CHAPTER

Ray Optics

09

MHT CET Physics

PHYSICS CIRCLE

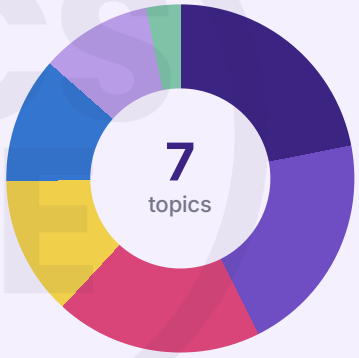
CONTENTS

9.1	Reflection & Mirrors	2
9.2	Refraction, Glass Slab & Apparent Depth	7
9.3	Total Internal Reflection	12
9.4	Spherical Surfaces & Lens Maker's Formula	16
9.5	Thin Lens Formula, Magnification & Power	20
9.6	Combination of Lenses	24
9.7	Prism	28
9.8	Dispersion, Aberration & Scattering	32
9.9	Human Eye & Microscopes	36
9.10	Telescopes & Resolving Power	40
★	**Exam-Day Card & Formula Sheet**	44

MHT CET WEIGHTAGE

155 **Questions**

MHT CET · all years



Refraction & Apparent Depth	34	22%
Prism, Dispersion & Scattering	32	21%
Spherical Surfaces & Thin Lenses	30	19%
Total Internal Reflection	20	13%
Optical Instruments & the Eye	18	12%
Combination of Lenses	16	10%
Reflection & Mirrors	5	3%

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

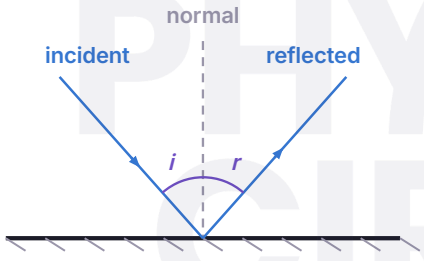
01 CONCEPT Reflection & Mirrors

IN ONE LINE
Light falling on a polished surface comes back into the **same medium**. This is reflection.

9.1.1 Laws of reflection

$$\angle i = \angle r$$

- Angle of incidence = angle of reflection.
- Both angles are measured from the **normal**.
- Incident ray, normal and reflected ray lie in **one plane**.
- Speed, wavelength and frequency do not change.



i and r are measured from the normal

9.1.2 Image in a plane mirror

- Image is **virtual** and **erect**.
- Image is of the **same size**: m = +1.
- Image is **laterally inverted** (left ↔ right).
- Image is as far **behind** the mirror as the object is in front.
- Full image of a person needs a mirror of **half his height**.
- Mirror turned through θ ⇒ reflected ray turns through **2θ**.

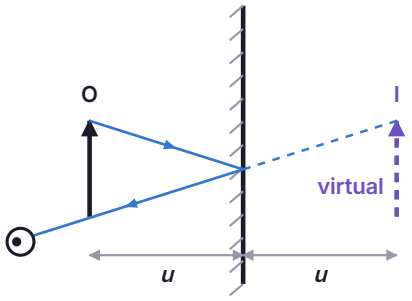


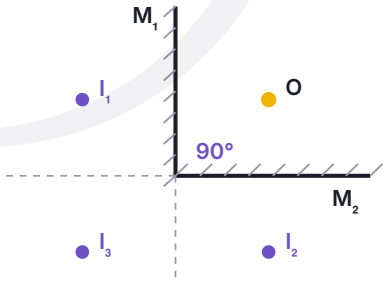
Image distance = object distance

9.1.3 Number of images

$$n = \frac{360°}{\theta} - 1$$

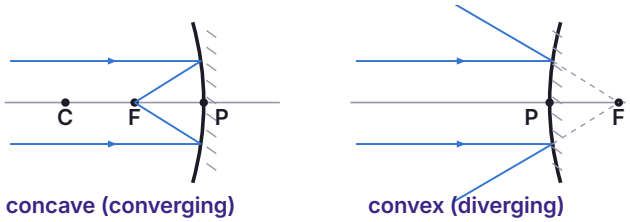
$\frac{360°}{\theta}$	Object	Images n
even	anywhere	$\frac{360°}{\theta} - 1$
odd	on the bisector	$\frac{360°}{\theta} - 1$
odd	not on the bisector	$\frac{360°}{\theta}$

- Mirrors at 90° ⇒ 3 images.
- Mirrors at 60° ⇒ 5 images.



