)

Q48. Two light beams fall on a transparent material block at point 1 and 2 with angle θ_1 and $\theta_{2'}$ 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.

Numerical value type: the answer is a number.

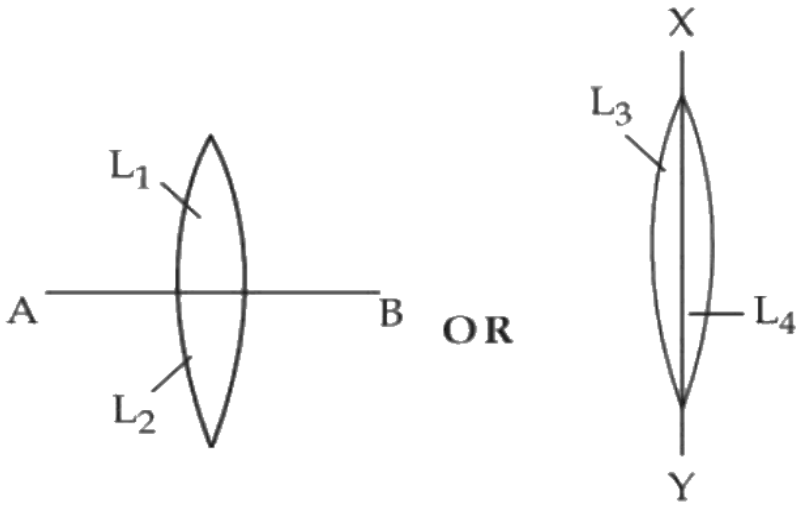
Answer: 6. · Key from source paper

Q59 JEE Main 2025 · 29 Jan · Shift 2 MCQ

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

(see the figure above)

Q27. 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

(1) 1:1

(2) 1:2

(3) 1:4

(4) 2:1

(A) 1:1
(B) 1:2
(C) 1:4
(D) 2:1

Answer: (B) 1:2 · Key from source paper

Q60 JEE Main 2025 · 29 Jan · Shift 2 MCQ

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

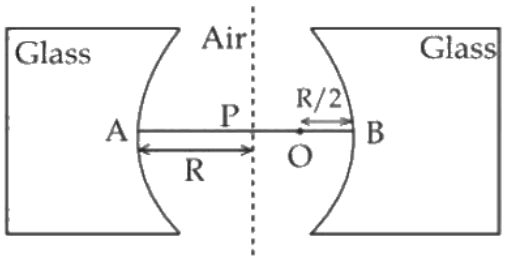
(A) 24 cm
(B) 96 cm
(C) 48 cm
(D) 72 cm

Answer: (B) 96 cm · Key from source paper

Q61 JEE Main 2025 · 29 Jan · Shift 2 MCQ

see figure

Q41.



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 :

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

(A) 0.214 R
(B) 0.411 R
(C) 0.124 R
(D) 0.114 R

Answer: (D) 0.114 R · Key from source paper

Q62 JEE Main 2025 · 28 Jan · Shift 1 MCQ

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

(A) 3
(B) 16/3
(C) 4
(D) 1.5

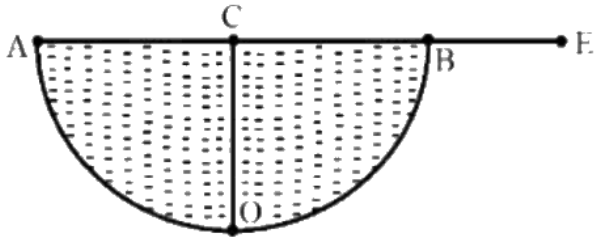
Answer: (A) 3 · Key from source paper

Q63 JEE Main 2025 · 28 Jan · Shift 1 MCQ

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

(see the figure above)

Q33. 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



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

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

Answer: (D) $\sqrt{2}$ · Key from source paper

Q64 JEE Main 2025 · 28 Jan · Shift 2 MCQ

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 :

(A) 30 cm
(B) 3.75 cm
(C) 15 cm
(D) 7.5 cm

Answer: (C) 15 cm · Key from source paper

Q65 JEE Main 2025 · 28 Jan · Shift 2 MCQ

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 :

(A) $\frac{1}{3}$ cm
(B) $\frac{4}{3}$ cm
(C) 1 cm
(D) $\frac{2}{3}$ cm

Answer: (D) $\frac{2}{3}$ cm · Key from source paper

Q66 JEE Main 2025 · 24 Jan · Shift 1 MCQ

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

(A) 0.01
(B) 0.04
(C) 0.40
(D) 0.1

Answer: (B) 0.04 · Key from source paper

Q67 JEE Main 2025 · 24 Jan · Shift 1 MCQ

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

(A) 0.20 m
(B) 0.25 m
(C) 0.15 m
(D) 0.10 m

Answer: (D) 0.10 m · Key from source paper

Q68 JEE Main 2025 · 24 Jan · Shift 1 MCQ

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

(A) 1 : 2
(B) 1 : 3
(C) 3 : 5
(D) 2 : 3

Answer: (B) 1 : 3 · Key from source paper

Q69 JEE Main 2025 · 24 Jan · Shift 2 MCQ

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 km^2. The focal length of the lens in the drone camera is :

(A) 1.8 cm
(B) 0.9 cm
(C) 2.8 cm
(D) 2.5 cm

Answer: (A) 1.8 cm · Key from source paper

Q70 JEE Main 2025 · 23 Jan · Shift 1 MCQ

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

(A) 5 R
(B) 3 R
(C) 1.5 R
(D) 2 R

Answer: (A) 5 R · Key from source paper

Q71 JEE Main 2025 · 23 Jan · Shift 1 MCQ

Given a thin convex lens (refractive index μ_2), kept in a liquid (refractive index $\mu_1, \mu_1 < \mu_2$) 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?

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

Answer: (A) $\frac{\mu_1|R_1|\cdot|R_2|}{\mu_2(|R_1|+|R_2|)-\mu_1|R_2|}$ · Key from source paper

Q72 JEE Main 2025 · 23 Jan · Shift 1 MCQ

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?

(A) $\frac{h\tan(i-r)}{\tan r}$
(B) $\frac{h\sin(i-r)}{\cos r}$
(C) h
(D) $\frac{h\cos(i-r)}{\sin r}$

Answer: (B) $\frac{h\sin(i-r)}{\cos r}$ · Key from source paper

Q73 JEE Main 2025 · 23 Jan · Shift 2 MCQ

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:

(A) μf
(B) f
(C) $\frac{f}{(\mu-1)}$
(D) $\frac{f}{\mu}$

Answer: (B) f · Key from source paper

Q74 JEE Main 2025 · 23 Jan · Shift 2 MCQ

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?

(A) 60°
(B) 58°
(C) 48°
(D) 50°

Answer: (A) 60° · Key from source paper

Q75 JEE Main 2025 · 22 Jan · Shift 1 MCQ

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 ?

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(A) R/μ
(B) $R/(2\mu-3)$
(C) μR
(D) $\mathrm{R}/(2\mu-1)$

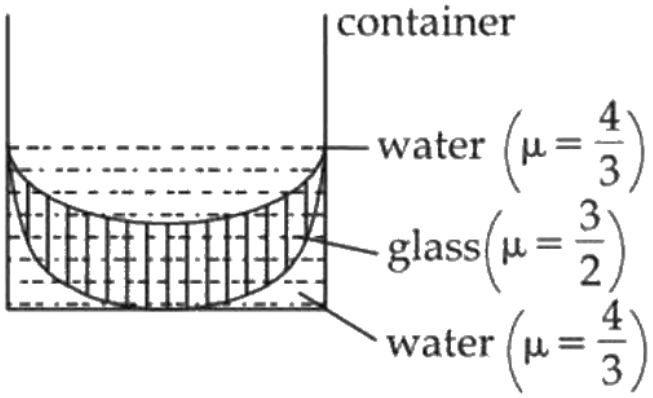
Answer: (D) $\mathrm{R}/(2\mu-1)$ · Key from source paper

Q76 JEE Main 2025 · 22 Jan · Shift 1 MCQ

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

(see the figure above)

Q42. 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

(1) $\frac{1}{6}\left(\frac{1}{|\mathrm{R}_1|}-\frac{1}{|\mathrm{R}_2|}\right)$
(2) $-\frac{1}{6}\left(\frac{1}{|\mathrm{R}_1|}+\frac{1}{|\mathrm{R}_2|}\right)$
(3) $\frac{1}{6}\left(\frac{1}{|R_1|}+\frac{1}{|R_2|}\right)$
(4) $-\frac{1}{6}\left(\frac{1}{|\mathrm{R}_1|}-\frac{1}{|\mathrm{R}_2|}\right)$

(A) $\frac{1}{6}\left(\frac{1}{|R_1|}-\frac{1}{|R_2|}\right)$
(B) $-\frac{1}{6}\left(\frac{1}{|R_1|}+\frac{1}{|R_2|}\right)$
(C) $\frac{1}{6}\left(\frac{1}{|R_1|}+\frac{1}{|R_2|}\right)$
(D) $-\frac{1}{6}\left(\frac{1}{|R_1|}-\frac{1}{|R_2|}\right)$

Answer: (D) $-\frac{1}{6}\left(\frac{1}{|R_1|}-\frac{1}{|R_2|}\right)$ · Key from source paper

Q77 JEE Main 2025 · 22 Jan · Shift 1 Numerical

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 100 a is _____ m/s^2.

Numerical value type: the answer is a number.

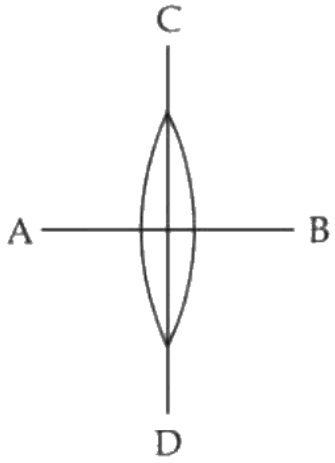
Answer: 8. · Key from source paper

Q78 JEE Main 2025 · 22 Jan · Shift 2 MCQ

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 4 D then the power of a part of the divided lens is

(see the figure above)

Q29. 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 4 D then the power of a part of the divided lens is



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

(A) D
(B) 8D
(C) 2D
(D) 4D

Answer: (C) 2D · Key from source paper

Q79 JEE Main 2024 · 9 Apr · Shift 1 MCQ

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 :

(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

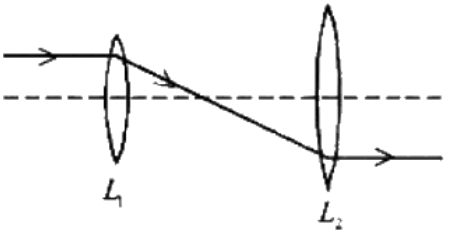
Answer: (D) Statement I is false but Statement II is true · Checked by our team

Q80 JEE Main 2024 · 9 Apr · Shift 2 MCQ

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 :

(see the figure above)

Q14. 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 :

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

(A) 10 cm
(B) 35 cm
(C) 25 cm
(D) 15 cm

Answer: (C) 25 cm · Key from source paper

Q81 JEE Main 2024 · 8 Apr · Shift 1 MCQ

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

(A) $1 : \sqrt{2}$
(B) $\sqrt{2} : 1$
(C) $2 : 1$
(D) $1 : 2$

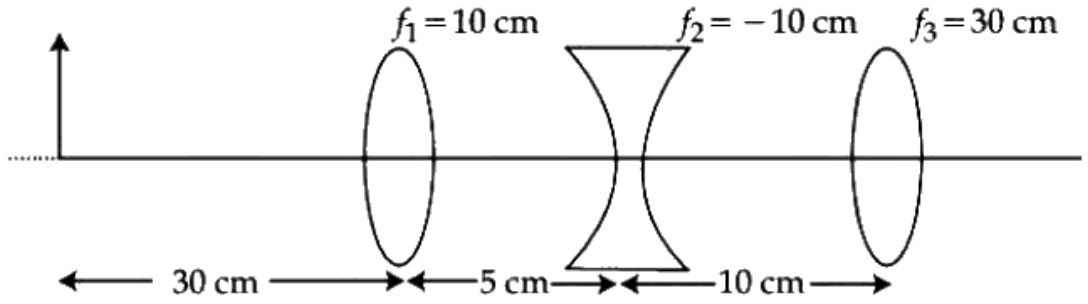
Answer: (B) $\sqrt{2} : 1$ · Key from source paper

Q82 JEE Main 2024 · 8 Apr · Shift 2 MCQ

The position of the image formed by the combination of lenses is :

(see the figure above)

Q15. The position of the image formed by the combination of lenses is :



(1) 15 cm (right of second lens)
(2) 30 cm (left of third lens)
(3) 15 cm (left of second lens)
(4) 30 cm (right of third lens)

(A) 15 cm (right of second lens)
(B) 30 cm (left of third lens)
(C) 15 cm (left of second lens)
(D) 30 cm (right of third lens)

Answer: (D) 30 cm (right of third lens) · Key from source paper

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Q83 JEE Main 2024 · 6 Apr · Shift 1 · Numerical

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 _____.

Numerical value type: the answer is a number.

Answer: 60. · Key from source paper

Q84 JEE Main 2024 · 6 Apr · Shift 2 · MCQ

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

(A) 1.2
(B) 1.8
(C) 1.5
(D) 1.4

Answer: (C) 1.5 · Key from source paper

Q85 JEE Main 2024 · 5 Apr · Shift 2 · MCQ

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, chose the correct answer from the options given below:

(A) Statement I is false but Statement II is true
(B) Statement I is true but Statement II is false
(C) Both Statement I and Statement II are true
(D) Both Statement I and Statement II are false

Answer: (C) Both Statement I and Statement II are true · Key from source paper

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Q86 JEE Main 2024 · 4 Apr · Shift 1 MCQ

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 :

(A) 20 cm
(B) 50 cm
(C) 500 cm
(D) 25 cm

Answer: (A) 20 cm · Key from source paper

Q87 JEE Main 2024 · 4 Apr · Shift 2 Numerical

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 $\sin 15^\circ = 0.25$)

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q88 JEE Main 2024 · 1 Feb · Shift 1 Numerical

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.

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q89 JEE Main 2024 · 31 Jan · Shift 1 MCQ

The refractive index of a prism with apex angle A is $\cot\frac{A}{2}$. The angle of minimum deviation is :

(A) $\delta_m = 180^\circ - A$
(B) $\delta_m = 180^\circ - 3A$
(C) $\delta_m = 180^\circ - 4A$
(D) $\delta_m = 180^\circ - 2A$

Answer: (D) $\delta_m = 180^\circ - 2A$ · Key from source paper

Q90 JEE Main 2024 · 31 Jan · Shift 2 Numerical

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.

Numerical value type: the answer is a number.

Answer: 200. · Key from source paper

Q91 JEE Main 2024 · 30 Jan · Shift 1 Numerical

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.

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q92 JEE Main 2024 · 29 Jan · Shift 1 MCQ

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

(A) -45 cm
(B) 45 cm
(C) -15 cm
(D) 15 cm

Answer: (C) -15 **cm** · Key from source paper

Q93 JEE Main 2024 · 29 Jan · Shift 1 MCQ

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:

(A) -16 cm
(B) -160 cm
(C) $+160$ cm
(D) $+16$ cm

Answer: (B) -160 **cm** · Key from source paper

Q94 JEE Main 2024 · 29 Jan · Shift 2 MCQ

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 :

(A) 15 cm

(B) -12 cm

(C) -10 cm

(D) $\frac{10}{3}$ cm

Answer: (C) -10 cm · Key from source paper

Q95 JEE Main 2024 · 27 Jan · Shift 1 MCQ

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

(A) $\pi - 2$ A

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

(C) $\pi -$ A

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

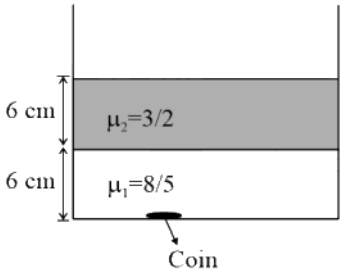
Answer: (A) $\pi - 2$ A · Key from source paper

Q96 JEE Main 2024 · 27 Jan · Shift 1 Numerical

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 _____.

(see the figure above)

Q29. 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 _____.



Numerical value type: the answer is a number.

Answer: 31. · Key from source paper

Q97 JEE Main 2023 · 15 Apr · Shift 1 Numerical

The refractive index of a transparent liquid filled in an equilateral hollow prism is $\sqrt{2}$. The angle of minimum deviation for the liquid will be _____ °.

Numerical value type: the answer is a number.

Answer: 30. · Key from source paper

Q98 JEE Main 2023 · 13 Apr · Shift 1 MCQ

A vessel of depth d is half filled with oil of refractive index n_1 and the other half is filled with water of refractive index n_2. The apparent depth of this vessel when viewed from above will be-

(A) $\frac{2d(n_1+n_2)}{n_1+n_2}$
(B) $\frac{d(n_1+n_2)}{2n_1n_2}$
(C) $\frac{dn_1n_2}{2(n_1+n_2)}$
(D) $\frac{dn_1n_2}{(n_1+n_2)}$

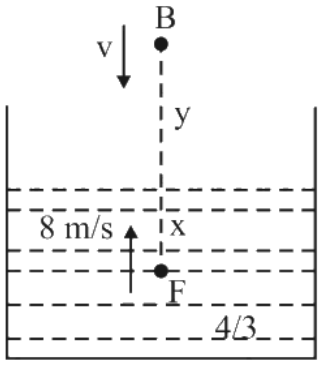
Answer: (B) $\frac{d(n_1+n_2)}{2n_1n_2}$ · Key from source paper

Q99 JEE Main 2023 · 13 Apr · Shift 1 Numerical

A fish rising vertically upward with a uniform velocity of 8 m s^{-1}, observes that a bird is diving vertically downward towards the fish with the velocity of 12 m s^{-1}. If the refractive index of water is $\frac{4}{3}$, then the actual velocity of the diving bird to pick the fish, will be _____ m s^{-1}.

(see the figure above)

Q24. A fish rising vertically upward with a uniform velocity of 8 m s^{-1}, observes that a bird is diving vertically downward towards the fish with the velocity of 12 m s^{-1}. If the refractive index of water is $\frac{4}{3}$, then the actual velocity of the diving bird to pick the fish, will be_____m s^{-1}.



Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q100 JEE Main 2023 · 13 Apr · Shift 2 Numerical

A bi convex lens of focal length 10 cm is cut in two identical parts along a plane perpendicular to the principal axis. The power of each lens after cut is _____ D.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q101 JEE Main 2023 · 12 Apr · Shift 1 MCQ

An ice cube has a bubble inside. When viewed from one side the apparent distance of the bubble is 12 cm. When viewed from the opposite side, the apparent distance of the bubble is observed as 4 cm.

If the side of the ice cube is 24 cm, the refractive index of the ice cube is

(A) $\frac{3}{2}$
(B) $\frac{2}{3}$
(C) $\frac{6}{5}$
(D) $\frac{4}{3}$

Answer: (A) $\frac{3}{2}$ · Key from source paper

Q102 JEE Main 2023 · 12 Apr · Shift 1 Numerical

Two convex lenses of focal length 20 cm each are placed coaxially with a separation of 60 cm between them. The image of the distant object formed by the combination is at _____ cm from the first lens.

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q103 JEE Main 2023 · 11 Apr · Shift 1 MCQ

The critical angle of the denser-rarer interface is 45°. The speed of light in rarer medium is $3 \times 10^8\ \mathrm{m\ s^{-1}}$. The speed of light in the denser medium is:

(A) $3.12 \times 10^7\ \mathrm{m\ s^{-1}}$
(B) $5 \times 10^7\ \mathrm{m\ s^{-1}}$
(C) $2.12 \times 10^8\ \mathrm{m\ s^{-1}}$
(D) $\sqrt{2} \times 10^8\ \mathrm{m\ s^{-1}}$

Answer: (C) $2.12 \times 10^8\ \mathrm{m\ s^{-1}}$ · Key from source paper

Q104 JEE Main 2023 · 11 Apr · Shift 1 Numerical

The radius of curvature of each surface of a convex lens having refractive index 1.8 is 20 cm. The lens is now immersed in a liquid of refractive index 1.5. The ratio of power of lens in air to its power in the liquid will be $x : 1$. The value of x is

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q105 JEE Main 2023 · 11 Apr · Shift 2 MCQ

When one light ray is reflected from a plane mirror with 30° angle of reflection, the angle of deviation of the ray after reflection is:

(A) 120°
(B) 110°
(C) 140°
(D) 130°

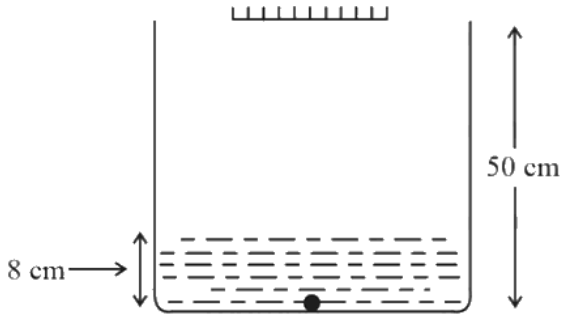
Answer: (A) 120° · Key from source paper

Q106 JEE Main 2023 · 11 Apr · Shift 2 Numerical

As shown in the figure, a plane mirror is fixed at a height of 50 cm from the bottom of tank containing water $\left(\mu = \frac{4}{3}\right)$. The height of water in the tank is 8 cm. A small bulb is placed at the bottom of the water tank. The distance of image of the bulb formed by mirror from the bottom of the tank is _____ cm.

(see the figure above)

Q26. As shown in the figure, a plane mirror is fixed at a height of 50 cm from the bottom of tank containing water $\left(\mu = \frac{4}{3}\right)$. The height of water in the tank is 8 cm. A small bulb is placed at the bottom of the water tank. The distance of image of the bulb formed by mirror from the bottom of the tank is _____ cm.



Numerical value type: the answer is a number.

Answer: 98. · Key from source paper

Q107 JEE Main 2023 · 10 Apr · Shift 1 MCQ

An object is placed at a distance of 12 cm in front of a plane mirror. The virtual and erect image is formed by the mirror. Now the mirror is moved by 4 cm towards the stationary object. The distance by which the position of image would be shifted, will be

(A) 4 cm towards mirror
(B) 8 cm towards mirror
(C) 8 cm away from mirror
(D) 2 cm towards mirror

Answer: (B) 8 cm towards mirror · Key from source paper

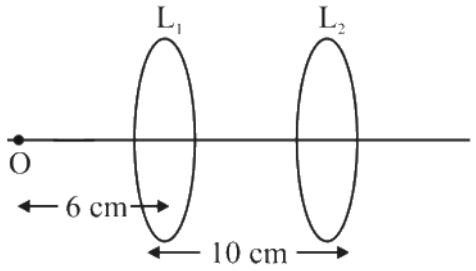
Q108 JEE Main 2023 · 10 Apr · Shift 2 Numerical

A point object O is placed in front of two thin symmetrical coaxial convex lenses L_1 and L_2 with focal length 24 cm and 9 cm respectively. The distance between two lenses is 10 cm and the object is

placed 6 cm away from lens L_1 as shown in the figure. The distance between the object and the image formed by the system of two lenses is _____ cm

(see the figure above)

Q29. A point object O is placed in front of two thin symmetrical coaxial convex lenses L_1 and L_2 with focal length 24 cm and 9 cm respectively. The distance between two lenses is 10 cm and the object is placed 6 cm away from lens L_1 as shown in the figure. The distance between the object and the image formed by the system of two lenses is _____ cm



Numerical value type: the answer is a number.

Answer: 34. · Key from source paper

Q109 JEE Main 2023 · 8 Apr · Shift 1 MCQ

In a reflecting telescope, a secondary mirror is used to:

(A) reduce the problem of mechanical support
(B) make chromatic aberration zero
(C) move the eyepiece outside the telescopic tube
(D) remove spherical aberration

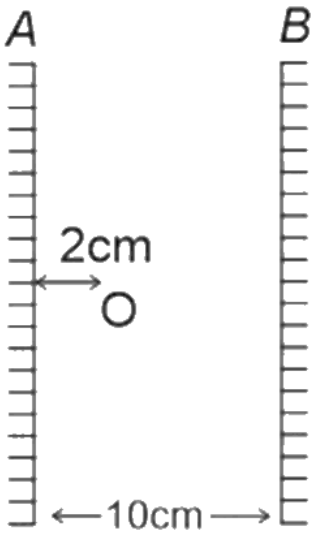
Answer: (C) move the eyepiece outside the telescopic tube · Key from source paper

Q110 JEE Main 2023 · 8 Apr · Shift 1 Numerical

Two vertical parallel mirrors A and B are separated by 10 cm. A point object O is placed at a distance of 2 cm from mirror A. The distance of the second nearest image behind mirror A from the mirror A is _____ cm.

(see the figure above)

Q25. Two vertical parallel mirrors A and B are separated by 10 cm. A point object O is placed at a distance of 2 cm from mirror A. The distance of the second nearest image behind mirror A from the mirror A is _____ cm.



Numerical value type: the answer is a number.

Answer: 18. · Key from source paper

Q111 JEE Main 2023 · 8 Apr · Shift 2 Numerical

Two transparent media having refractive indices 1.0 and 1.5 are separated by a spherical refracting surface of radius of curvature $30\ \text{cm}$. The centre of curvature of surface is towards denser medium and a point object is placed on the principal axis in rarer medium at a distance of $15\ \text{cm}$ from the pole of the surface. The distance of image from the pole of the surface is cm.

Numerical value type: the answer is a number.

Answer: 30. · Key from source paper

Q112 JEE Main 2023 · 6 Apr · Shift 1 MCQ

A monochromatic light wave with wavelength λ_1 and frequency ν_1 in air enters another medium. If the angle of incidence and angle of refraction at the interface are 45° and 30° respectively, then the wavelength λ_2 and frequency ν_2 of the refracted wave are:

(A) $\lambda_2 = \sqrt{2}\lambda_1,\ \nu_2 = \nu_1$

(B) $\lambda_2 = \lambda_1,\ \nu_2 = \frac{1}{\sqrt{2}}\nu_1$

(C) $\lambda_2 = \lambda_1,\ \nu_2 = \sqrt{2}\nu_1$

(D) $\lambda_2 = \frac{1}{\sqrt{2}}\lambda_1,\ \nu_2 = \nu_1$

Answer: (D) $\lambda_2 = \frac{1}{\sqrt{2}}\lambda_1,\ \nu_2 = \nu_1$ · Key from source paper

Q113 JEE Main 2023 · 6 Apr · Shift 1 Numerical

A pole is vertically submerged in swimming pool, such that it gives a length of shadow $2.15\ \text{m}$ within water when sunlight is incident at an angle of 30° with the surface of water. If swimming pool is filled

to a height of $1.5\ \mathrm{m}$, then the height of the pole above the water surface in centimeters is $\left(n_w = \frac{4}{3}\right)$ _____ .

Numerical value type: the answer is a number.

Answer: 50. · Key from source paper

Q114 JEE Main 2023 · 1 Feb · Shift 1 Numerical

A thin cylindrical rod of length 10 cm is placed horizontally on the principle axis of a concave mirror of focal length 20 cm. The rod is placed in a such a way that mid point of the rod is at 40 cm from the pole of mirror. The length of the image formed by the mirror will be $\frac{x}{3}$ cm. The value of x is _____.

Numerical value type: the answer is a number.

Answer: 32. · Key from source paper

Q115 JEE Main 2023 · 1 Feb · Shift 2 MCQ

Two objects A and B are placed at 15 cm and 25 cm from the pole in front of a concave mirror having radius of curvature 40 cm. The distance between images formed by the mirror is:

(A) 40 cm
(B) 60 cm
(C) 160 cm
(D) 100 cm

Answer: (C) 160 cm · Key from source paper

Q116 JEE Main 2023 · 31 Jan · Shift 2 MCQ

A microscope is focused on an object at the bottom of a bucket. If liquid with refractive index $\frac{5}{3}$ is poured inside the bucket, then microscope have to be raised by 30 cm to focus the object again. The height of the liquid in the bucket is :

(A) 75 cm
(B) 50 cm
(C) 18 cm
(D) 12 cm

Answer: (A) 75 cm · Key from source paper

Q117 JEE Main 2023 · 30 Jan · Shift 1 MCQ

A person has been using spectacles of power -1.0 diopter for distant vision and a separate reading glass of power 2.0 diopters. What is the least distance of distinct vision for this person:

(A) 10 cm
(B) 40 cm
(C) 30 cm
(D) 50 cm

Answer: (D) 50 cm · Key from source paper

Q118 JEE Main 2023 · 30 Jan · Shift 2 MCQ

A thin prism P_1 with an angle 6° and made of glass of refractive index 1.54 is combined with another prism P_2 made from glass of refractive index 1.72 to produce dispersion without average deviation. The angle of prism P_2 is :

(A) 6°
(B) 1.3°
(C) 7.8°
(D) 4.5°

Answer: (D) 4.5° · Key from source paper

Q119 JEE Main 2023 · 29 Jan · Shift 2 MCQ

A scientist is observing a bacteria through a compound microscope. For better analysis and to improve its resolving power he should. (Select the best option)

(A) Increase the wave length of the light
(B) Increase the refractive index of the medium between the object and objective lens
(C) Decrease the focal length of the eye piece
(D) Decrease the diameter of the objective lens

Answer: (B) Increase the refractive index of the medium between the object and objective lens · Key from source paper

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Q120 JEE Main 2023 · 25 Jan · Shift 1 Numerical

A ray of light is incident from air on a glass plate having thickness $\sqrt{3}$ cm and refractive index $\sqrt{2}$. The angle of incidence of a ray is equal to the critical angle for glass-air interface. The lateral displacement of the ray when it passes through the plate is _____ $\times 10^{-2}$ cm. (given $\sin 15^\circ = 0.26$)

Numerical value type: the answer is a number.

Answer: 52. · Key from source paper

Q121 JEE Main 2023 · 25 Jan · Shift 2 MCQ

The light rays from an object have been reflected towards an observer from a standard flat mirror, the image observed by the observer are :-

A. Real

B. Erect

C. Smaller in size than object

D. Laterally inverted

Choose the most appropriate answer from the options given below:

(A) B and D only

(B) B and C only

(C) A and D only

(D) A, C and D only

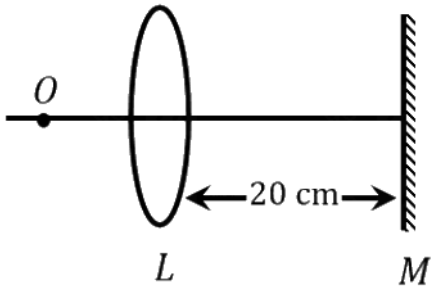
Answer: (A) B and D only · Key from source paper

Q122 JEE Main 2023 · 25 Jan · Shift 2 Numerical

An object is placed on the principal axis of convex lens of focal length 10 cm as shown. A plane mirror is placed on the other side of lens at a distance of 20 cm. The image produced by the plane mirror is 5 cm inside the mirror. The distance of the object from the lens is _____ cm.

(see the figure above)

Q27. An object is placed on the principal axis of convex lens of focal length 10 cm as shown. A plane mirror is placed on the other side of lens at a distance of 20 cm. The image produced by the plane mirror is 5 cm inside the mirror. The distance of the object from the lens is ____ cm.



Numerical value type: the answer is a number.

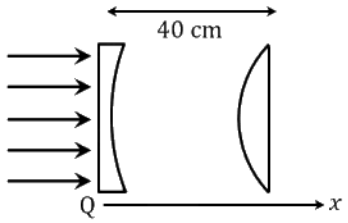
Answer: 30. · Key from source paper

Q123 JEE Main 2023 · 24 Jan · Shift 1 Numerical

As shown in the figure, a combination of a thin plano-concave lens and a thin plano-convex lens is used to image an object placed at infinity. The radius of curvature of both the lenses is 30 cm and refraction index of the material for both the lenses is 1.75. Both the lenses are placed at distance of 40 cm from each other. Due to the combination, the image of the object is formed at distance x = _____ cm, from concave lens.

(see the figure above)

Q29. As shown in the figure, a combination of a thin plano-concave lens and a thin plano-convex lens is used to image an object placed at infinity. The radius of curvature of both the lenses is 30 cm and refraction index of the material for both the lenses is 1.75. Both the lenses are placed at distance of 40 cm from each other. Due to the combination, the image of the object is formed at distance x = _____ cm, from concave lens.



Numerical value type: the answer is a number.

Answer: 120. · Key from source paper

Q124 JEE Main 2023 · 24 Jan · Shift 2 MCQ

When a beam of white light is allowed to pass through convex lens parallel to principal axis, the different colours of light converge at different point on the principle axis after refraction. This is called :

(A) Scattering
(B) Chromatic aberration
(C) Spherical aberration
(D) Polarisation

Answer: (B) Chromatic aberration · Key from source paper

Q125 JEE Main 2023 · 24 Jan · Shift 2 Numerical

A convex lens of refractive index 1.5 and focal length 18 cm in air is immersed in water. The change in focal length of the lens will be _____ cm.

(Given refractive index of water $= \frac{4}{3}$)

Numerical value type: the answer is a number.

Answer: 54. · Key from source paper

Q126 JEE Main 2022 · 29 Jul · Shift 1 Numerical

The $X-Y$ plane be taken as the boundary between two transparent media M_1 and M_2. M_1 in $Z \geq 0$ has a refractive index of $\sqrt{2}$ and M_2 with $Z < 0$ has a refractive index of $\sqrt{3}$. A ray of light travelling in M_1 along the direction given by the vector $\vec{A} = 4\sqrt{3}\hat{i} - 3\sqrt{3}\hat{j} - 5\hat{k}$, is incident on the plane of separation. The value of difference between the angle of incident in M_1 and the angle of refraction in M_2 will be _____ degree.

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q127 JEE Main 2022 · 29 Jul · Shift 2 MCQ

Light enters from air into a given medium at an angle of 45° with interface of the air-medium surface. After refraction, the light ray is deviated through an angle of 15° from its original direction. The refractive index of the medium is :

(A) 1.732
(B) 1.333
(C) 1.414
(D) 2.732

Answer: (C) 1.414 · Key from source paper

Q128 JEE Main 2022 · 28 Jul · Shift 1 MCQ

In normal adjustment, for a refracting telescope, the distance between objective and eye piece is $30\ \text{cm}$. The focal length of the objective, when the angular magnification of the telescope is 2, will be:

(A) $20\ \text{cm}$
(B) $30\ \text{cm}$
(C) $10\ \text{cm}$
(D) $15\ \text{cm}$

Answer: (A) $20\ \text{cm}$ · Key from source paper

Q129 JEE Main 2022 · 28 Jul · Shift 2 MCQ

The power of a lens (biconvex) is $1.25\ \text{m}^{-1}$ in particular medium. Refractive index of the lens is 1.5 and radii of curvature are $20\ \text{cm}$ and $40\ \text{cm}$ respectively. The refractive index of surrounding medium:

(A) 1.0
(B) $\frac{9}{7}$
(C) $\frac{3}{2}$
(D) $\frac{4}{3}$

Options (4) or (2) were accepted. More than one answer was accepted. · Key from source paper

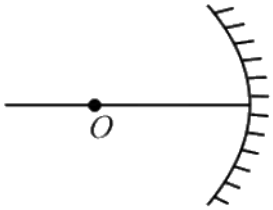
Q130 JEE Main 2022 · 28 Jul · Shift 2 Numerical

An object 'O' is placed at a distance of $100\ \text{cm}$ in front of a concave mirror of radius of curvature $200\ \text{cm}$ as shown in the figure. The object starts moving towards the mirror at a speed $2\ \text{cm}\,\text{s}^{-1}$. The position of the image from the mirror after $10\ \text{s}$ will be at _____ cm.

(see the figure above)

EdLoop JEE

Q29. An object 'O' is placed at a distance of 100 cm in front of a concave mirror of radius of curvature 200 cm as shown in the figure. The object starts moving towards the mirror at a speed 2 cm s^{-1}. The position of the image from the mirror after 10 s will be at _____ cm.



Numerical value type: the answer is a number.

Answer: 400. · Key from source paper

Q131 JEE Main 2022 · 28 Jul · Shift 2 Numerical

In an experiment with a convex lens. The plot of the image distance (v') against the object distance (μ') measured from the focus gives a curve $v'\mu' = 225$. If all the distances are measured in cm. The magnitude of the focal length of the lens is _____ cm.

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q132 JEE Main 2022 · 27 Jul · Shift 1 MCQ

A microscope was initially placed in air (refractive index 1). It is then immersed in oil (refractive index 2). For a light whose wavelength in air is λ, calculate the change of microscope's resolving power due to oil and choose the correct option

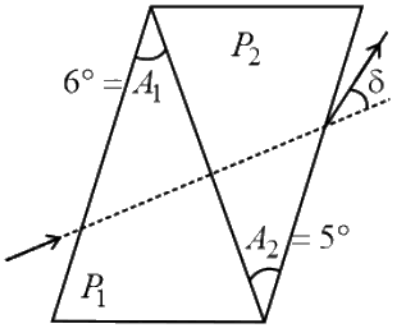
(A) Resolving power will be $\frac{1}{4}$ in the oil than it was in the air
(B) Resolving power will be twice in the oil than it was in the air.
(C) Resolving power will be four times in the oil than it was in the air.
(D) Resolving power will be $\frac{1}{2}$ in the oil than it was in the air.