Mirrors at 90°: three images

9.1.4 Concave and convex



Parallel rays meet at F (concave) or seem to come from F (convex)

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

$$f = \frac{R}{2}$$

- **Concave** mirror converges light.
- Uses of concave: shaving mirror, headlight reflector, telescope.
- **Convex** mirror diverges light.
- Convex always gives an erect, diminished image.
- Use of convex: rear-view mirror (wide field of view).

9.1.5 New Cartesian

- Measure all distances from the pole P.
- Along the incident light: +. Against it: −.
- Heights above the axis: +. Below: −.
- Real object: u is always **negative**.
- Concave mirror: f **negative**. Convex mirror: f **positive**.

9.1.6 Linking u, v and f

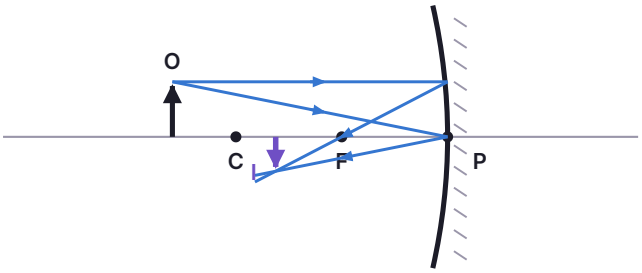
$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$m = \frac{h_i}{h_o} = -\frac{v}{u}$$

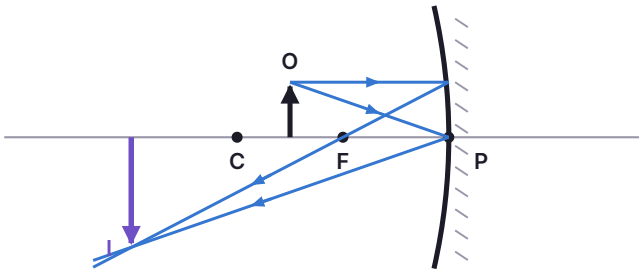
- m negative ⇒ real, inverted image.
- m positive ⇒ virtual, erect image.
- Concave mirror, real image n times the object:

$$|u| = f\left(\frac{n+1}{n}\right) \cdot |v| = f(n+1)$$

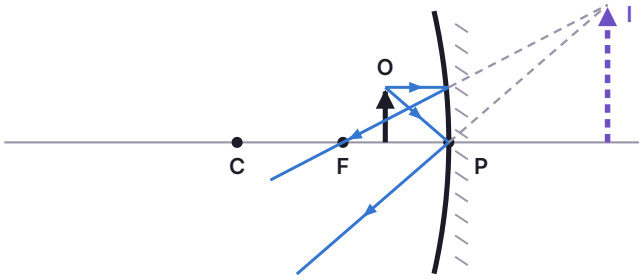
9.1.7 Where is the image?



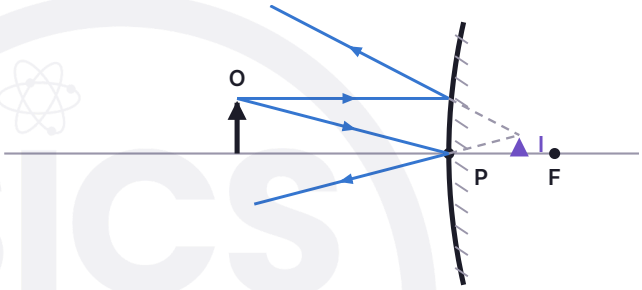
Concave, object beyond C: real, diminished