Answer: (B) Resolving power will be twice in the oil than it was in the air. · Key from source paper

Q133 JEE Main 2022 · 27 Jul · Shift 2 Numerical

A thin prism of angle 6° and refractive index for yellow light (n_Y)1.5 is combined with another prism of angle 5° and n_Y = 1.55. The combination produces no dispersion. The net average deviation (δ) produced by the combination is $\left(\frac{1}{x}\right)^\circ$. The value of x is _____ .
(see the figure above)

Q30. A thin prism of angle 6° and refractive index for yellow light $(n_Y)1.5$ is combined with another prism of angle 5° and $n_Y = 1.55$. The combination produces no dispersion. The net average deviation (δ) produced by the combination is $\left(\frac{1}{x}\right)^\circ$. The value of x is _____ .



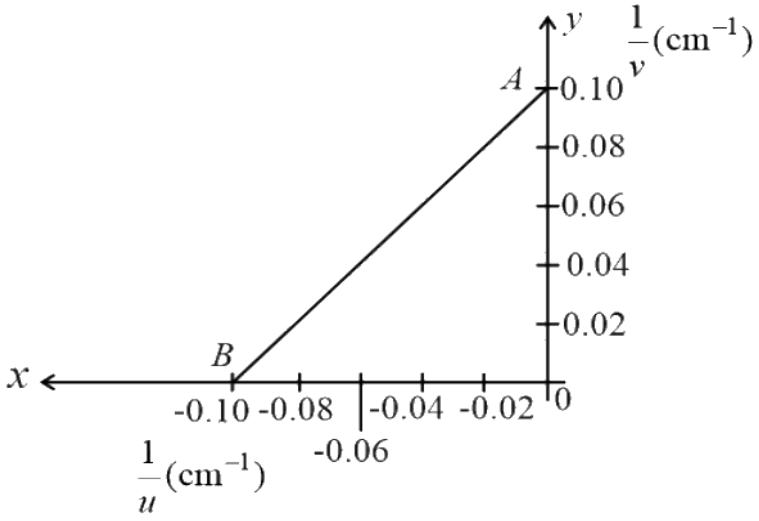
Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q134 JEE Main 2022 · 26 Jul · Shift 1 Numerical

The graph between $\frac{1}{u}$ and $\frac{1}{v}$ for a thin convex lens in order to determine its focal length is plotted as shown in the figure. The refractive index of lens is 1.5 and its both the surfaces have same radius of curvatures R. The value of R will be _____ cm.
(Where u = object distance, v = image distance)
(see the figure above)

Q28. The graph between $\frac{1}{u}$ and $\frac{1}{v}$ for a thin convex lens in order to determine its focal length is plotted as shown in the figure. The refractive index of lens is 1.5 and its both the surfaces have same radius of curvatures R. The value of R will be _____ cm.
(Where u = object distance, v = image distance)



Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q135 JEE Main 2022 · 26 Jul · Shift 2 MCQ

Light travels in two media M_1 and M_2 with speeds $1.5 \times 10^8\ \mathrm{m\ s^{-1}}$ and $2.0 \times 10^8\ \mathrm{m\ s^{-1}}$ respectively. The critical angle between them is

(A) $\tan^{-1}\frac{3}{\sqrt{7}}$
(B) $\tan^{-1}\frac{2}{3}$
(C) $\cos^{-1}\frac{3}{4}$
(D) $\sin^{-1}\frac{2}{3}$

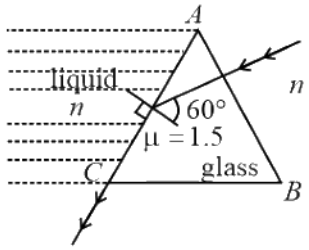
Answer: (A) $\tan^{-1}\frac{3}{\sqrt{7}}$ · Key from source paper

Q136 JEE Main 2022 · 26 Jul · Shift 2 Numerical

In the given figure, the face AC of the equilateral prism is immersed in a liquid of refractive index n. For incident angle $60°$ at the side AC, the refracted light beam just grazes along face AC. The refractive index of the liquid $n = \frac{\sqrt{x}}{4}$. The value of x is _____ .
(Given refractive index of glass $= 1.5$)

(see the figure above)

Q28. In the given figure, the face AC of the equilateral prism is immersed in a liquid of refractive index n. For incident angle $60°$ at the side AC, the refracted light beam just grazes along face AC. The refractive index of the liquid $n = \frac{\sqrt{x}}{4}$. The value of x is _____ .
(Given refractive index of glass $= 1.5$)



Numerical value type: the answer is a number.

Answer: 27. · Key from source paper

Q137 JEE Main 2022 · 25 Jul · Shift 1 MCQ

Which of the following statement is correct?

(A) In primary rainbow, observer sees red colour on the top and violet on the bottom
(B) In primary rainbow, observer sees violet colour on the top and red on the bottom
(C) In primary rainbow, light wave suffers total internal reflection twice before coming out of water drops
(D) Primary rainbow is less bright than secondary rainbow.

Answer: (A) In primary rainbow, observer sees red colour on the top and violet on the bottom · Key from source paper

Q138 JEE Main 2022 · 25 Jul · Shift 1 MCQ

Time taken by light to travel in two different materials A and B of refractive indices μ_A and μ_B of same thickness is t_1 and t_2 respectively. If t_2 - $t_1 = 5 \times 10^{-10}$s and the ratio of μ_A to μ_B is 1: 2. Then the thickness of material, in meter is: (Given v_A and v_B are velocities of light in A and B materials respectively.)

(A) $5 \times 10^{-10} v_A$ m
(B) 5×10^{-10} m
(C) 1.5×10^{10} m
(D) $5 \times 10^{-10} v_B$ m

Answer: (A) $5 \times 10^{-10} v_A$ m · Key from source paper

Q139 JEE Main 2022 · 25 Jul · Shift 2 MCQ

For an object placed at a distance $2.4\ \mathrm{m}$ from a lens, a sharp focused image is observed on a screen placed at a distance $12\ \mathrm{cm}$ from the lens. A glass plate of refractive index 1.5 and thickness $1\ \mathrm{cm}$ is introduced between lens and screen such that the glass plate plane faces parallel to the screen. By what distance should the object be shifted so that a sharp focused image is observed again on the screen?

(A) $0.8\ \mathrm{m}$
(B) $3.2\ \mathrm{m}$
(C) $1.2\ \mathrm{m}$
(D) $5.6\ \mathrm{m}$

Answer: (B) $3.2\ \mathrm{m}$ · Key from source paper

Q140 JEE Main 2022 · 25 Jul · Shift 2 Numerical

A convex lens of focal length $20\ \mathrm{cm}$ is placed in front of convex mirror with principal axis coinciding each other. The distance between the lens and mirror is $10\ \mathrm{cm}$. A point object is placed on principal axis at a distance of $60\ \mathrm{cm}$ from the convex lens. The image formed by combination coincides the object itself. The focal length of the convex mirror is _____ cm.

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q141 JEE Main 2022 · 29 Jun · Shift 1 Numerical

A parallel beam of light is allowed to fall on a transparent spherical globe of diameter $30\ \mathrm{cm}$ and refractive index 1.5. The distance from the centre of the globe at which beam of light can converge is _____ mm.

Numerical value type: the answer is a number.

Answer: 225. · Key from source paper

Q142 JEE Main 2022 · 29 Jun · Shift 2 MCQ

The speed of light in media 'A' and 'B' are $2.0 \times 10^{10}\ \mathrm{cm\,s^{-1}}$ and $1.5 \times 10^{10}\ \mathrm{cm\,s^{-1}}$ respectively. A ray of light enters from the medium B to A at an incident angle 'θ'. If the ray suffers total internal reflection, then

(A) $\theta = \sin^{-1}\left(\frac{4}{3}\right)$

(B) $\theta > \sin^{-1}\left(\frac{2}{3}\right)$

(C) $\theta > \sin^{-1}\left(\frac{3}{4}\right)$

(D) $\theta < \sin^{-1}\left(\frac{3}{4}\right)$

Answer: (C) $\theta > \sin^{-1}\left(\frac{3}{4}\right)$ · Key from source paper

Q143 JEE Main 2022 · 28 Jun · Shift 1 MCQ

The refracting angle of a prism is A and refractive index of the material of the prism is $\cot\left(\frac{A}{2}\right)$. Then the angle of minimum deviation will be

(A) $180^\circ - 2A$

(B) $90^\circ - A$

(C) $180^\circ + 2A$

(D) $180^\circ - 3A$

Answer: (A) $180^\circ - 2A$ · Key from source paper

Q144 JEE Main 2022 · 28 Jun · Shift 1 MCQ

The aperture of the objective is $24.4\ \mathrm{cm}$. The resolving power of this telescope, if a light of wavelength $2440\ \text{Å}$ is used to see the object will be

(A) 8.1×10^6

(B) 10.0×10^7

(C) 8.2×10^5

(D) 1.0×10^{-8}

Answer: (C) 8.2×10^5 · Key from source paper

Q145 JEE Main 2022 · 27 Jun · Shift 1 MCQ

Consider a light ray travelling in air is incident into a medium of refractive index $\sqrt{2n}$. The incident angle is twice that of refracting angle. Then, the angle of incidence will be

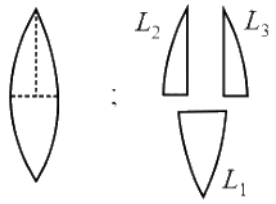
(A) $\sin^{-1}\sqrt{n}$
(B) $\cos^{-1}\left(\frac{n}{\sqrt{2}}\right)$
(C) $\sin^{-1}\left(\sqrt{2n}\right)$
(D) $2\cos^{-1}\left(\sqrt{\frac{n}{2}}\right)$

Answer: (D) $2\cos^{-1}\left(\sqrt{\frac{n}{2}}\right)$ · Key from source paper

Q146 JEE Main 2022 · 27 Jun · Shift 2 MCQ

A convex lens has power P. It is cut into two halves along its principal axis. Further one piece (out of the two halves) is cut into two halves perpendicular to its principal axis (as shown in figures). Choose the incorrect option for the reported pieces.
(see the figure above)

Q17. A convex lens has power P. It is cut into two halves along its principal axis. Further one piece (out of the two halves) is cut into two halves perpendicular to the principal axis (as shown in figures). Choose the incorrect option for the reported pieces.



(1) Power of $L_1 = \frac{P}{2}$
(2) Power of $L_2 = \frac{P}{2}$
(3) Power of $L_3 = \frac{P}{2}$
(4) Power of $L_1 = P$

(A) Power of $L_1 = \frac{P}{2}$
(B) Power of $L_2 = \frac{P}{2}$
(C) Power of $L_3 = \frac{P}{2}$
(D) Power of $L_1 = P$

Answer: (A) Power of $L_1 = \frac{P}{2}$ · Key from source paper

Q147 JEE Main 2022 · 26 Jun · Shift 1 MCQ

A wave of frequency $= 3$ GHz, strikes a particle of size $\left(\frac{1}{100}\right)^{th}$ of λ, then this phenomenon is called as

(A) Diffraction
(B) Scattering
(C) Reflection
(D) Refraction

Answer: (B) Scattering · Key from source paper

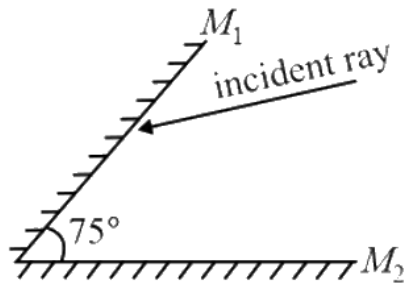
Q148 JEE Main 2022 · 26 Jun · Shift 1 Numerical

A light ray is incident, at an incident angle θ_1, on the system of two plane mirrors M_1 and M_2 having an inclination angle 75° between them (as shown in figure). After reflecting from mirror M_1 it gets

reflected back by the mirror M_2 with an angle of reflection 30°. The total deviation of the ray will be _____ degree.

(see the figure above)

Q28. A light ray is incident, at an incident angle θ_1, on the system of two plane mirrors M_1 and M_2 having an inclination angle 75° between them (as shown in figure). After reflecting from mirror M_1 it gets reflected back by the mirror M_2 with an angle of reflection 30°. The total deviation of the ray will be _____ degree.



Numerical value type: the answer is a number.

Answer: 210. · Key from source paper

Q149 JEE Main 2022 · 26 Jun · Shift 2 Numerical

A small bulb is placed at the bottom of a tank containing water to a depth of $\sqrt{7}$ m. The refractive index of water is $\frac{4}{3}$. The area of the surface of water through which light from the bulb can emerge out is $x\pi$ m^2. The value of x is _____ .

Numerical value type: the answer is a number.

Answer: 9. · Key from source paper

Q150 JEE Main 2022 · 25 Jun · Shift 1 MCQ

A light wave travelling linearly in a medium of dielectric constant 4, incidents on the horizontal interface separating medium with air. The angle of incidence for which the total intensity of incident wave will be reflected back into the same medium will be :
(Given : relative permeability of medium $\mu_r = 1$)

(A) 10°
(B) 20°
(C) 30°
(D) 60°

Answer: (D) 60° · Key from source paper

Q151 JEE Main 2022 · 25 Jun · Shift 1 MCQ

The difference of speed of light in the two media A and B $v_A - v_B$ is 2.6×10^7 m s^{-1}. If the refractive index of medium B is 1.47, then the ratio of refractive index of medium B to medium A is: (Given : speed of light in vacuum $c = 3 \times 10^8$ m s^{-1})

(A) 1.303
(B) 1.318
(C) 1.13
(D) 0.12

Answer: (C) 1.13 · Key from source paper

Q152 JEE Main 2022 · 24 Jun · Shift 1 Numerical

Two identical thin biconvex lenses of focal length $15\ \text{cm}$ and refractive index 1.5 are in contact with each other. The space between the lenses is filled with a liquid of refractive index 1.25. The focal length of the combination is _____ cm.

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q153 JEE Main 2022 · 24 Jun · Shift 2 Numerical

A ray of light is incident at an angle of incidence 60° on the glass slab of refractive index $\sqrt{3}$. After refraction, the light ray emerges out from other parallel faces and lateral shift between incident ray and emergent ray is $4\sqrt{3}\ \text{cm}$. The thickness of the glass slab is _____ cm.

Numerical value type: the answer is a number.

Answer: 12. · Key from source paper

Q154 JEE Main 2021 · 1 Sep · Shift 2 MCQ

A glass tumbler having inner depth of 17.5 cm is kept on a table. A student starts pouring water $\mu = \frac{4}{3}$ into it while looking at the surface of water from the above. When he feels that the tumbler is half filled, he stops pouring water. Up to what height, the tumbler is actually filled ?

(A) 10 cm
(B) 11.7 cm
(C) 7.5 cm
(D) 8.75 cm

Answer: (A) 10 cm · Key from source paper

Q155 JEE Main 2021 · 31 Aug · Shift 1 MCQ

An object is placed at the focus of concave lens having focal length f. What is the magnification and distance of the image from the optical centre of the lens?

(A) $\frac{1}{4}, \frac{f}{4}$
(B) $\frac{1}{2}, \frac{f}{2}$
(C) Very high, ∞
(D) $1, \infty$

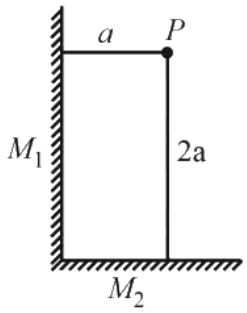
Answer: (B) $\frac{1}{2}, \frac{f}{2}$ · Key from source paper

Q156 JEE Main 2021 · 31 Aug · Shift 1 MCQ

Two plane mirrors M_1 and M_2 are at right angle to each other shown. A point source P is placed at a and $2a$ meter away from M_1 and M_2 respectively. The shortest distance between the images thus formed is : (Take $\sqrt{5} = 2.3$)

(see the figure above)

Q16. Two plane mirrors M_1 and M_2 are at right angle to each other shown. A point source P is placed at a and $2a$ meter away from M_1 and M_2 respectively. The shortest distance between the images thus formed is : (Take $\sqrt{5} = 2.3$)



(1) $2.3\,a$
(2) $2\sqrt{10}a$
(3) $4.6a$
(4) $3a$

(A) $2.3\,a$
(B) $2\sqrt{10}a$
(C) $4.6a$
(D) $3a$

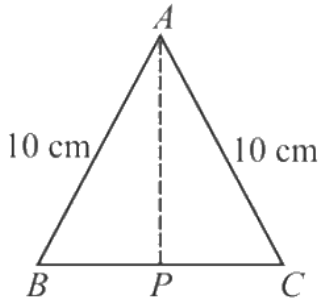
Answer: (C) $4.6a$ · Key from source paper

Q157 JEE Main 2021 · 31 Aug · Shift 2 Numerical

Cross-section view of a prism is the equilateral triangle ABC shown in the figure. The minimum deviation is observed using this prism when the angle of incidence is equal to the prism angle. The time taken by light to travel from P (midpoint of BC) to A is _____ $\times 10^{-10}$ s. (Given, speed of light in vacuum $= 3 \times 10^8$ m s^{-1} and $\cos 30^\circ = \frac{\sqrt{3}}{2}$)

(see the figure above)

Q27. Cross-section view of a prism is the equilateral triangle ABC shown in the figure. The minimum deviation is observed using this prism when the angle of incidence is equal to the prism angle. The time taken by light to travel from P (midpoint of BC) to A is _____ $\times 10^{-10}$ s. (Given, speed of light in vacuum $= 3 \times 10^8$ m s^{-1} and $\cos 30° = \frac{\sqrt{3}}{2}$)



Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q158 JEE Main 2021 · 27 Aug · Shift 1 MCQ

An object is placed beyond the centre of curvature C of the given concave mirror. If the distance of the object is d_1 from C and the distance of the image formed is d_2 from C, the radius of curvature of this mirror is:

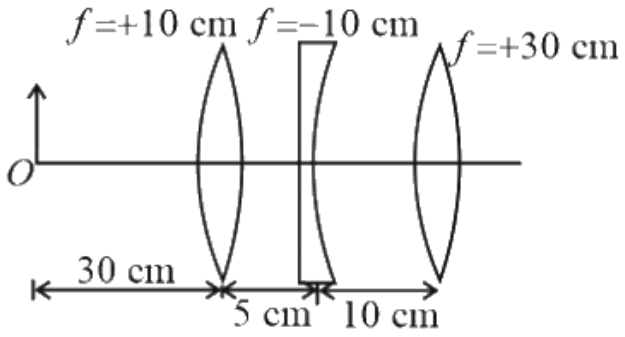
(A) $\frac{2d_1d_2}{d_1+d_2}$
(B) $\frac{2d_1d_2}{d_1-d_2}$
(C) $\frac{d_1d_2}{d_1+d_2}$
(D) $\frac{d_1d_2}{d_1-d_2}$

Answer: (B) $\frac{2d_1d_2}{d_1-d_2}$ · Key from source paper

Q159 JEE Main 2021 · 27 Aug · Shift 1 MCQ

Find the distance of the image from object O, formed by the combination of lenses in the figure:
(see the figure above)

Q17. Find the distance of the image from object O, formed by the combination of lenses in the figure:



(1) 75 cm
(2) 10 cm
(3) infinity
(4) 20 cm

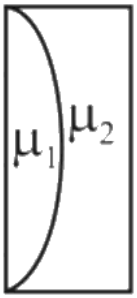
(A) 75 cm
(B) 10 cm
(C) infinity
(D) 20 cm

Answer: (A) 75 cm · Key from source paper

Q160 JEE Main 2021 · 27 Aug · Shift 2 MCQ

Curved surfaces of a plano-convex lens of refractive index μ_1 and a plano-concave lens of refractive index μ_2 have equal radius of curvature as shown in figure. Find the ratio of radius of curvature to the focal length of the combined lenses
(see the figure above)

Q16. Curved surfaces of a plano-convex lens of refractive index μ_1 and a plano-concave lens of refractive index μ_2 have equal radius of curvature as shown in figure. Find the ratio of radius of curvature to the focal length of the combined lenses



(1) $\frac{1}{\mu_2-\mu_1}$
(2) $\frac{1}{\mu_1-\mu_2}$
(3) $\mu_2-\mu_1$
(4) $\mu_1-\mu_2$

(A) $\frac{1}{\mu_2-\mu_1}$

(B) $\frac{1}{\mu_1-\mu_2}$

(C) $\mu_2-\mu_1$

(D) $\mu_1-\mu_2$

Answer: (D) $\mu_1-\mu_2$ · Key from source paper

Q161 JEE Main 2021 · 26 Aug · Shift 1 MCQ

Car B overtakes another car A at a relative speed of $40\ \mathrm{m\ s^{-1}}$. How fast will the image of car B appear to move in the mirror of focal length $10\ \mathrm{cm}$ fitted in car A, when the car B is $1.9\ \mathrm{m}$ away from the car A?

(A) $0.1\ \mathrm{m\ s^{-1}}$

(B) $0.2\ \mathrm{m\ s^{-1}}$

(C) $40\ \mathrm{m\ s^{-1}}$

(D) $4\ \mathrm{m\ s^{-1}}$

Answer: (A) $0.1\ \mathrm{m\ s^{-1}}$ · Key from source paper

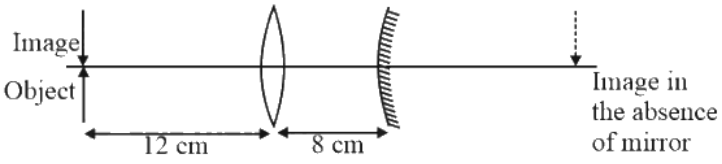
Q162 JEE Main 2021 · 26 Aug · Shift 2 Numerical

An object is placed at a distance of $12\ \mathrm{cm}$ from a convex lens. A convex mirror of focal length $15\ \mathrm{cm}$ is placed on another side of the lens at $8\ \mathrm{cm}$ as shown in the figure. The image of the object coincides with the object.

(see the figure above)

When the convex mirror is removed, a real and inverted image is formed at a position. The distance of the image from the object will be ___ cm

Q28. An object is placed at a distance of 12 cm from a convex lens. A convex mirror of focal length 15 cm is placed on another side of the lens at 8 cm as shown in the figure. The image of the object coincides with the object.



When the convex mirror is removed, a real and inverted image is formed at a position. The distance of the image from the object will be ___ cm

Numerical value type: the answer is a number.

Answer: 50. · Key from source paper

Q163 JEE Main 2021 · 27 Jul · Shift 1 Numerical

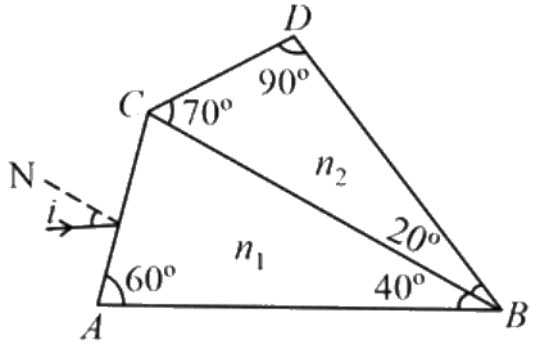
A prism of refractive index n_1 and another prism of refractive index n_2 are stuck together (as shown in the figure). n_1 and n_2 depend on λ, the wavelength of light, according to the relation $n_1 = 1.2 +$

$\frac{10.8\times10^{-14}}{\lambda^2}$ and $n_2 = 1.45 + \frac{1.8\times10^{-14}}{\lambda^2}$. The wavelength for which rays incident at any angle on the interface BC pass through without bending at that interface will be _____ nm.

(see the figure above)

Q25. A prism of refractive index n_1 and another prism of refractive index n_2 are stuck together (as shown in the figure). n_1 and n_2 depend on λ, the wavelength of light, according to the relation $n_1 = 1.2 + \frac{10.8\times10^{-14}}{\lambda^2}$ and $n_2 = 1.45 + \frac{1.8\times10^{-14}}{\lambda^2}$

The wavelength for which rays incident at any angle on the interface BC pass through without bending at that interface will be ____ nm.



Numerical value type: the answer is a number.

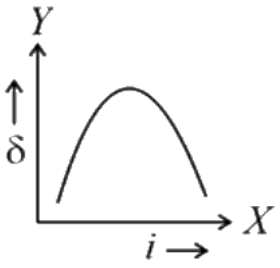
Answer: 600. · Key from source paper

Q164 JEE Main 2021 · 27 Jul · Shift 2 MCQ

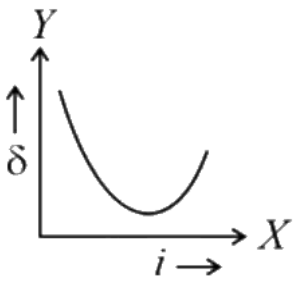
The expected graphical representation of the variation of angle of deviation ' δ ' with angle of incidence 'i' in a prism is :

Q17. The expected graphical representation of the variation of angle of deviation ' δ ' with angle of incidence 'i' in a prism is :

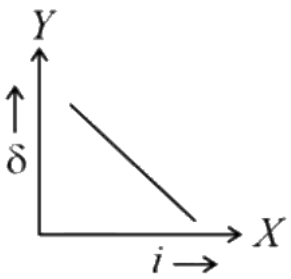
(1)



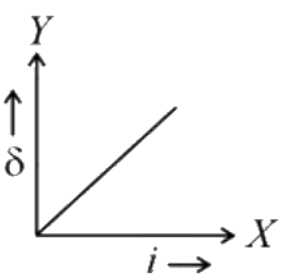
(2)



(3)



(4)



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (B) · Key from source paper

Q165 JEE Main 2021 · 25 Jul · Shift 1 MCQ

A ray of laser of a wavelength $630\ \text{nm}$ is incident at an angle of 30° at the diamond-air interface. It is going from diamond to air. The refractive index of diamond is 2.42 and that of air is 1. Choose the correct option.

(A) Angle of refraction is 24.41°.
(B) Angle of refraction is 30°.
(C) Refraction is not possible.
(D) Angle of refraction is 53.4°.

Answer: (C) Refraction is not possible. · Key from source paper

Q166 JEE Main 2021 · 25 Jul · Shift 2 MCQ

A prism of refractive index μ and angle of prism A is placed in the position of minimum angle of deviation. If minimum angle of deviation is also A, then in terms of refractive index, the angle of prism A is

(A) $2\cos^{-1}\left(\frac{\mu}{2}\right)$
(B) $\sin^{-1}\left(\frac{\mu}{2}\right)$
(C) $\sin^{-1}\left(\sqrt{\frac{\mu-1}{2}}\right)$
(D) $\cos^{-1}\left(\frac{\mu}{2}\right)$

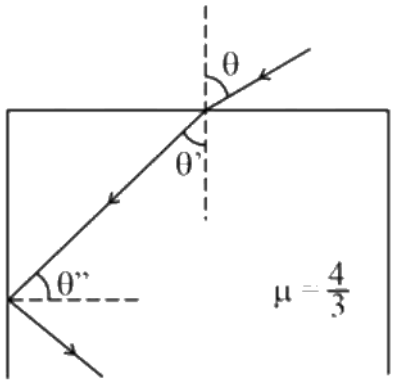
Answer: (A) $2\cos^{-1}\left(\frac{\mu}{2}\right)$ · Key from source paper

Q167 JEE Main 2021 · 25 Jul · Shift 2 MCQ

A ray of light entering from air into a denser medium of refractive index $\frac{4}{3}$, as shown in figure. The light ray suffers total internal reflection at the adjacent surface as shown. The maximum value of angle θ should be equal to:

(see the figure above)

Q18. A ray of light entering from air into a denser medium of refractive index $\frac{4}{3}$, as shown in figure.
The light ray suffers total internal reflection at the adjacent surface as shown. The maximum value of angle θ should be equal to:



(1) $\sin^{-1}\frac{\sqrt{7}}{3}$
(2) $\sin^{-1}\frac{\sqrt{5}}{4}$
(3) $\sin^{-1}\frac{\sqrt{7}}{4}$
(4) $\sin^{-1}\frac{\sqrt{5}}{3}$

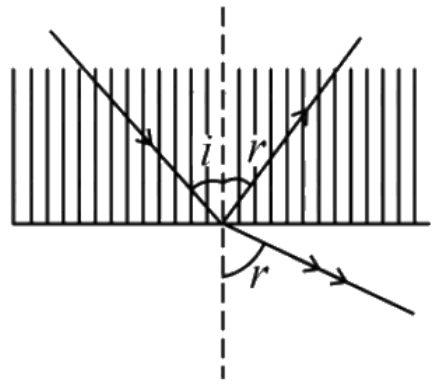
(A) $\sin^{-1}\frac{\sqrt{7}}{3}$
(B) $\sin^{-1}\frac{\sqrt{5}}{4}$
(C) $\sin^{-1}\frac{\sqrt{7}}{4}$
(D) $\sin^{-1}\frac{\sqrt{5}}{3}$

Answer: (A) $\sin^{-1}\frac{\sqrt{7}}{3}$ · Key from source paper

Q168 JEE Main 2021 · 22 Jul · Shift 1 MCQ

A ray of light passes from a denser medium to a rarer medium at an angle of incidence i. The reflected and refracted rays make an angle of 90° with each other. The angle of reflection and refraction are respectively r and r'. The critical angle is given by,
(see the figure above)

Q16. A ray of light passes from a denser medium to a rarer medium at an angle of incidence i. The reflected and refracted rays make an angle of 90° with each other. The angle of reflection and refraction are respectively r and r'. The critical angle is given by,



(1) $\sin^{-1}(\cot r)$
(2) $\tan^{-1}(\sin i)$
(3) $\sin^{-1}(\tan r')$
(4) $\sin^{-1}(\tan r)$

(A) $\sin^{-1}(\cot r)$
(B) $\tan^{-1}(\sin i)$
(C) $\sin^{-1}(\tan r')$
(D) $\sin^{-1}(\tan r)$

Answer: (D) $\sin^{-1}(\tan r)$ · Key from source paper

Q169 JEE Main 2021 · 22 Jul · Shift 1 Numerical

A ray of light passing through a prism $(\mu = \sqrt{3})$ suffers minimum deviation. It is found that the angle of incidence is double the angle of refraction within the prism. Then, the angle of prism is _____ (in degrees).

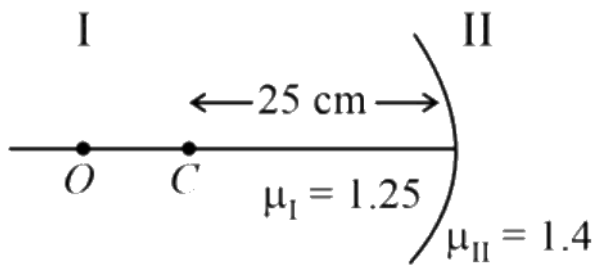
Numerical value type: the answer is a number.

Answer: 60. · Key from source paper

Q170 JEE Main 2021 · 20 Jul · Shift 1 MCQ

Region I and II are separated by a spherical surface of radius $25\ \text{cm}$. An object is kept in region I at a distance of $40\ \text{cm}$ from the surface. The distance of the image from the surface is:
(see the figure above)

Q16. Region I and II are separated by a spherical surface of radius 25 cm. An object is kept in region I at a distance of 40 cm from the surface. The distance of the image from the surface is:



(1) 55.44 cm
(2) 9.52 cm
(3) 18.23 cm
(4) 37.58 cm

(A) 55.44 cm
(B) 9.52 cm
(C) 18.23 cm
(D) 37.58 cm

Answer: (D) 37.58 cm · Key from source paper

Q171 JEE Main 2021 · 20 Jul · Shift 1 Numerical

An object viewed from a near point distance of 25 cm, using a microscopic lens with magnification 6, gives an unresolved image. A resolved image is observed at infinite distance with a total magnification double the earlier using an eyepiece along with the given lens and a tube of length 0.6 m, if the focal length of the eyepiece is equal to ___ cm.

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q172 JEE Main 2021 · 18 Mar · Shift 1 MCQ

Your friend is having eye sight problem. She is not able to see clearly a distant uniform window mesh and it appears to her as nonuniform and distorted. The doctor diagnosed the problem as :

(A) Astigmatism
(B) Myopia with Astigmatism
(C) Presbyopia with Astigmatism
(D) Myopia and hypermetropia

Answer: (B) Myopia with Astigmatism · Key from source paper

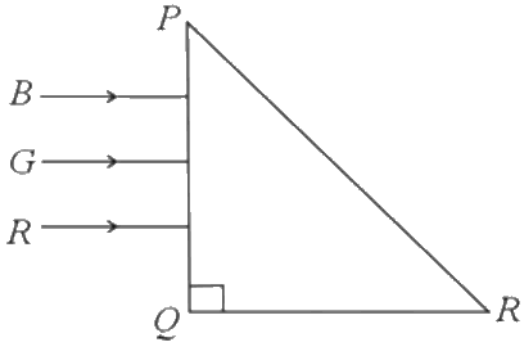
Q173 JEE Main 2021 · 18 Mar · Shift 2 MCQ

Three rays of light, namely red (R), green (G) and blue (B) are incident on the face PQ of a right angled prism PQR as shown in figure.

(see the figure above)

The refractive indices of the material of the prism for red, green and blue wavelength are $1.27, 1.42$ and 1.49 respectively. The colour of the ray(s) emerging out of the face PR is :

Q17. Three rays of light, namely red (R), green (G) and blue (B) are incident on the face PQ of a right angled prism PQR as shown in figure.



The refractive indices of the material of the prism for red, green and blue wavelength are $1.27, 1.42$ and 1.49 respectively. The colour of the ray(s) emerging out of the face PR is :

(1) green (2) red

(3) blue and green (4) blue

(A) green

(B) red

(C) blue and green

(D) blue

Answer: (B) red · Key from source paper

Q174 JEE Main 2021 · 17 Mar · Shift 1 MCQ

The thickness at the centre of a plano convex lens is $3\ \text{mm}$ and the diameter is $6\ \text{cm}$. If the speed of light in the material of the lens is $2 \times 10^8\ \text{m s}^{-1}$. The focal length of the lens is _____.

(A) $0.30\ \text{cm}$

(B) $15\ \text{cm}$

(C) $1.5\ \text{cm}$

(D) $30\ \text{cm}$

Answer: (D) $30\ \text{cm}$ · Key from source paper

Q175 JEE Main 2021 · 17 Mar · Shift 2 Numerical

The image of an object placed in air formed by a convex refracting surface is at a distance of $10\ \text{m}$ behind the surface. The image is real and is at $\frac{2^{rd}}{3}$ of the distance of the object from the surface. The wavelength of light inside the surface is $\frac{2}{3}$ times the wavelength in air. The radius of the curved surface is $\frac{x}{13}\ \text{m}$, the value of x is _____.

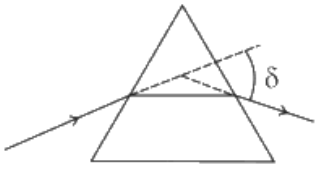
Numerical value type: the answer is a number.

Answer: 30. · Key from source paper

Q176 JEE Main 2021 · 16 Mar · Shift 1 MCQ

The angle of deviation through a prism is minimum when
(see the figure above)
(A) Incident ray and emergent ray are symmetric to the prism
(B) The refracted ray inside the prism becomes parallel to its base
(C) Angle of incidence is equal to that of the angle of emergence
(D) When angle of emergence is double the angle of incidence
Choose the correct answer from the options given below :

Q18. The angle of deviation through a prism is minimum when



(A) Incident ray and emergent ray are symmetric to the prism
(B) The refracted ray inside the prism becomes parallel to its base
(C) Angle of incidence is equal to that of the angle of emergence
(D) When angle of emergence is double the angle of incidence
Choose the correct answer from the options given below :
(1) Statements (A),(B) and (C) are true
(2) Only statement (D) is true
(3) Only statements (A) and (B) are true
(4) Statements (B) and (C) are true

A Statements (A),(B) and (C) are true
B Only statement (D) is true
C Only statements (A) and (B) are true
D Statements (B) and (C) are true

Answer: (A) Statements (A),(B) and (C) are true · Key from source paper

Q177 JEE Main 2021 · 16 Mar · Shift 2 MCQ

The refractive index of a converging lens is 1.4. What will be the focal length of this lens if it is placed in a medium of same refractive index ? (Assume the radii of curvature of the faces of lens are R_1 and R_2 respectively)

(A) 1
(B) Infinite
(C) $\frac{R_1R_2}{R_1-R_2}$
(D) Zero

Answer: (B) Infinite · Key from source paper

Q178 JEE Main 2021 · 16 Mar · Shift 2 Numerical

A deviation of 2° is produced in the yellow ray when prism of crown and flint glass are achromatically combined. Taking dispersive powers of crown and flint glass are 0.02 and 0.03 respectively and refractive index for yellow light for these glasses are 1.5 and 1.6 respectively. The refracting angles for crown glass prism will be _____$^\circ$ (in degree)
(Round off to the Nearest Integer)

Numerical value type: the answer is a number.

Answer: 12. · Key from source paper

Q179 JEE Main 2021 · 26 Feb · Shift 1 MCQ

A short straight object of height $100\ \text{cm}$ lies before the central axis of a spherical mirror whose focal length has absolute value $|f| = 40\ \text{cm}$. The image of object produced by the mirror is of height $25\ \text{cm}$ and has the same orientation of the object. One may conclude from the information:

(A) Image is real, same side of convex mirror.
(B) Image is virtual, opposite side of concave mirror.
(C) Image is real, same side of concave mirror.
(D) Image is virtual, opposite side of convex mirror.