Concave, object between C and F: real, enlarged



Concave, object between F and P: virtual, enlarged



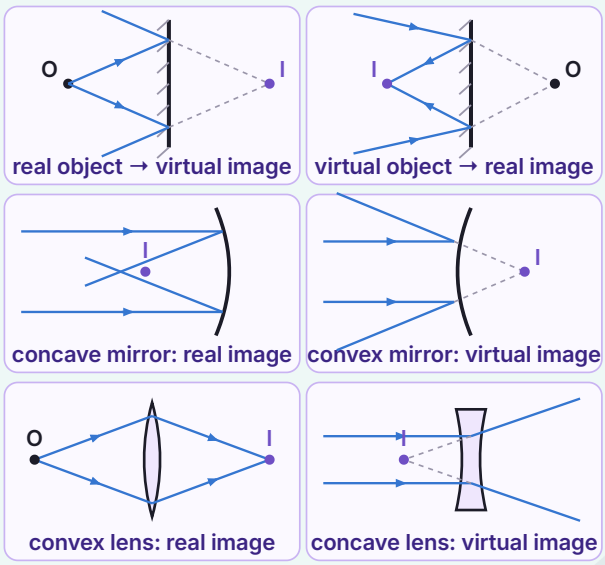
Convex: virtual, erect, diminished

Object at	Image at	Nature and size
infinity	F	real, inverted, point-sized
beyond C	between F and C	real, inverted, diminished
C	C	real, inverted, same size
between C and F	beyond C	real, inverted, enlarged
F	infinity	real, inverted, very large
between F and P	behind the mirror	virtual, erect, enlarged
convex: anywhere	between P and F	virtual, erect, diminished

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

JEE · NEET Corner

Real and virtual objects



Real and virtual objects and images

Vector form of reflection

$$\hat{r} = \hat{i} - 2(\hat{i} \cdot \hat{n})\,\hat{n}$$

- Component along the normal reverses; component along the mirror stays the same.

Moving object, moving mirror



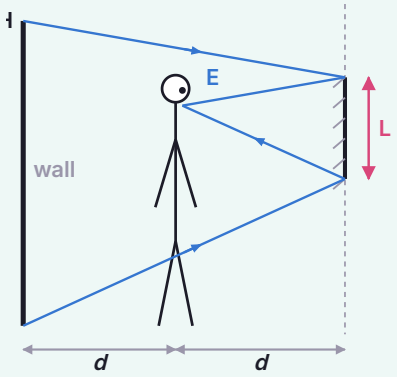
(A) mirror at rest: image u (B) mirror moving: image 2u

Image speed: u for a moving object, 2u for a moving mirror

$$v_{image} = 2v_{mirror} - v_{object}$$

- All velocities measured along the normal.
- Component along the mirror is the same for object and image.

Mirror to see the whole wall behind



Person in the middle of the room

$$L_{min} = \frac{H}{3}$$

Speed of image (spherical mirror)

$$v_{image} = -\left(\frac{v}{u}\right)^2 v_{object}$$

- Along the axis the image moves opposite to the object.
- Perpendicular to the axis: $v_{image} = m\, v_{object}$.

Axial and areal magnification

$$m_L = -\frac{v_2 - v_1}{u_2 - u_1}$$ · small object: $m_L = -m^2$

areal magnification $m_A = m^2$

Newton's formula and graphs

$$x_1 x_2 = f^2$$

- x_1, x_2 are measured from F.
- $\frac{1}{v}$ against $\frac{1}{u}$: straight line of slope −1.
- u against v (real images): rectangular hyperbola.
- A mirror dipped in a liquid keeps the same f.

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

Solved Examples 01 Reflection & Mirrors

SOLVED 1 MHT CET 2024 · 2 May · Shift 1

A plane mirror produces a magnification of

(a) −1 (b) zero
(c) +1 (d) +2

STEP 1 Plane mirror: image is erect and of the same size, v = −u
STEP 2 $m = \frac{h_i}{h_o} = -\frac{v}{u} = +1$
STEP 3 m = **+1**

Answer: **(c)**

SOLVED 2 JEE Main 2023 · 11 Apr · Shift 2

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

(a) 140° (b) 130°
(c) 120° (d) 110°

STEP 1 i = r = 30°
STEP 2 δ = 180° − 2i
STEP 3 δ = 180° − 60° = **120°**

Answer: **(c)**

SOLVED 3 MHT CET 2023 · 10 May · Shift 2

To get three images of a single object, the angle between the two plane mirrors should be

(a) 50° (b) 60°
(c) 72° (d) 90°

STEP 1 $n = \frac{360°}{\theta} - 1$ when $\frac{360°}{\theta}$ is even
STEP 2 $3 = \frac{360°}{\theta} - 1 \Rightarrow \frac{360°}{\theta} = 4$
STEP 3 θ = **90°**

Answer: **(d)**

SOLVED 4 AIEEE 2002

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

(a) 5 (b) 6
(c) 7 (d) 8

STEP 1 $\frac{360°}{60°} = 6$, an even number
STEP 2 n = 6 − 1
STEP 3 n = **5**

Answer: **(a)**

SOLVED 5 AIPMT 2000

A man of height 6 feet wants to see his full image. The required minimum length of the mirror is

(a) 12 feet (b) 3 feet
(c) 6 feet (d) any length

STEP 1 Minimum mirror length = half the height
STEP 2 $L = \frac{6}{2}$
STEP 3 L = **3 feet**

Answer: **(b)**

SOLVED 6 MHT CET 2026 · 13 Apr · Shift 1

A parallel beam incident on a spherical mirror passes through the focal point after reflection. If F is the focal length and R the radius of curvature, then

(a) R = F (b) R = 2F
(c) $R = \frac{F}{2}$ (d) $R = \frac{F}{4}$

STEP 1 Paraxial rays meet at F, mid-way between P and C
STEP 2 $F = \frac{R}{2}$
STEP 3 **R = 2F**

Answer: **(b)**

SOLVED 7 JEE Main 2021 · 24 Feb · Shift 1

The focal length f of a convex mirror is related to its radius of curvature r by

(a) f = r (b) f = −r
(c) $f = +\frac{r}{2}$ (d) $f = -\frac{r}{2}$

STEP 1 $f = \frac{R}{2}$ for every spherical mirror
STEP 2 Convex mirror: f and R are both positive
STEP 3 $\mathbf{f = +\frac{r}{2}}$

Answer: **(c)**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

Solved Examples 01 Reflection & Mirrors (contd.)

SOLVED 8 NEET 2020 · Phase 2

An object is on the principal axis of a concave mirror at 1.5f (f is the focal length). The image will be at

(a) 3f (b) −3f
(c) 1.5f (d) −1.5f

STEP 1 u = −1.5f, focal length = −f
STEP 2 $\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = -\frac{1}{f} + \frac{1}{1.5f} = -\frac{1}{3f}$
STEP 3 v = **−3f** (real, beyond C)

Answer: **(b)**

SOLVED 9 MHT CET 2024 · 2 May · Shift 2

A concave mirror of focal length f produces a real image n times the size of the object. The object distance is

(a) (n − 1)f (b) $(\frac{n-1}{n})f$
(c) $(\frac{n+1}{n})f$ (d) (n + 1)f

STEP 1 Real image: |v| = n|u| (both in front); let |u| = x
STEP 2 $\frac{1}{nx} + \frac{1}{x} = \frac{1}{f} \Rightarrow \frac{n+1}{nx} = \frac{1}{f}$
STEP 3 x = $\mathbf{(\frac{n+1}{n})f}$

Answer: **(c)**

SOLVED 10 JEE Main 2024 · 29 Jan · Shift 1

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

(a) −45 cm (b) −15 cm
(c) 45 cm (d) 15 cm

STEP 1 f = +15 cm; $m = -\frac{v}{u} = \frac{1}{2} \Rightarrow v = -\frac{u}{2}$
STEP 2 $\frac{1}{v} + \frac{1}{u} = -\frac{2}{u} + \frac{1}{u} = -\frac{1}{u} = \frac{1}{15}$
STEP 3 u = **−15 cm**

Answer: **(b)**

SOLVED 11 JEE Main 2026 · 24 Jan · Shift 2

The distance between an object and its three times magnified real image is 40 cm. The focal length of the mirror is

(a) −20 cm (b) $-\frac{15}{2}$ cm
(c) −10 cm (d) −15 cm

STEP 1 Real, m = −3 ⇒ v = 3u; |v| − |u| = 2|u| = 40 ⇒ u = −20 cm, v = −60 cm
STEP 2 $\frac{1}{f} = -\frac{1}{60} - \frac{1}{20} = -\frac{4}{60}$
STEP 3 f = **−15 cm**

Answer: **(d)**

SOLVED 12 JEE Main 2025 · 28 Jan · Shift 2

A concave mirror produces an image with magnification −3, the object–image distance being 20 cm. The magnitude of the radius of curvature is

(a) 3.75 cm (b) 15 cm
(c) 7.5 cm (d) 30 cm

STEP 1 v = 3u, 2|u| = 20 ⇒ u = −10 cm, v = −30 cm
STEP 2 $\frac{1}{f} = -\frac{1}{30} - \frac{1}{10} = -\frac{4}{30} \Rightarrow$ f = −7.5 cm
STEP 3 |R| = 2|f| = **15 cm**