Answer: (D) Image is virtual, opposite side of convex mirror. · Key from source paper

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Q180 JEE Main 2021 · 26 Feb · Shift 2 MCQ

Given below are two statements : one is labeled as Assertion A and the other is labeled as Reason R.
Assertion A: For a simple microscope, the angular size of the object equals the angular size of the image.
Reason R: Magnification is achieved as the small object can be kept much closer to the eye than $25\ \text{cm}$ and hence it subtends a large angle. In the light of the above statements, choose the most appropriate answer from the options given below:

(A) A is false but R is true
(B) Both A and R are true but R is NOT the correct explanation of A
(C) A is true but R is false
(D) Both A and R are true and R is the correct explanation of A

Options (4) or (2) were accepted. More than one answer was accepted. · Key from source paper

Q181 JEE Main 2021 · 26 Feb · Shift 2 MCQ

The incident ray, reflected ray and the outward drawn normal are denoted by the unitvectors $\vec{a}$, $\vec{b}$and $\vec{c}$ respectively. Then choose the correct relation for these vectors.

(A) $\vec{b} = \vec{a} + 2\vec{c}$
(B) $\vec{b} = 2\vec{a} + \vec{c}$
(C) $\vec{b} = \vec{a} - 2(\vec{a} \cdot \vec{c})\vec{c}$
(D) $\vec{b} = \vec{a} - \vec{c}$

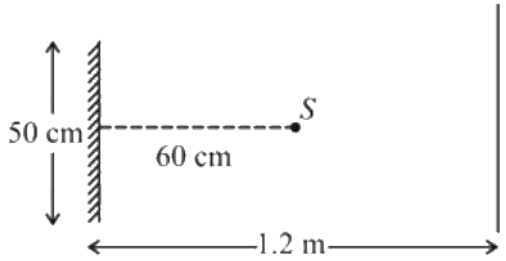
Answer: (C) $\vec{b} = \vec{a} - 2(\vec{a} \cdot \vec{c})\vec{c}$ · Key from source paper

Q182 JEE Main 2021 · 26 Feb · Shift 2 Numerical

A point source of light S, placed at a distance $60\ \text{cm}$ infront of the centre of a plane mirror of width $50\ \text{cm}$, hangs vertically on a wall. A man walks infront of the mirror along a line parallel to the mirror at a distance $1.2\ \text{m}$ from it (see in the figure). The distance between the extreme points where he can see the image of the light source in the mirror is _____ cm

(see the figure above)

Q27. A point source of light S, placed at a distance $60\ \text{cm}$ infront of the centre of a plane mirror of width $50\ \text{cm}$, hangs vertically on a wall. A man walks infront of the mirror along a line parallel to the mirror at a distance $1.2\ \text{m}$ from it (see in the figure). The distance between the extreme points where he can see the image of the light source in the mirror is__cm



Numerical value type: the answer is a number.

Answer: 150. · Key from source paper

Q183 JEE Main 2021 · 25 Feb · Shift 1 Numerical

The same size images are formed by a convex lens when the object is placed at $20\ \text{cm}$ or at $10\ \text{cm}$ from the lens. The focal length of convex lens is

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q184 JEE Main 2021 · 24 Feb · Shift 1 MCQ

The focal length f is related to the radius of curvature r of the spherical convex mirror by:

(A) $f = -\frac{1}{2}r$
(B) $f = +\frac{1}{2}r$
(C) $f = r$
(D) $f = -r$

Answer: (B) $f = +\frac{1}{2}r$ · Key from source paper

Q185 JEE Main 2020 · 6 Sep · Shift 1 MCQ

A point like object is placed at distance of 1m in front of a convex lens of focal length 0.5m. A plane mirror is placed at a distance of 2m behind the lens. The position and nature of the image formed by the system is

(A) 2.6m from the mirror, real
(B) 1m from the mirror, virtual
(C) 1m from the mirror, real
(D) 2.6m from the mirror, virtual

Answer: (A) 2.6m **from the mirror, real** · Checked by our team

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Q186 JEE Main 2020 · 6 Sep · Shift 2 MCQ

A double convex lens has power P and same radii of curvature r of both the surfaces. The radius of curvature of a surface of a plano-convex lens made of the same material with power $1.5\ \text{P}$ is :

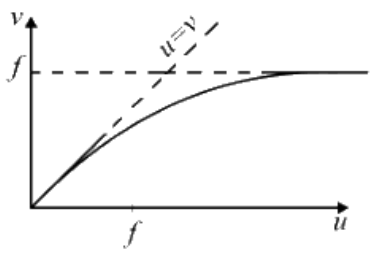
(A) $2R$
(B) $\frac{R}{2}$
(C) $\frac{3R}{2}$
(D) $\frac{R}{3}$

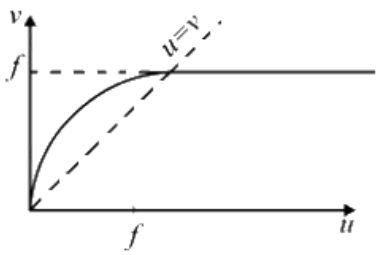
Answer: (D) $\frac{R}{3}$ · Key from source paper

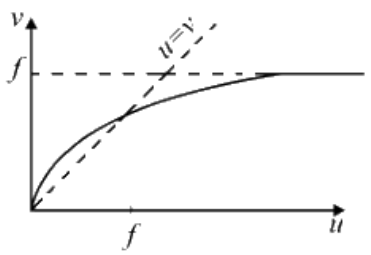
Q187 JEE Main 2020 · 5 Sep · Shift 1 MCQ

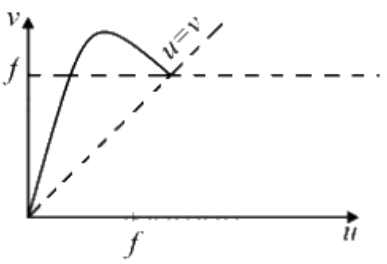
For a concave lens of focal length f, the relation between object and image distance u and v, respectively, from its pole can best be represented by ($u = v$ is the reference line):
(see the figure above)

Q18. For a concave lens of focal length f, the relation between object and image distance u and v, respectively, from its pole can best be represented by ($u = v$ is the reference line):

(1) 

(2) 

(3) 

(4) 

(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Key from source paper

Q188 JEE Main 2020 · 5 Sep · Shift 1 Numerical

A compound microscope consists of an objective lens of focal length 1 cm and an eye piece of focal length 5 cm with a separation of 10 cm. The distance between an object and the objective lens, at which the strain on the eye is minimum is $\frac{n}{40}$cm. The value of n is.....

Numerical value type: the answer is a number.

Answer: 50. · Key from source paper

Q189 JEE Main 2020 · 5 Sep · Shift 2 Numerical

A prism of angle $A = 1^\circ$ $\mu = 1.5$. A good estimate for the minimum angle of deviation (in degrees) is close to $\frac{N}{10}$. Value of N is _____

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q190 JEE Main 2020 · 4 Sep · Shift 1 Numerical

In a compound microscope, the magnified virtual image is formed at a distance of 25 cm from the eye-piece. The focal length of its objective lens is 1 cm. If the magnification is 100 and the tube length of the microscope is 20 cm, then the focal length of the eye-piece lens (in cm) is _____

Numerical value type: the answer is a number.

Answer: 6.25. · Key from source paper

Q191 JEE Main 2020 · 4 Sep · Shift 2 Numerical

The distance between an object and a screen is $100\ \mathrm{cm}$. A lens can produce real image of the object on the screen for two different positions between the screen and the object. The distance between these two positions is $40\ \mathrm{cm}$. If the power of the lens is close to $\left(\frac{N}{100}\right)\ \mathrm{D}$ where N is an integer, the value of N is _____

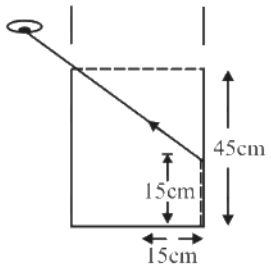
Numerical value type: the answer is a number.

Answer: 476. · Key from source paper

Q192 JEE Main 2020 · 3 Sep · Shift 1 Numerical

An observer can see through a small hole on the side of a jar (radius $15\ \mathrm{cm}$) at a point at height of $15\ \mathrm{cm}$ from the bottom (see figure). The hole is at a height of $45\ \mathrm{cm}$. When the jar is filled with a liquid up to a height of $30\ \mathrm{cm}$ the same observer can see the edge at the bottom of the jar. If the refractive index of the liquid is $\frac{N}{100}$, where N is an integer, the value of N is
(see the figure above)

Q25. An observer can see through a small hole on the side of a jar (radius $15\ \mathrm{cm}$) at a point at height of $15\ \mathrm{cm}$ from the bottom (see figure). The hole is at a height of $45\ \mathrm{cm}$. When the jar is filled with a liquid up to a height of $30\ \mathrm{cm}$ the same observer can see the edge at the bottom of the jar. If the refractive index of the liquid is $\frac{\mathrm{N}}{100}$, where N is an integer, the value of N is



Numerical value type: the answer is a number.

Answer: 158. · Key from source paper

Q193 JEE Main 2020 · 3 Sep · Shift 2 Numerical

When an object is kept at a distance of $30\ \mathrm{cm}$ from a concave mirror, the image is formed at a distance of $10\ \mathrm{cm}$ from the mirror. If the object is moved with a speed of $9\ \mathrm{cm\,s^{-1}}$, the speed (in $\mathrm{cm\,s^{-1}}$) with which image moves at that instant is

Numerical value type: the answer is a number.

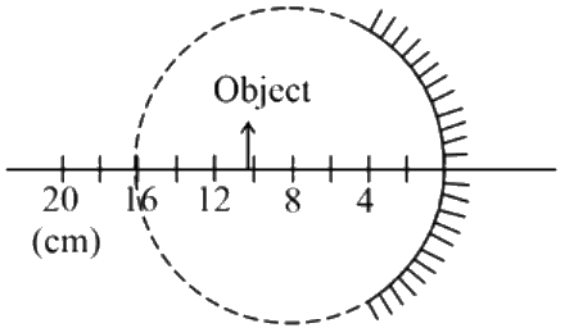
Answer: 1. · Key from source paper

Q194 JEE Main 2020 · 2 Sep · Shift 1 MCQ

A spherical mirror is obtained as shown in the figure from a hollow glass sphere, if an object is positioned in front of the mirror, what will be the nature and magnification of the image of the object? (Figure down as schematic and not to scale)

(see the figure above)

Q17. A spherical mirror is obtained as shown in the figure from a hollow glass sphere, if an object is positioned in front of the mirror, what will be the nature and magnification of the image of the object? (Figure down as schematic and not to scale)



(1) Inverted, real and magnified
(2) Erect, virtual and magnified
(3) Erect, virutual and unmagnified
(4) Inverted, real and unmagnified

(A) Inverted, real and magnified
(B) Erect, virtual and magnified
(C) Erect, virtual and unmagnified
(D) Inverted, real and unmagnified

Answer: (D) Inverted, real and unmagnified · Key from source paper

Q195 JEE Main 2020 · 2 Sep · Shift 2 Numerical

A light ray enters a solid glass sphere of refractive index $\mu = \sqrt{3}$ at an angle of incidence 60°. The ray is both reflected and refracted at the farther surface of the sphere. The angle (in degrees) between the reflected and refracted rays at this surface is _____.

Numerical value type: the answer is a number.

Answer: 90. · Key from source paper

Q196 JEE Main 2020 · 9 Jan · Shift 1 MCQ

A vessel of depth $2h$ is half filled with a liquid of refractive index $2\sqrt{2}$ and the upper half with another liquid of refractive index $\sqrt{2}$. The liquids are immiscible. The apparent depth of the inner surface of the bottom of the vessel will be

(A) $\frac{h}{\sqrt{2}}$
(B) $\frac{h}{2(\sqrt{2}+1)}$
(C) $\frac{h}{3\sqrt{2}}$
(D) $\frac{3\sqrt{2}h}{4}$

Answer: (D) $\frac{3\sqrt{2}h}{4}$ · Key from source paper

Q197 JEE Main 2020 · 9 Jan · Shift 2 MCQ

There is a small source of light at some depth below the surface of water (refractive index $= \frac{4}{3}$) in a tank of large cross sectional surface area. Neglecting any reflection from the bottom and absorption by water, percentage of light that emerges out of surface is (nearly):
[Use the fact that surface area of a spherical cap of height h and radius of curvature r is $2\pi rh$]

(A) 21%
(B) 34%
(C) 17%
(D) 50%

Answer: (C) 17% · Key from source paper

Q198 JEE Main 2020 · 8 Jan · Shift 1 MCQ

The critical angle of a medium for a specific wavelength, if the medium has relative permittivity 3 and relative permeability $\frac{4}{3}$ for this wavelength, will be:

(A) 15°
(B) 30°
(C) 45°
(D) 60°

Answer: (B) 30° · Key from source paper

Q199 JEE Main 2020 · 8 Jan · Shift 1 MCQ

The magnifying power of a telescope with tube length 60cm is 5. What is the focal length of its eye piece?

(A) 20cm
(B) 40cm
(C) 30cm
(D) 10cm

Answer: (D) 10cm · Key from source paper

Q200 JEE Main 2020 · 8 Jan · Shift 1 Numerical

A point object in air is in front of the curved surface of a plano-convex lens. The radius of curvature of the curved surface is $30\ \text{cm}$ and the refractive index of the lens material is 1.5, then the focal length of the lens (in cm) is _____.

Numerical value type: the answer is a number.

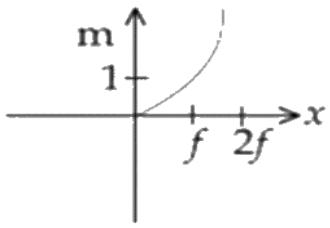
Answer: 60. · Key from source paper

Q201 JEE Main 2020 · 8 Jan · Shift 2 MCQ

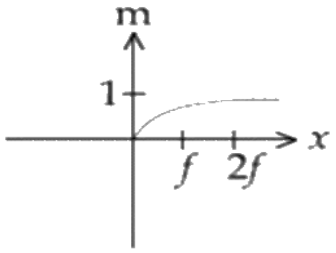
An object is gradually moving away from the focal point of a concave mirror along the axis of the mirror. The graphical representation of the magnitude of linear magnification (m) versus distance of the object from the mirror (x) is correctly given by
(Graphs are drawn schematically and are not to scale)

Q17. An object is gradually moving away from the focal point of a concave mirror along the axis of the mirror. The graphical representation of the magnitude of linear magnification (m) versus distance of the object from the mirror (x) is correctly given by
(Graphs are drawn schematically and are not to scale)

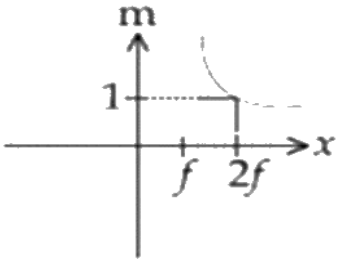
(1)



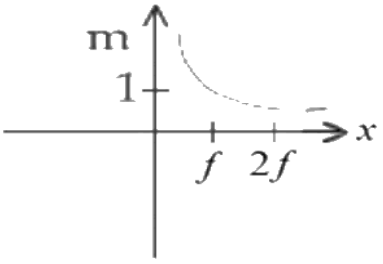
(2)



(3)



(4)



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q202 JEE Main 2020 · 7 Jan · Shift 1 MCQ

If we need a magnification of 375 from a compound microscope of tube length 150mm and an objective of focal length 5mm, the focal length of the eye-piece, should be close to:

(A) 22mm
(B) 2mm
(C) 4mm
(D) 33mm

Answer: (A) 22mm · Key from source paper

Q203 JEE Main 2020 · 7 Jan · Shift 2 MCQ

A thin lens made of glass (refractive index $= 1.5$) of focal length $f = 16\text{cm}$ is immersed in a liquid of refractive index 1.42. If its focal length in liquid is f_l, then the ratio f_l/f is closest to the integer:

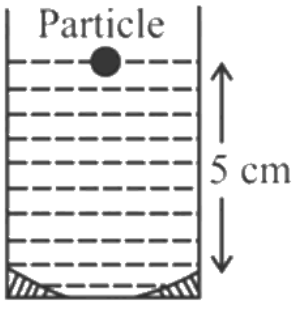
(A) 1
(B) 9
(C) 5
(D) 17

Answer: (B) 9 · Key from source paper

Q204 JEE Main 2019 · 12 Apr · Shift 1 MCQ

A concave mirror has radius of curvature of 40 cm . It is at the bottom of a glass that has water filled up to 5 cm (see figure). If a small particle is floating on the surface of water, its image as seen, from directly above the glass, is at a distance d from the surface of water. The value of d is close to: (Refractive index of water $= 1.33$)
(see the figure above)

Q24. A concave mirror has radius of curvature of 40 cm . It is at the bottom of a glass that has water filled up to 5 cm (see figure). If a small particle is floating on the surface of water, its image as seen, from directly above the glass, is at a distance d from the surface of water. The value of d is close to: (Refractive index of water $= 1.33$)



(1) 13.4 cm
(2) 8.8 cm
(3) 6.7 cm
(4) 11.7 cm

(A) 13.4 cm
(B) 8.8 cm
(C) 6.7 cm
(D) 11.7 cm

Answer: (B) 8.8 cm · Key from source paper

Q205 JEE Main 2019 · 12 Apr · Shift 1 MCQ

The value of numerical aperture of the objective lens of a microscope is 1.25 . If light of wavelength 5000 Å is used, the minimum separation between two points, to be seen as distinct, will be:

(A) $0.48\ \mu\text{m}$
(B) $0.24\ \mu\text{m}$
(C) $0.38\ \mu\text{m}$
(D) $0.12\ \mu\text{m}$

Answer: (B) $0.24\ \mu\text{m}$ · Key from source paper

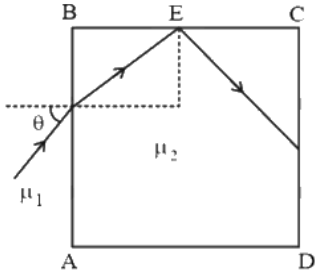
Q206 JEE Main 2019 · 12 Apr · Shift 2 MCQ

A transparent cube of side d, made of a material of refractive index μ_2, is immersed in a liquid of refractive index μ_1 ($\mu_1 < \mu_2$). A ray is incident on the face AB at an angle θ (shown in the figure). Total internal reflection takes place at the point E on the face BC.

(see the figure above)

Then, θ must satisfy

Q23. A transparent cube of side d, made of a material of refractive index μ_2, is immersed in a liquid of refractive index μ_1 ($\mu_1 < \mu_2$). A ray is incident on the face AB at an angle θ (shown in the figure). Total internal reflection takes place at the point E on the face BC.