Answer: **(b)**

SOLVED 13 MHT CET 2025 · 25 Apr · Shift 1

The image of an object approaching a convex mirror of radius of curvature 20 m moves from $\frac{25}{3}$ m to $\frac{50}{7}$ m in 30 s. The speed of the object in km/h is

(a) 5 (b) 2.5
(c) 4 (d) 3

STEP 1 f = +10 m; $\frac{1}{u} = \frac{1}{f} - \frac{1}{v}$: $v = \frac{25}{3} \Rightarrow u = -50$ m; $v = \frac{50}{7} \Rightarrow u = -25$ m
STEP 2 Object moves 25 m in 30 s ⇒ $\frac{5}{6}$ m s^{-1}
STEP 3 $\frac{5}{6} \times 3.6 =$ **3 km/h**

Answer: **(d)**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

RAY OPTICS · TOPIC 01

Reflection & Mirrors

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

16	4	1
questions	concepts	easy

CONTENTS

01	Reflection & Mirrors	Q 1–16	16 Qs
	Level 1 · Easy		16 Qs
	◆ **Laws of reflection & deviation**		10 Qs
	◆ **Inclined mirrors & number of images**		3 Qs
	◆ **Moving mirror & mirror size**		2 Qs
	◆ **Magnification & nature of image**		1 Qs
	Answer key		

WATCH THE CONCEPT VIDEOS

Every chapter explained on YouTube. Subscribe to **Physics Circle**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

TOPIC 01

Reflection & Mirrors

16 PYQs · Easy 16 · Medium 0 · Difficult 0 | MHT CET 3 · NEET 4 · JEE 9

Concepts covered: Laws of reflection & deviation (10) · Inclined mirrors & number of images (3) · Moving mirror & mirror size (2) · Magnification & nature of image (1)

LEVEL 1 · EASY 16 questions

◆ Laws of reflection & deviation 10 Qs

1. If a parallel beam of light is incident on spherical mirrors then after reflection they pass through focal point. If F is the focal length and R is the radius of curvature of mirror then

MHT CET 2026 · 13 APR · SHIFT 1

(a) $R = F$ (b) $R = 2F$
(c) $R = F/2$ (d) $R = F/4$

2. A plane mirror produces a magnification of

MHT CET 2024 · 2 MAY · SHIFT 1

(a) -1 (b) zero (c) $+1$ (d) $+2$

3. Given below are two statements:

Statement I: Image formation needs regular reflection and/or refraction.

Statement II: The variety in colour of objects we see around us is due to the constituent colours of the light incident on them.

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

NEET 2024

(a) Statement I is correct but statement II is incorrect
(b) Statement I is incorrect but Statement II is correct
(c) Both Statement I and Statement II are correct
(d) Both Statement I and Statement II are incorrect

4. An object is placed on the principal axis of a concave mirror at a distance of $1.5f$ (f is the focal length). The image will be at,

NEET 2020 · PHASE 2

(a) $3f$ (b) $-3f$ (c) $1.5f$ (d) $-1.5f$

5. In parallax method for the determination of focal length of a concave mirror, the object should always be placed:

JEE MAIN 2026 · 22 JAN · SHIFT 2

(a) between the focus (F) and the centre of curvature (C) of the mirror ONLY
(b) between the pole (P) and the focus (F) of the concave mirror ONLY
(c) at any point beyond the focus (F) of the mirror
(d) beyond the centre of the curvature (C) of the mirror ONLY

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

JEE MAIN 2025 · 23 JAN · SHIFT 2

(a) μf (b) f (c) $\frac{f}{\mu}$ (d) $\frac{f}{(\mu-1)}$

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

JEE MAIN 2024 · 29 JAN · SHIFT 1

(a) -45 cm (b) -15 cm (c) 45 cm (d) 15 cm

8. 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:

JEE MAIN 2023 · 11 APR · SHIFT 2

(a) 140° (b) 130° (c) 120° (d) 110°

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

A. Real
B. Erect
C. Smaller in size than object
D. Laterally inverted

Choose the most appropriate answer from the options given below:

JEE MAIN 2023 · 25 JAN · SHIFT 2

(a) B and D only (b) A, C, and D only
(c) A and D only (d) B and C only

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

JEE MAIN 2021 · 24 FEB · SHIFT 1

(a) $f = r$ (b) $f = -r$
(c) $f = +\frac{1}{2}r$ (d) $f = -\frac{1}{2}r$

◆ Inclined mirrors & number of images 3 Qs

11. To get three images of a single object, the angle between the two plane mirrors should be

MHT CET 2023 · 10 MAY · SHIFT 2

(a) 50° (b) 60° (c) 72° (d) 90°

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

AIEEE 2003

(a) 60° (b) 90° (c) 120° (d) 30°

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

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

AIEEE 2002

(a) 5 (b) 6 (c) 7 (d) 8

◆ Moving mirror & mirror size 2 Qs

14. A tall man of height 6 feet, want to see his full image. Then required minimum length of the mirror will be

AIPMT 2000

(a) 12 feet (b) 3 feet
(c) 6 feet (d) any length

15. 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

JEE MAIN 2023 · 10 APR · SHIFT 1

(a) 4 cm towards mirror (b) 2 cm towards mirror
(c) 8 cm away from mirror (d) 8 cm towards mirror

◆ Magnification & nature of image 1 Q

16. Match the corresponding entries of column 1 with column 2. [Where m is the magnification produced by the mirror]

NEET 2016 · PHASE 1

Column 1		Column 2	
(A)	m = - 2	(p)	Convex mirror
(B)	m = $-\frac{1}{2}$	(q)	Concave mirror
(C)	m = +2	(r)	Real image
(D)	m = $+\frac{1}{2}$	(s)	Virtual image

(a) A $\rightarrow$ p and s; B $\rightarrow$ q and r; C $\rightarrow$ q and s; D $\rightarrow$ q and r
(b) A $\rightarrow$ r and s; B $\rightarrow$ q and s; C $\rightarrow$ q and r; D $\rightarrow$ p and s
(c) A $\rightarrow$ q and r; B $\rightarrow$ q and r; C $\rightarrow$ q and s; D $\rightarrow$ p and s
(d) A $\rightarrow$ p and r; B $\rightarrow$ p and s; C $\rightarrow$ p and q; D $\rightarrow$ r and s

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

ANSWER KEY

Shaded by level: **Easy**

01 Reflection & Mirrors

1. (b)	2. (c)	3. (c)	4. (b)	5. (c)	6. (b)	7. (b)	8. (c)	9. (a)	10. (c)
11. (d)	12. (b)	13. (a)	14. (b)	15. (d)	16. (c)				

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

RAY OPTICS · TOPIC 02

Refraction, Glass Slab & Apparent Depth

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

28	5	1
questions	concepts	easy

CONTENTS

02	Refraction, Glass Slab & Apparent Depth	Q 1–28	28 Qs
	Level 1 · Easy		28 Qs
	◆ **Snell's law & refractive index**		2 Qs
	◆ **Speed, wavelength & optical path**		15 Qs
	◆ **Glass slab: lateral & normal shift**		2 Qs
	◆ **Apparent depth & real depth**		7 Qs
	◆ **Brewster's angle & polarisation**		2 Qs
	Answer key		

WATCH THE CONCEPT VIDEOS

Every chapter explained on YouTube. Subscribe to **Physics Circle**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

TOPIC 02

Refraction, Glass Slab & Apparent Depth

28 PYQs · Easy 28 · Medium 0 · Difficult 0 | MHT CET 13 · NEET 10 · JEE 5

Concepts covered: Snell's law & refractive index (2) · Speed, wavelength & optical path (15) · Glass slab: lateral & normal shift (2) · Apparent depth & real depth (7) · Brewster's angle & polarisation (2)

LEVEL 1 · EASY 28 questions

◆ Snell's law & refractive index 2 Qs

1. A ray of light travels from air to water to glass and again from glass to air. Refractive index of water with respect to air is 'x', glass with respect to water is 'y' and air with respect to glass is 'z'. Which one of the following is correct?

MHT CET 2026 · 15 APR · SHIFT 1

(a) $xy = z$ (b) $xyz = 1$ (c) $xz = y$ (d) $yz = x$

2. A ray of light travels from air to water to glass and again from glass to air. Refractive index of water w.r.t. air is 'X', glass w.r.t. water is 'Y' and air w.r.t. glass is 'Z'. Which one of the following is correct?