Then, θ must satisfy

(1) $\theta < \sin^{-1}\sqrt{\frac{\mu_2^2}{\mu_1^2} - 1}$
(2) $\theta > \sin^{-1}\frac{\mu_1}{\mu_2}$
(3) $\theta < \sin^{-1}\frac{\mu_1}{\mu_2}$
(4) $\theta > \sin^{-1}\sqrt{\frac{\mu_2^2}{\mu_1^2} - 1}$

(A) $\theta < \sin^{-1}\sqrt{\frac{\mu_2^2}{\mu_1^2} - 1}$

(B) $\theta > \sin^{-1}\frac{\mu_1}{\mu_2}$

(C) $\theta < \sin^{-1}\frac{\mu_1}{\mu_2}$

(D) $\theta > \sin^{-1}\sqrt{\frac{\mu_2^2}{\mu_1^2} - 1}$

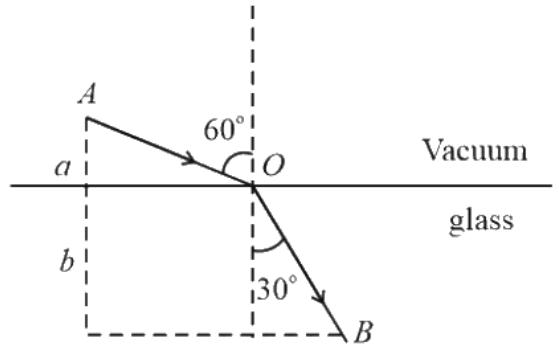
Answer: (A) $\theta < \sin^{-1}\sqrt{\frac{\mu_2^2}{\mu_1^2} - 1}$ · Key from source paper

Q207 JEE Main 2019 · 10 Apr · Shift 1 MCQ

A ray of light AO in vacuum is incident on a glass slab at angle 60° and refracted at angle 30° along OB as shown in the figure. The optical path length of light ray from A to B is:

(see the figure above)

Q24. A ray of light AO in vacuum is incident on a glass slab at angle 60° and refracted at angle 30° along OB as shown in the figure. The optical path length of light ray from A to B is:



(1) $\frac{2\sqrt{3}}{\mathrm{a}} + 2\mathrm{b}$

(2) $2\mathrm{a} + 2\mathrm{b}$

(3) $2\mathrm{a} + \frac{2\mathrm{b}}{\sqrt{3}}$

(4) $2\mathrm{a} + \frac{2\mathrm{b}}{3}$

(A) $\frac{2\sqrt{3}}{a} + 2b$

(B) $2a + 2b$

(C) $2a + \frac{2b}{\sqrt{3}}$

(D) $2a + \frac{2b}{3}$

Answer: (B) $2a + 2b$ · Key from source paper

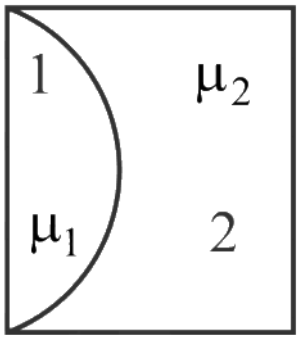
Q208 JEE Main 2019 · 10 Apr · Shift 1 MCQ

One plano-convex and one plano-concave lens of the same radius of curvature R but of different materials are joined side by side as shown in the figure. If the refractive index of the material of 1 is μ_1 and that of 2 is μ_2, then the focal length of the combination is:

(see the figure above)

Q25. One plano-convex and one plano-concave lens of the same radius of curvature R but of different materials are joined side by side as shown in the figure. If the refractive index of the material of 1 is μ_1 and that of 2 is μ_2,

then the focal length of the combination is:



(1) $\frac{R}{2-(\mu_1-\mu_2)}$
(2) $\frac{R}{2(\mu_1-\mu_2)}$
(3) $\frac{2R}{\mu_1-\mu_2}$
(4) $\frac{R}{\mu_1-\mu_2}$

(A) $\frac{R}{2-(\mu_1-\mu_2)}$
(B) $\frac{R}{2(\mu_1-\mu_2)}$
(C) $\frac{2R}{\mu_1-\mu_2}$
(D) $\frac{R}{\mu_1-\mu_2}$

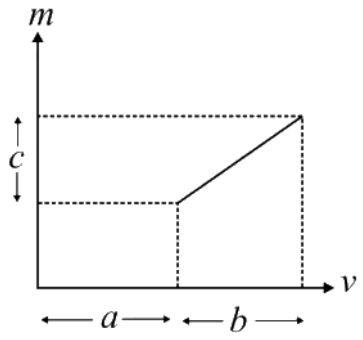
Answer: (D) $\frac{R}{\mu_1-\mu_2}$ · Key from source paper

Q209 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The graph shows how the magnification m produced by a thin lens varies with image distance v. The focal length of the lens used is

(see the figure above)

Q24. The graph shows how the magnification m produced by a thin lens varies with image distance v. The focal length of the lens used is



(1) $\frac{b}{c}$
(2) $\frac{a}{c}$
(3) $\frac{b^2c}{a}$
(4) $\frac{b^2}{ac}$

(A) $\frac{b}{c}$
(B) $\frac{a}{c}$
(C) $\frac{b^2c}{a}$
(D) $\frac{b^2}{ac}$

Answer: (A) $\frac{b}{c}$ · Key from source paper

Q210 JEE Main 2019 · 9 Apr · Shift 1 MCQ

A concave mirror for face viewing has a focal length of 0.4 m. The distance at which you hold the mirror from your face in order to see your image upright with a magnification of 5 is

(A) 1.60 m
(B) 0.16 m
(C) 0.32 m
(D) 0.24 m

Answer: (C) 0.32 m · Key from source paper

Q211 JEE Main 2019 · 9 Apr · Shift 2 MCQ

A convex lens of focal length 20 cm produces images of the same magnification 2 when an object is kept at two distances x_1 and $x_2(x_1 > x_2)$ from the lens. The ratio of x_1 and x_2 is:

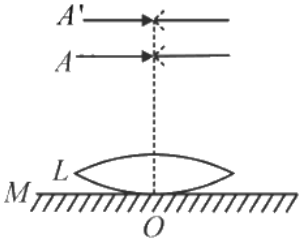
(A) 2 : 1
(B) 5 : 3
(C) 4 : 3
(D) 3 : 1

Answer: (D) 3 : 1 · Key from source paper

Q212 JEE Main 2019 · 9 Apr · Shift 2 MCQ

A thin convex lens L (refractive index = 1.5) is placed on a plane mirror M. When a pin is placed at A, such that OA = 18 cm, its real inverted image is formed at A itself, as shown in figure. When liquid of refractive index μ_l is put between the lens and the mirror, the pin has to be moved to A', such that OA' = 27 cm, to get its inverted real image at A' itself. The value of μ_l will be
(see the figure above)

Q25. A thin convex lens L (refractive index $= 1.5$) is placed on a plane mirror M. When a pin is placed at A, such that $\mathrm{OA} = 18$ cm, its real inverted image is formed at A itself, as shown in figure. When liquid of refractive index μ_l is put between the lens and the mirror, the pin has to be moved to A', such that $\mathrm{OA'} = 27$ cm, to get its inverted real image at A' itself. The value of μ_l will be



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

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

Answer: (A) $\frac{4}{3}$ · Key from source paper

Q213 JEE Main 2019 · 9 Apr · Shift 2 MCQ

Diameter of the objective lens of a telescope is 250 cm. For light of wavelength 600 nm coming from a distant object, the limit of resolution of the telescope is close to:

(A) 1.5×10^{-7} rad
(B) 3.0×10^{-7} rad
(C) 2.0×10^{-7} rad
(D) 4.5×10^{-7} rad

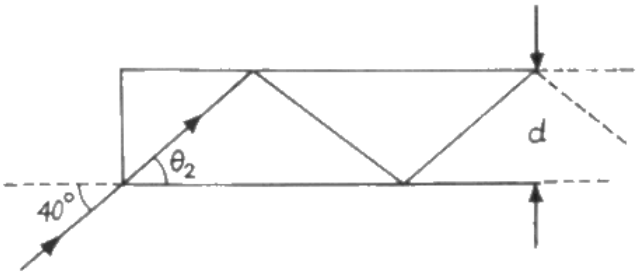
Answer: (B) 3.0×10^{-7} rad · Key from source paper

Q214 JEE Main 2019 · 8 Apr · Shift 1 MCQ

In figure, the optical fiber is $l = 2$ m long and has a diameter of d = 20 μm. If a ray of light is incident on one end of the fiber at angle $\theta_1 = 40^\circ$, the number of reflections it makes before emerging from the other end is close to: (refractive index of fiber is 1.31 , $\sin 40^\circ = 0.64$ and $\sin^{-1} 0.49 = 30^\circ$.)
(see the figure above)

Q24. In figure, the optical fiber is $l = 2$ m long and has a diameter of d = 20 μm. If a ray of light is incident on one end of the fiber at angle $\theta_1 = 40°$, the number of reflections it makes before emerging from the other end is close to:

(refractive index of fiber is 1.31 , sin 40° = 0.64 and $\sin^{-1}0.49 = 30°$.)



(1) 55000 (2) 57000 (3) 45000 (4) 66000

(A) 55000
(B) 57000
(C) 45000
(D) 66000

Answer: (B) 57000 · Key from source paper

Q215 JEE Main 2019 · 8 Apr · Shift 1 MCQ

An upright object is placed at a distance of 40 cm in front of a convergent lens of focal length 20 cm. A convergent mirror of focal length 10 cm is placed at a distance of 60 cm on the other side of the lens. The position and size of the final image will be:

(A) 40 cm from the convergent lens, twice the size of the object
(B) 20 cm from the convergent mirror, twice the size of the object
(C) 40 cm from the convergent lens, same size of the object
(D) 20 cm from the convergent mirror, same size of the object

Answer: (C) 40 cm from the convergent lens, same size of the object · Key from source paper

Q216 JEE Main 2019 · 8 Apr · Shift 2 MCQ

A convex lens (of focal length 20 cm) and a concave mirror, having their principal axes along the same lines, are kept 80 cm apart from each other. The concave mirror is to the right of the convex lens. When an object is kept at a distance of 30 cm to the left of the convex lens, its image remains at the same position even if the concave mirror is removed. The maximum distance of the object for which this concave mirror, by itself would produce a virtual image would be:

(A) 30 cm
(B) 25 cm
(C) 20 cm
(D) 10 cm

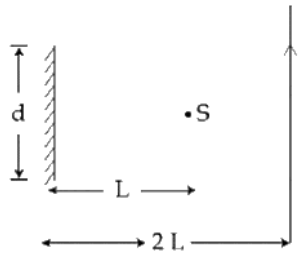
Answer: (D) 10 cm · Key from source paper

Q217 JEE Main 2019 · 12 Jan · Shift 1 MCQ

A point source of light, S is placed at a distance L in front of the center of plane mirror of width d which is hanging vertically on a wall. A man walks in front of the mirror along a line parallel to the mirror, at a distance 2L as shown below. The distance over which the man can see the image of the light source in the mirror is:

(see the figure above)

Q22. A point source of light, S is placed at a distance L in front of the center of plane mirror of width d which is hanging vertically on a wall. A man walks in front of the mirror along a line parallel to the mirror, at a distance 2L as shown below. The distance over which the man can see the image of the light source in the mirror is:



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

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

Answer: (A) $3d$ · Key from source paper

Q218 JEE Main 2019 · 12 Jan · Shift 1 MCQ

What is the position and nature of image formed by lens combination shown in figure? (f_1, f_2 are focal lengths)

(see the figure above)

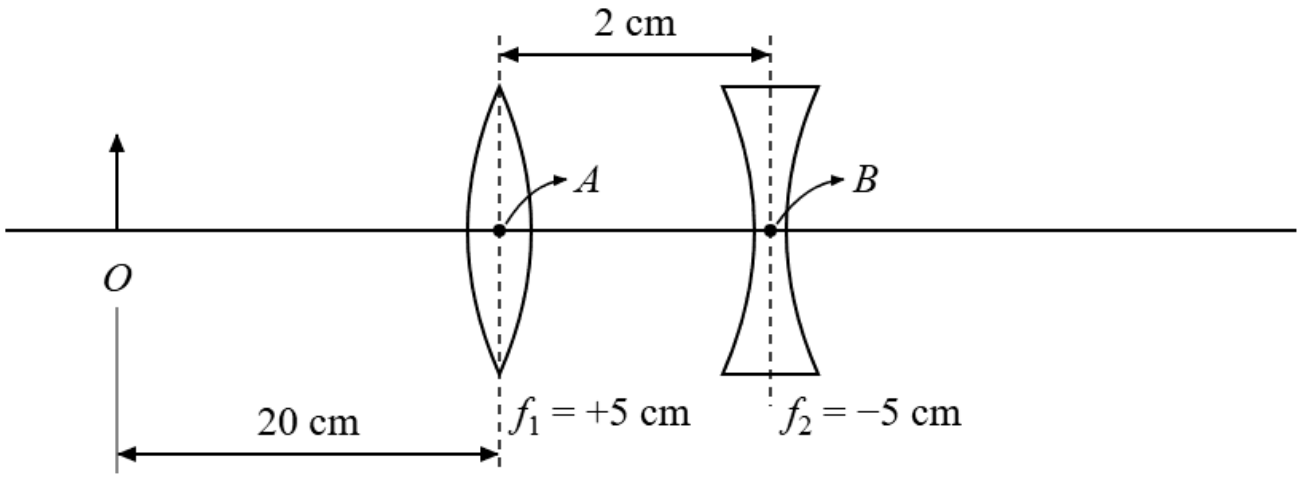


Figure redrawn by EdLoop

(A) 40 cm from point B at right; real
(B) $\frac{20}{3}$ cm from point B at right, real
(C) 70 cm from point B at right; real
(D) 70 cm from point B at left; virtual

Answer: (C) 70 cm from point B at right; real · Key from source paper

Q219 JEE Main 2019 · 12 Jan · Shift 2 MCQ

A plano - convex lens (focal length f_2 , refractive index μ_2, radius of curvature R) fits exactly into a plano - concave lens (focal length f_1, refractive index μ_1, radius of curvature R). Their plane surfaces are parallel to each other. Then, the focal length of the combination will be:

(A) $\frac{R}{\mu_2-\mu_1}$
(B) $f_1 - f_2$
(C) $f_1 + f_2$
(D) $\frac{2f_1f_2}{f_1+f_2}$

Answer: (A) $\frac{R}{\mu_2-\mu_1}$ · Key from source paper

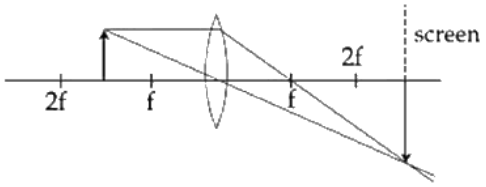
Q220 JEE Main 2019 · 12 Jan · Shift 2 MCQ

Formation of real image using a biconvex lens is shown below:

(see the figure above)

If the whole set up is immersed in water without disturbing the object and the screen positions, what will one observe on the screen?

Q24. Formation of real image using a biconvex lens is shown below:



If the whole set up is immersed in water without disturbing the object and the screen positions, what will one observe on the screen?

(1) Image disappears
(2) Magnified image
(3) Erect real image
(4) No change

(A) Image disappears
(B) Magnified image
(C) Erect real image
(D) No change

Answer: (A) Image disappears · Key from source paper

Q221 JEE Main 2019 · 11 Jan · Shift 1 MCQ

An object is at a distance of 20 m from a convex lens of focal length 0.3 m. The lens forms an image of the object. If the object moves away from the lens at a speed of 5 m/s the speed and direction of the image will be

(A) 2.26×10^{-3} m/s away from the lens

(B) 0.92×10^{-3} m/s away from the lens

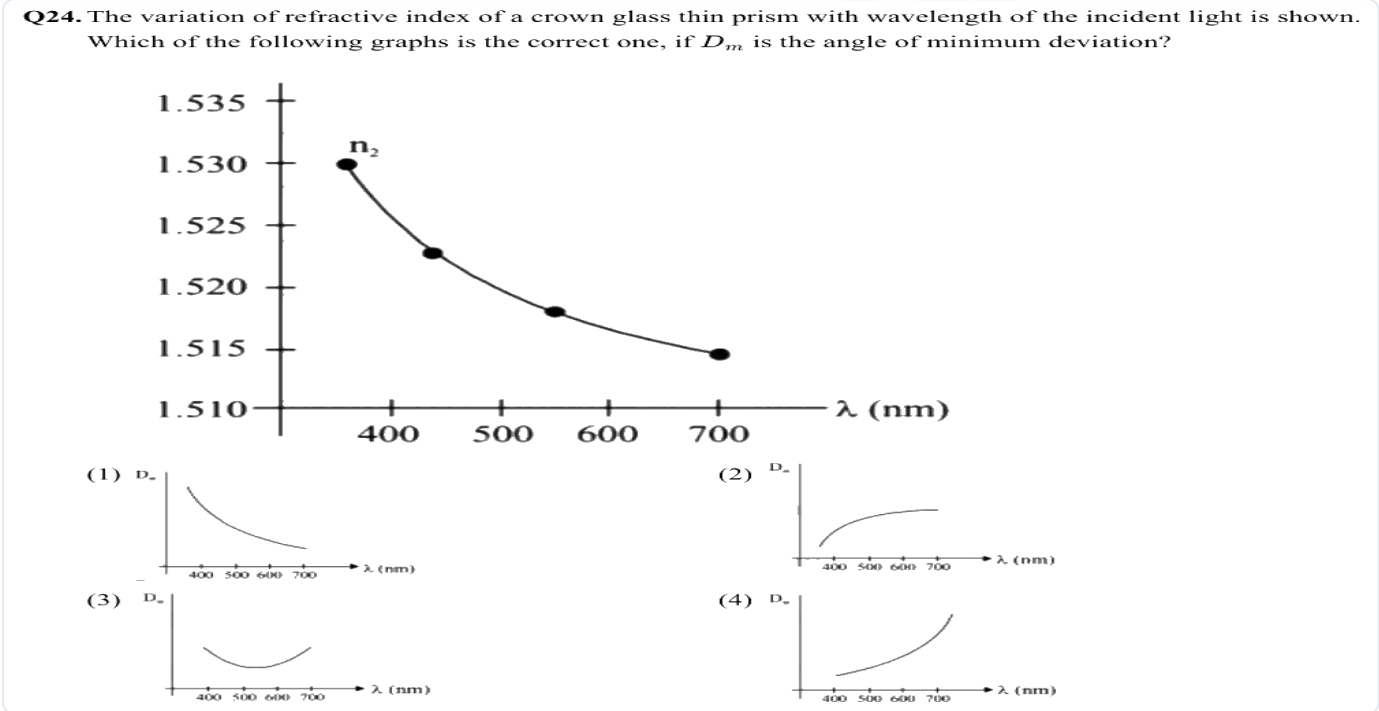
(C) 3.22×10^{-3} m/s towards the lens

(D) 1.16×10^{-3} m/s towards the lens

Answer: (D) 1.16×10^{-3} **m/s towards the lens** · Key from source paper

Q222 JEE Main 2019 · 11 Jan · Shift 1 MCQ

The variation of refractive index of a crown glass thin prism with wavelength of the incident light is shown. Which of the following graphs is the correct one, if D_m is the angle of minimum deviation? *(see the figure above)*



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Key from source paper

Q223 JEE Main 2019 · 11 Jan · Shift 2 MCQ

A monochromatic light is incident at a certain angle on an equilateral triangular prism and suffers minimum deviation. If the refractive index of the material of the prism is $\sqrt{3}$, then the angle of

incidence is :

(A) 90°
(B) 30°
(C) 60°
(D) 45°

Answer: (C) 60° · Key from source paper

Q224 JEE Main 2019 · 10 Jan · Shift 1 MCQ

A plano-convex lens of refractive index μ_1 and focal length f_1 is kept in contact with another plano-concave lens of refractive index μ_2 and focal length f_2. If the radius of curvature of their spherical faces is R each and $f_1 = 2f_2$, the μ_1 and μ_2 are related as:

(A) $2\mu_2 - \mu_1 = 1$
(B) $3\mu_2 - 2\mu_1 = 1$
(C) $\mu_1 + \mu_2 = 3$
(D) $2\mu_1 - \mu_2 = 1$

Answer: (D) $2\mu_1 - \mu_2 = 1$ · Key from source paper

Q225 JEE Main 2019 · 10 Jan · Shift 2 MCQ

The eye can be regarded as a single refracting surface. The radius of curvature of this surface is equal to that of the cornea $(7.8\ \text{mm})$. This surface separates two media of refractive indices 1 and 1.34. Calculate the distance from the refracting surface at which a parallel beam of light will come to focus.

(A) $4.0\ \text{cm}$
(B) $1\ \text{cm}$
(C) $2\ \text{cm}$
(D) $3.07\ \text{cm}$

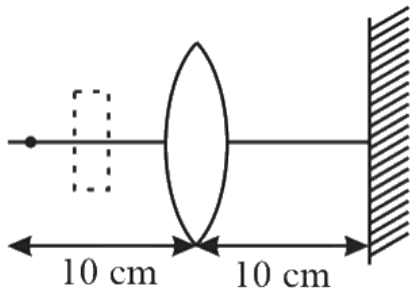
Answer: (D) $3.07\ \text{cm}$ · Key from source paper

Q226 JEE Main 2019 · 9 Jan · Shift 1 MCQ

A convex lens is put $10\ cm$ from a light source and it makes a sharp image on a screen, kept $10\ cm$ from the lens. Now a glass block (refractive index 1.5) of $1.5\ cm$ thickness is placed in between the light source and the lens. To get the sharp image again, the screen is shifted by a distance d . Then d is:

(see the figure above)

Q26. A convex lens is put 10 cm from a light source and it makes a sharp image on a screen, kept 10 cm from the lens. Now a glass block (refractive index 1.5) of 1.5 cm thickness is placed in between the light source and the lens. To get the sharp image again, the screen is shifted by a distance d. Then d is:



(1) 0
(2) 0.55 cm away from the lens
(3) 0.55 cm towards the lens
(4) 1.1 cm away from the lens

(A) 0
(B) $0.55\ cm$ away from the lens
(C) $0.55\ cm$ towards the lens
(D) $1.1\ cm$ away from the lens

Answer: (B) $0.55\ cm$ **away from the lens** · Key from source paper

Q227 JEE Main 2019 · 9 Jan · Shift 2 MCQ

Two plane mirrors are inclined to each other such that a ray of light incident on the first mirror (M_1) and parallel to the second mirror (M_2) is finally reflected from the second mirror (M_2) and parallel to the first mirror (M_1). The angle between the two mirrors will be:

(A) 60°
(B) 45°
(C) 90°
(D) 75°

Answer: (A) 60° · Key from source paper

Q228 JEE Main 2018 · 16 Apr · Online MCQ

A ray of light is incident at an angle of 60° on one face of a prism of angle 30°. The emergent ray of light makes an angle of 30° with incident ray. The angle made by the emergent ray with second face of prism will be:

(A) 0°
(B) 90°
(C) 30°
(D) 45°

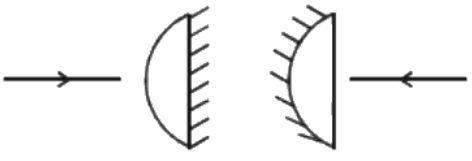
Answer: (B) 90° · Key from source paper

Q229 JEE Main 2018 · 15 Apr · Shift 1 MCQ

A planoconvex lens becomes an optical system of $28\ \text{cm}$ focal length when its plane surface is silvered and illuminated from left to right as shown in Fig-A. If the same lens is instead silvered on the curved surface and illuminated from other side as in Fig. B, it acts like an optical system of focal length $10\ \text{cm}$. The refractive index of the material of lens is

(see the figure above)

Q22. A planoconvex lens becomes an optical system of 28 cm focal length when its plane surface is silvered and illuminated from left to right as shown in Fig-A. If the same lens is instead silvered on the curved surface and illuminated from other side as in Fig. B, it acts like an optical system of focal length 10 cm. The refractive index of the material of lens is



(1) 1.50
(2) 1.55
(3) 1.75
(4) 1.51

(A) 1.50
(B) 1.55
(C) 1.75
(D) 1.51

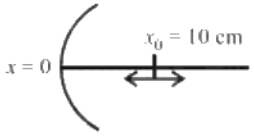
Answer: (B) 1.55 · Key from source paper

Q230 JEE Main 2018 · 15 Apr · Shift 1 MCQ

A particle is oscillating on the X-axis with an amplitude $2\ \text{cm}$ about the point $x_0 = 10\ \text{cm}$ with a frequency ω. A concave mirror of focal length $5\ \text{cm}$ is placed at the origin (see figure) Identify the correct statements: (A) The image executes periodic motion (B) The image executes non-periodic motion (C) The turning points of the image are asymmetric w.r.t the image of the point at $x = 10\ \text{cm}$ (D) The distance between turning points of the oscillation of the image is $\frac{100}{21}$

(see the figure above)

Q23. A particle is oscillating on the X-axis with an amplitude 2 cm about the point $x_0 = 10$ cm with a frequency ω. A concave mirror of focal length 5 cm is placed at the origin (see figure) Identify the correct statements: (A) The image executes periodic motion (B) The image executes non-periodic motion (C) The turning points of the image are asymmetric w.r.t the image of the point at $x = 10$ cm (D) The distance between the turning points of the oscillation of the image is $\frac{100}{21}$



(1) (B), (D)
(2) (B), (C)
(3) (A), (C), (D)
(4) (A), (D)

(A) (B), (D)
(B) (B), (C)
(C) (A), (C), (D)
(D) (A), (D)

Answer: (C) (A), (C), (D) · Key from source paper

Q231 JEE Main 2018 · 15 Apr · Shift 2 MCQ

A convergent doublet of separated lenses, corrected for spherical aberration, has resultant focal length of $10\ \text{cm}$. The separation between the two lenses is $2\ \text{cm}$. The focal lengths of the component lenses

(A) $18\ \text{cm},\ 20\ \text{cm}$
(B) $10\ \text{cm},\ 12\ \text{cm}$
(C) $12\ \text{cm},\ 14\ \text{cm}$
(D) $16\ \text{cm},\ 18\ \text{cm}$

Answer: (A) $18\ \text{cm},\ 20\ \text{cm}$ · Key from source paper

Q232 JEE Main 2017 · 9 Apr · Online MCQ

In an experiment a convex lens of focal length 15 cm is placed coaxially on an optical bench in front of a convex mirror at a distance of 5 cm from it. It is found that an object and its image coincide, if the object is placed at a distance of 20 cm from the lens. The focal length of the convex mirror is-

(A) 20.0 cm
(B) 30.5 cm
(C) 25.0 cm
(D) 27.5 cm

Answer: (D) 27.5 cm · Key from source paper

Q233 JEE Main 2017 · 8 Apr · Online MCQ

Let the refractive index of a denser medium with respect to rarer medium be n_{12} and its critical angle be θ_C. At an angle of incidence A when light is travelling from denser medium to rarer medium, a part of the light is reflected and the rest is refracted and the angle between reflected and refracted rays is 90°. Angle A is given by

(A) $\tan^{-1}(\sin\theta_C)$
(B) $\frac{1}{\tan^{-1}(\sin\theta_C)}$
(C) $\cos^{-1}(\sin\theta_C)$
(D) $\frac{1}{\cos^{-1}(\sin\theta_C)}$

Answer: (A) $\tan^{-1}(\sin\theta_C)$ · Key from source paper

Q234 JEE Main 2017 · 2 Apr · Offline MCQ

A diverging lens with magnitude of focal length $25\ \text{cm}$ is placed at a distance of $15\ \text{cm}$ from a converging lens of magnitude of focal length $20\ \text{cm}$. A beam of parallel light falls on the diverging lens. The final image formed is:

(A) Real and at a distance of $6\ \text{cm}$ from the convergent lens
(B) Real and at a distance of $40\ \text{cm}$ from convergent lens
(C) Virtual and at a distance of $40\ \text{cm}$ from convergent lens
(D) Real and at a distance of $40\ \text{cm}$ from the divergent lens

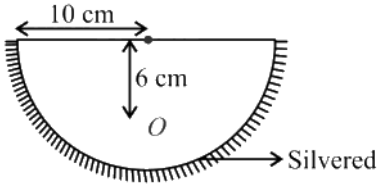
Answer: (B) Real and at a distance of $40\ \text{cm}$ from convergent lens · Key from source paper

Q235 JEE Main 2016 · 10 Apr · Online MCQ

A hemispherical glass body of radius $10\ \text{cm}$ and refractive index 1.5 is silvered on its curved surface. A small air bubble is $6\ \text{cm}$ below the flat surface inside it along the axis. The position of the image of the air bubble made by the mirror is seen :

(see the figure above)

Q23. A hemispherical glass body of radius 10 cm and refractive index 1.5 is silvered on its curved surface. A small air bubble is 6 cm below the flat surface inside it along the axis. The position of the image of the air bubble made by the mirror is seen :



(1) 14cm below flat surface
(2) 20cm below flat surface
(3) 16cm below flat surface
(4) 30cm below flat surface

(A) 14cm below flat surface
(B) 20cm below flat surface
(C) 16cm below flat surface
(D) 30cm below flat surface

Answer: (B) 20cm below flat surface · Key from source paper

Q236 JEE Main 2016 · 3 Apr · Offline MCQ

An observer looks at a distant tree of height 10 m with a telescope of magnifying power of 20. To the observer, the tree appears as

(A) 20 times taller.
(B) 20 times nearer.
(C) 10 times taller.
(D) 10 times nearer.

Answer: (B) 20 times nearer. · Key from source paper

Q237 JEE Main 2016 · 3 Apr · Offline MCQ

In an experiment for determination of refractive index of glass of a prism by i v/s δ plot, it was found that a ray incident at angle 35° , suffers a deviation of 40° and that it emerges at angle 79° . In that case which of the following is closest to the maximum possible value of the refractive index?

(A) 1.7
(B) 1.8
(C) 1.5
(D) 1.6

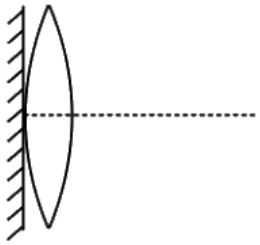
Answer: (C) 1.5 · Key from source paper

Q238 JEE Main 2015 · 11 Apr · Online MCQ

A thin convex lens of focal length f is put on a plane mirror as shown in the figure. When an object is kept at a distance a from the lens-mirror combination, its image is formed at a distance $\frac{a}{3}$ in front of the combination.
The value of a is:
(see the figure above)

Q25. A thin convex lens of focal length f is put on a plane mirror as shown in the figure. When an object is kept at a distance a from the lens-mirror combination, its image is formed at a distance $\frac{a}{3}$ in front of the combination.

The value of a is:



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

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

Answer: (A) $2f$ · Key from source paper

Q239 JEE Main 2015 · 10 Apr · Online MCQ

A telescope has an objective lens of focal length 150 cm and an eyepiece of focal length 5 cm. If a 50 m tall tower at a distance of 1 km is observed through this telescope in a normal setting, the angle formed by the image of the tower is θ, then θ is close to

(A) 30°
(B) 15°
(C) 1°
(D) 86°

Answer: (D) 86° · Key from source paper

Q240 JEE Main 2015 · 10 Apr · Online MCQ

You are asked to design a shaving mirror assuming that a person keeps it at 10 cm from his face and views the magnified image of the face at the closest comfortable distance of 25 cm. The radius of curvature of the mirror would then be:

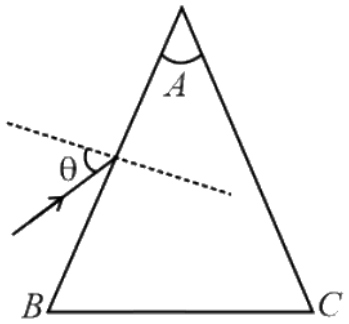
(A) 24 cm
(B) 30 cm
(C) 60 cm
(D) -24 cm

Answer: (C) 60 cm · Key from source paper

Q241 JEE Main 2015 · 4 Apr · Offline MCQ

Monochromatic light is incident on a glass prism of angle A. If the refractive index of the material of the prism is μ, a ray, incident at an angle θ, on the face AB would get transmitted through the face AC of the prism provided:
(see the figure above)

Q25. Monochromatic light is incident on a glass prism of angle A. If the refractive index of the material of the prism is μ, a ray, incident at an angle θ, on the face AB would get transmitted through the face AC of the prism provided:



(1) $\theta < \cos^{-1}\left[\mu \sin\left(\mathrm{A} + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(2) $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(3) $\theta < \sin^{-1}\left[\mu \sin\left(\mathrm{A} - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(4) $\theta > \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(A) $\theta < \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(B) $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(C) $\theta < \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

(D) $\theta > \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

Answer: (B) $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$ · Key from source paper

Q242 JEE Main 2014 · 19 Apr · Online MCQ

The diameter of the objective lens of the microscope makes an angle β at the focus of the microscope. Further, the medium between the object and the lens is the oil of the refractive index n. Then the resolving power of the microscope.

(A) Increases with decreasing value of β

(B) Increases with increasing value of $n \sin 2\beta$

(C) Increases with increasing value of $\frac{1}{n \sin 2\beta}$

(D) Increases with decreasing value of n

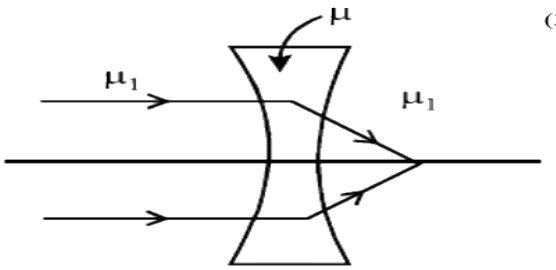
Answer: (B) Increases with increasing value of $n \sin 2\beta$ · Key from source paper

Q243 JEE Main 2014 · 12 Apr · Online MCQ

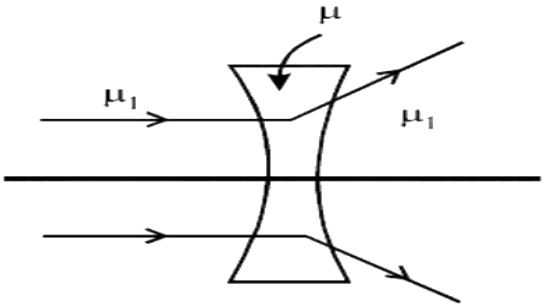
The refractive index of the material of a concave lens is μ. It is immersed in a medium of refractive index μ_1. A parallel beam of light is incident on the lens. The path of the emergent rays when $\mu_1 > \mu$ is:

Q24. The refractive index of the material of a concave lens is μ. It is immersed in a medium of refractive index μ_1. A parallel beam of light is incident on the lens. The path of the emergent rays when $\mu_1 > \mu$ is:

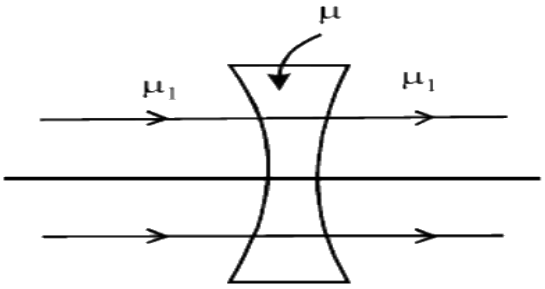
(1)



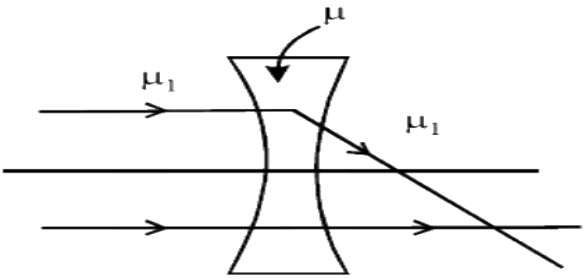
(2)



(3)



(4)



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (A) · Key from source paper

Q244 JEE Main 2014 · 11 Apr · Online MCQ

An object is located in a fixed position in front of a screen. Sharp image is obtained on the screen for two positions of a thin lens separated by $10\ \text{cm}$. The size of the images in two situations are in the ratio $3 : 2$. What is the distance between the screen and the object?

(A) $124.5\ \text{cm}$
(B) $144.5\ \text{cm}$
(C) $65.0\ \text{cm}$
(D) $99.0\ \text{cm}$

Answer: (D) $99.0\ \text{cm}$ · Key from source paper

Q245 JEE Main 2014 · 11 Apr · Online MCQ

In a compound microscope the focal length of objective lens is $1.2\ \text{cm}$ and focal length of eye piece is $3.0\ \text{cm}$. When object is kept at $1.25\ \text{cm}$ in front of objective, final image is formed at infinity. Magnifying power of the compound microscope should be:

(A) 200
(B) 100
(C) 400
(D) 150

Answer: (A) 200 · Key from source paper

Q246 JEE Main 2014 · 9 Apr · Online MCQ

A diver looking up through the water sees the outside world contained in a circular horizon. The refractive index of water is $\frac{4}{3}$, and the diver's eyes are 15 cm below the surface of the water. Then the radius of the circle is :

(A) $\frac{15\times\sqrt{7}}{3}$ cm
(B) $\frac{15\times 3}{\sqrt{7}}$ cm
(C) $15\times 3\sqrt{7}$ cm
(D) $15\times 3\times\sqrt{5}$ cm

Answer: (B) $\frac{15\times 3}{\sqrt{7}}$ cm · Key from source paper

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Q247 JEE Main 2014 · 9 Apr · Online MCQ

The focal lengths of objective lens and eye lens of a Galilean Telescope are respectively 30 cm and 3.0 cm. Telescope produces virtual, erect image of an object situated far away from it at least distance of distinct vision from the eye lens. In this condition the Magnifying Power of the Galilean Telescope should be :

(A) $+8.8$
(B) -11.2
(C) $+11.2$
(D) -8.8

Answer: (A) $+8.8$ · Checked by our team

Q248 JEE Main 2014 · 6 Apr · Offline MCQ

A thin convex lens made from crown glass $\left(\mu=\frac{3}{2}\right)$ has focal length f. When it is measured in two different liquids having refractive indices $\frac{4}{3}$ and $\frac{5}{3}$, it has the focal lengths f_1 and f_2 respectively. The correct relation between the focal lengths is :

(A) $f_1=f_2<f$
(B) $f_1>f$ and f_2 becomes negative
(C) $f_2>f$ and f_1 becomes negative
(D) f_1 and f_2 both become negative

Answer: (B) $f_1>f$ and f_2 becomes negative · Key from source paper

Q249 JEE Main 2014 · 6 Apr · Offline MCQ

A green light is incident from the water to the air - water interface at the critical angle (θ_c). Select the **correct** statement.

(A) The entire spectrum of visible light will come out of the water at an angle of 90° to the normal
(B) The spectrum of visible light whose frequency is less than that of green light will come out to the air medium
(C) The spectrum of visible light whose frequency is more than that of green light will come out to the air medium
(D) The entire spectrum of visible light will come out of the water at various angles to the normal

Answer: (B) The spectrum of visible light whose frequency is less than that of green light will come out to the air medium · Key from source paper

Q250 JEE Main 2013 · 23 Apr · Online MCQ

This question has Statement-1 and Statement-2. Of the four choices given after the Statements, choose the one that best describes the two Statements. Statement 1: Very large size telescopes are reflecting telescopes instead of refracting telescopes. Statement 2: It is easier to provide mechanical support to large size mirrors than large size lenses.

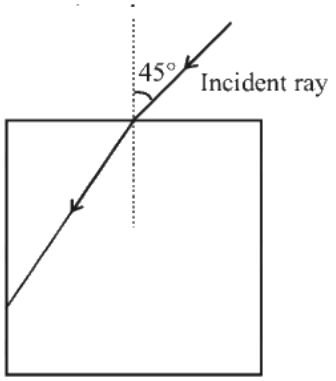
(A) Statement-1 is true and Statement-2 is false.
(B) Statement-1 is false and Statement-2 is true.
(C) Statement-1 and statement-2 are true and Statement-2 is correct explanation for statement-1.
(D) Statements-1 and statement-2 are true and Statement-2 is not the correct explanation for statement-1.

Answer: (C) Statement-1 and statement-2 are true and Statement-2 is correct explanation for statement-1. · Key from source paper

Q251 JEE Main 2013 · 23 Apr · Online MCQ

A light ray falls on a square glass slab as shown in the diagram. The index of refraction of the glass, if total internal reflection is to occur at the vertical face, is equal to :
(see the figure above)

Q24. A light ray falls on a square glass slab as shown in the diagram. The index of refraction of the glass, if total internal reflection is to occur at the vertical face, is equal to :



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

(A) $\frac{(\sqrt{2}+1)}{2}$
(B) $\sqrt{\frac{5}{2}}$
(C) $\frac{3}{2}$
(D) $\sqrt{\frac{3}{2}}$

Answer: (D) $\sqrt{\frac{3}{2}}$ · Key from source paper

Q252 JEE Main 2013 · 22 Apr · Online MCQ

The focal length of the objective and the eyepiece of a telescope are $50\ \text{cm}$ and $5\ \text{cm}$ respectively. If the telescope is focussed for distinct vision on a scale distant $2\ \text{m}$ from its objective, then its magnifying power will be :

(A) -4
(B) -8
(C) $+8$
(D) -2

Answer: (D) -2 · Key from source paper

Q253 JEE Main 2013 · 22 Apr · Online MCQ

The image of an illuminated square is obtained on a screen with the help of a converging lens. The distance of the square from the lens is $40\ \text{cm}$. The area of the image is 9 times that of the square. The focal length of the lens is :

(A) 36 cm
(B) 27 cm
(C) 60 cm
(D) 30 cm

Answer: (D) 30 cm · Key from source paper

Q254 JEE Main 2013 · 9 Apr · Online MCQ

Light is incident from a medium into air at two possible angles of incidence (A) 20° and (B) 40°. In the medium light travels 3.0 cm in 0.2 ns. The ray will :

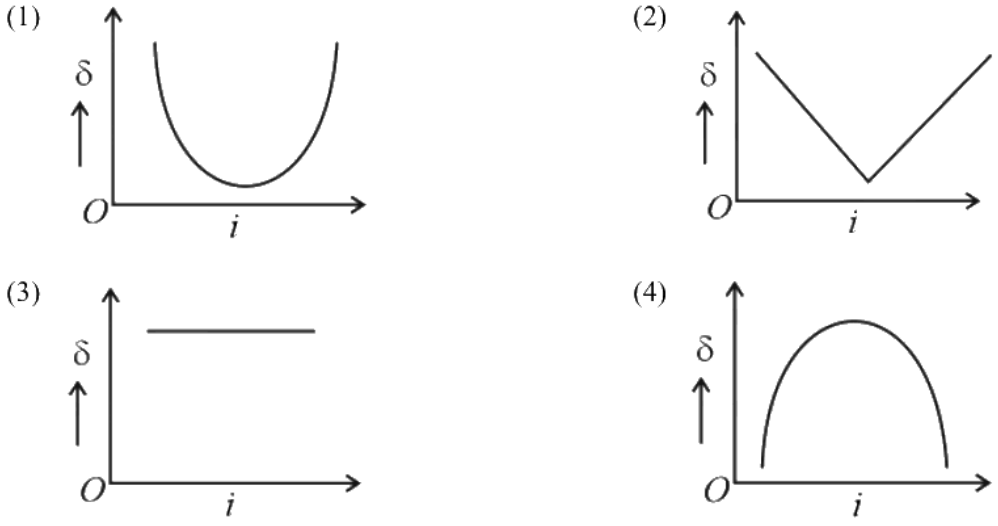
(A) suffer total internal reflection in both cases (A) and (B)
(B) suffer total internal reflection in case (B) only
(C) have partial reflection and partial transmission in case (B)
(D) have 100% transmission in case (A)

Answer: (B) suffer total internal reflection in case (B) only · Key from source paper

Q255 JEE Main 2013 · 7 Apr · Offline MCQ

The graph between angle of deviation (δ) and angle of incidence (i) for a triangular prism is represented by :

Q23. The graph between angle of deviation (δ) and angle of incidence (i) for a triangular prism is represented by :



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (A) · Key from source paper

Q256 JEE Main 2013 · 7 Apr · Offline MCQ

Diameter of a plano - convex lens is 6 cm and thickness at the centre is 3 mm. If the speed of light in the material of lens is $2 \times 10^8 \text{ m s}^{-1}$, the focal length of the lens is:

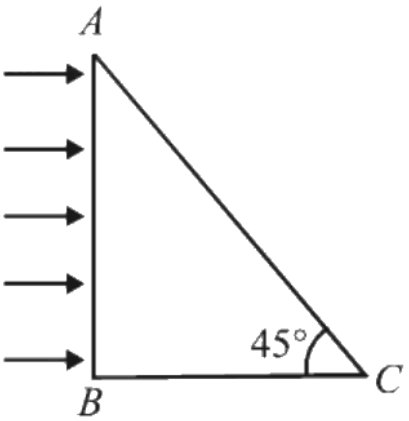
(A) 30 cm
(B) 10 cm
(C) 15 cm
(D) 20 cm

Answer: (A) 30 cm · Key from source paper

Q257 AIEEE 2012 · 26 May · Online MCQ

A beam of light consisting of red, green and blue colours is incident on a right-angled prism on face AB. The refractive indices of the material for the above red, green and blue colours are 1.39, 1.44 and 1.47 respectively.
(see the figure above)
A person looking on surface AC of the prism will see

Q24. A beam of light consisting of red, green and blue colours is incident on a right-angled prism on face AB. The refractive indices of the material for the above red, green and blue colours are 1.39, 1.44 and 1.47 respectively.



A person looking on surface AC of the prism will see
(1) no light
(2) green and blue colours
(3) red and green colours
(4) red colour only

(A) no light
(B) green and blue colours
(C) red and green colours
(D) red colour only

Answer: (D) red colour only · Key from source paper

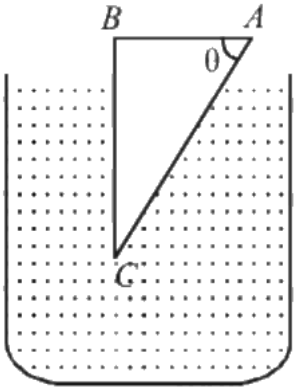
Q258 AIEEE 2012 · 19 May · Online MCQ

A glass prism of refractive index 1.5 is immersed in water (refractive index $\frac{4}{3}$) as shown in figure. A light beam incident normally on the face AB is *(see the figure above)* totally reflected to reach the face

BC, if

Q23. A glass prism of refractive index 1.5 is immersed in water (refractive index $\frac{4}{3}$) as shown in figure. A light beam incident normally on the face AB is

totally reflected to reach the face BC, if



(1) $\sin\theta > \frac{5}{9}$
(2) $\sin\theta > \frac{2}{3}$
(3) $\sin\theta > \frac{8}{9}$
(4) $\sin\theta > \frac{1}{3}$

(A) $\sin\theta > \frac{5}{9}$
(B) $\sin\theta > \frac{2}{3}$
(C) $\sin\theta > \frac{8}{9}$
(D) $\sin\theta > \frac{1}{3}$

Answer: (C) $\sin\theta > \frac{8}{9}$ · Key from source paper

Q259 AIEEE 2012 · 12 May · Online MCQ

We wish to make a microscope with the help of two positive lenses both with a focal length of 20 mm each and the object is positioned 25 mm from the objective lens. How far apart the lenses should be so that the final image is formed at infinity?

(A) 20 mm
(B) 100 mm
(C) 120 mm
(D) 80 mm

Answer: (C) 120 mm · Key from source paper

Q260 AIEEE 2012 · 7 May · Online MCQ

Which of the following processes play a part in the formation of a rainbow? (i) Refraction (ii) Total internal reflection (iii) Dispersion (iv) Interference

(A) (i), (ii) and (iii)
(B) (i) and (ii)
(C) (i), (ii) and (iv)
(D) (iii) and (iv)

Answer: (A) (i), (ii) and (iii) · Key from source paper

Q261 AIEEE 2012 · Offline MCQ

An object $2.4\ \mathrm{m}$ in front of a lens forms a sharp image on a film $12\ \mathrm{cm}$ behind the lens. A glass plate $1\ \mathrm{cm}$ thick, of refractive index 1.50 is interposed between lens and film with its plane faces parallel to film. At what distance (from lens) should object be shifted to be in sharp focus on film?

(A) $7.2\ \mathrm{m}$
(B) $2.4\ \mathrm{m}$
(C) $3.2\ \mathrm{m}$
(D) $5.6\ \mathrm{m}$

Answer: (D) $5.6\ \mathrm{m}$ · Key from source paper

Q262 AIEEE 2011 MCQ

Let the $x-z$ plane be the boundary between two transparent media. Medium 1 in $z \geq 0$ has a refractive index of $\sqrt{2}$ and medium 2 with $z<0$ has a refractive index of $\sqrt{3}$. A ray of light in medium 1 given by the vector $\vec{A}=6\sqrt{3}\hat{i}+8\sqrt{3}\hat{j}-10\hat{k}$ is incident on the plane of separation. The angle of refraction in medium 2 is

(A) 45°
(B) 60°
(C) 75°
(D) 30°

Answer: (A) 45° · Key from source paper

Q263 AIEEE 2011 MCQ

A car is fitted with a convex side-view mirror of focal length $20\ \mathrm{cm}$. A second car $2.8\ \mathrm{m}$ behind the first car is overtaking the first car at relative speed of $15\ \mathrm{m/s}$. The speed of the image of the second car as seen in the mirror of the first one is :

(A) $\frac{1}{15}\ \mathrm{m/s}$
(B) $10\ \mathrm{m/s}$
(C) $15\ \mathrm{m/s}$
(D) $\frac{1}{10}\ \mathrm{m/s}$

Answer: (A) $\frac{1}{15}\ \mathrm{m/s}$ · Key from source paper

Q264 AIEEE 2010 MCQ

An initially parallel cylindrical beam travels in a medium of refractive index $\mu(I) = \mu_0 + \mu_2 I$, where μ_0 and μ_2 are positive constants and I is the intensity of the light beam. The intensity of the beam is decreasing with increasing radius. The speed of light in the medium is

(A) minimum on the axis of the beam
(B) the same everywhere in the beam
(C) directly proportional to the intensity I
(D) maximum on the axis of the beam

Answer: (A) minimum on the axis of the beam · Key from source paper

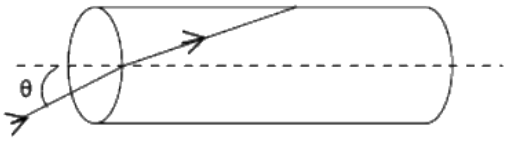
Q265 AIEEE 2009 MCQ

A transparent solid cylindrical rod has a refractive index of $\frac{2}{\sqrt{3}}$. It is surrounded by air. A light ray is incident at the mid point of one end of the rod as shown in the figure. The incident angle θ for which the light ray

(see the figure above)

grazes along the wall of the rod is

Q23. A transparent solid cylindrical rod has a refractive index of $\frac{2}{\sqrt{3}}$. It is surrounded by air. A light ray is incident at the mid point of one end of the rod as shown in the figure. The incident angle θ for which the light ray



grazes along the wall of the rod is

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

(A) $\sin^{-1}\left(\frac{1}{2}\right)$
(B) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$
(C) $\sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$
(D) $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: (D) $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$ · Key from source paper

Q266 AIEEE 2007 MCQ

Two lenses of power -15 D and $+5$ D are in contact with each other. The focal length of the combination is

(A) -20 cm
(B) -10 cm
(C) $+20$ cm
(D) $+10$ cm

Answer: (B) -10 cm · Key from source paper

Q267 AIEEE 2006 MCQ

The refractive index of glass is 1.520 for red light and 1.525 for blue light. Let D_1 and D_2 be an of minimum deviation for red and blue light respectively for a prism of this glass. Then

(A) $D_1 > D_2$
(B) $\mathrm{D_1 < D_2}$
(C) $\mathrm{D_1 = D_2}$
(D) D_1 can be less than or greater than depending upon the angle of prism

Answer: (B) $\mathrm{D_1 < D_2}$ · Key from source paper

Q268 AIEEE 2005 MCQ

A fish looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is $4/3$ and the fish is 12 cm below the surface, the radius of this circle in cm is

(A) $36\sqrt{7}$
(B) $36/\sqrt{7}$
(C) $36\sqrt{5}$
(D) $4\sqrt{5}$

Answer: (B) $36/\sqrt{7}$ · Key from source paper

Q269 AIEEE 2005 MCQ

A thin glass (refractive index 1.5) lens has optical power of $-5D$ in air. Its optical power in a liquid medium with refractive index 1.6 will be

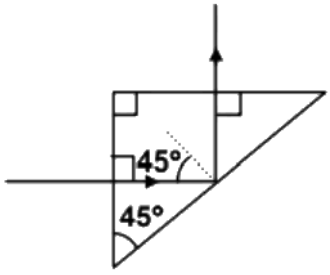
(A) $1D$
(B) $-1D$
(C) $25D$
(D) None of these

Answer: (D) None of these · Key from source paper

Q270 AIEEE 2004 MCQ

A light ray is incident perpendicular to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45°, we conclude that the refractive index n
(see the figure above)

Q64. A light ray is incident perpendicular to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45°, we conclude that the refractive index n



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

(A) $n < \frac{1}{2}$
(B) $n > \sqrt{2}$
(C) $n > \frac{1}{\sqrt{2}}$
(D) $n < \sqrt{2}$

Answer: (B) $n > \sqrt{2}$ · Key from source paper

Q271 AIEEE 2004 MCQ

A plane convex lens of refractive index 1.5 and radius of curvature 30 cm is silvered at the curved surface. Now this lens has been used to form the image of an object. At what distance from this lens an object be placed in order to have a real image of the size of the object?

(A) 20 cm
(B) 30 cm
(C) 60 cm
(D) 80 cm

Answer: (A) 20 cm · Key from source paper

Q272 AIEEE 2003 MCQ

The image formed by an objective of a compound microscope is

(A) virtual and diminished
(B) real and diminished
(C) real and enlarged
(D) virtual and enlarged

Answer: (C) real and enlarged · Key from source paper

Q273 AIEEE 2003 MCQ

To get three images of a single object, one should have two plane mirrors at an angle of

(A) 60°
(B) 90°
(C) 120°
(D) 30°

Answer: (B) 90° · Key from source paper

Q274 AIEEE 2003 MCQ

Consider telecommunication through optical fibres. Which of the following statements is not true?

(A) Optical fibres can be of graded refractive index
(B) Optical fibres are subjective to electromagnetic interference from outside
(C) Optical fibres have extremely low transmission loss
(D) Optical fibres may have homogeneous core with a suitable cladding.

Answer: (B) Optical fibres are subjective to electromagnetic interference from outside · Key from source paper

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Q275 AIEEE 2002 MCQ

An astronomical telescope has a large aperture to

(A) reduce spherical aberration
(B) have high resolution
(C) increase span of observation
(D) have low dispersion

Answer: (B) have high resolution · Key from source paper

Q276 AIEEE 2002 MCQ

If two mirrors are kept at 60° to each other, then the number of images formed by them is

(A) 5
(B) 6
(C) 7
(D) 8

Answer: (A) 5 · Key from source paper

Q277 AIEEE 2002 MCQ

Which of the following is used in optical fibres ?

(A) total internal reflection
(B) scattering
(C) diffraction
(D) refraction

Answer: (A) total internal reflection · Key from source paper

Q278 AIEEE 2002 MCQ

Wavelength of light used in an optical instrument are $\lambda_1 = 4000\mathring{A}$ and $\lambda_2 = 5000\mathring{A}$, then ratio of their respective resolving powers (corresponding to λ_1 and λ_2) is

(A) 16 : 25
(B) 9 : 1
(C) 4 : 5
(D) 5 : 4

Answer: (D) 5 : 4 · Key from source paper

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