MHT CET 2021 · 23 SEP · SHIFT 1

(a) YZ = X (b) XYZ = 1 (c) XY = Z (d) XZ = Y

◆ Speed, wavelength & optical path 15 Qs

3. For the same angle of incidence, the angles of refraction in media A, B, C and D are 50°, 40°, 30° and 20° respectively. The speed of light is minimum in medium

MHT CET 2026 · 15 MAY · SHIFT 2

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

4. Optical path of a particular ray of light has travelled a distance of 3 cm in flint glass is same as that on travelling a distance ' x ' cm through another medium. The value of ' x ' is [refractive index of flint glass $= 1 \cdot 6$, refractive index of another medium $= 1.25$]

MHT CET 2024 · 16 MAY · SHIFT 1

(a) 3.84 cm (b) 2.84 cm (c) 1.84 cm (d) 4.84 cm

5. White light consists of wavelengths from 480 nm to 672 nm. What will be the wavelength range when white light is passed through glass of refractive index 1.6?

MHT CET 2021 · 24 SEP · SHIFT 2

(a) 420 nm − 672 nm (b) 300 nm − 480 nm
(c) 300 nm − 420 nm (d) 300 nm − 672 nm

6. Refractive index of the medium is μ and wavelength is λ, then which of the following proportionality relation is correct?

MHT CET 2020 · 16 OCT · SHIFT 2

(a) $\mu \propto \lambda^2$ (b) $\mu \propto \frac{1}{\lambda}$ (c) $\mu \propto \lambda$ (d) $\mu \propto \frac{1}{\lambda^2}$

7. The refractive index of the material of crystal is 1.68 and that of castor oil is 1.2. When a ray of light passes from oil to glass, its velocity will change by a factor

MHT CET 2019 · 3 MAY · SHIFT 1

(a) $\frac{2}{3}$ (b) $\frac{3}{4}$ (c) $\frac{5}{6}$ (d) $\frac{5}{7}$

8. When light enters glass from vacuum, then the wavelength of light

MHT CET 2019 · 2 MAY · SHIFT 2

(a) decreases (b) becomes zero
(c) remains same (d) increases

9. ϵ_0 and μ_0 are the electric permittivity and magnetic permeability of free space respectively. If the corresponding quantities of a medium are $2\,\epsilon_0$ and $1.5\,\mu_0$ respectively, the refractive index of the medium will nearly be:

NEET 2023

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

10. An electromagnetic radiation of frequency n, wavelength λ, travelling with velocity v in air, enters a glass slab of refractive index μ. The frequency, wavelength and velocity of light in the glass slab will be respectively

AIPMT 1997

(a) n, 2λ and $\frac{v}{\mu}$ (b) $\frac{2n}{\mu}$, $\frac{\lambda}{\mu}$ and v
(c) $\frac{n}{\mu}$, $\frac{\lambda}{\mu}$ and $\frac{v}{\mu}$ (d) n, $\frac{\lambda}{\mu}$ and $\frac{v}{\mu}$

11. The refractive index of water is 1.33. What will be the speed of light in water?

AIPMT 1996

(a) 4×10^8 m/s (b) 1.33×10^8 m/s
(c) 3×10^8 m/s (d) 2.25×10^8 m/s

12. Light travels through a glass plate of thickness t and having a refractive index μ. If c is the velocity of light in vacuum, the time taken by light to travel this thickness of glass is

AIPMT 1996

(a) $\frac{t}{\mu c}$ (b) $\frac{\mu t}{c}$ (c) $t\mu c$ (d) $\frac{tc}{\mu}$

13. Time taken by sunlight to pass through a window of thickness 4 mm whose refractive index is $\frac{3}{2}$ is

AIPMT 1993

(a) 2×10^{-4} s (b) 2×10^8 s
(c) 2×10^{-11} s (d) 2×10^{11} s

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

14. A beam of monochromatic light is refracted from vacuum into a medium of refractive index 1.5. The wavelength of refracted light will be
AIPMT 1992
(a) depend on intensity of refracted light
(b) same
(c) smaller
(d) larger

15. A beam of monochromatic light is refracted from vacuum into a medium of refractive index 1.5. The wavelength of refracted light will be
AIPMT 1991
(a) depend on intensity of refracted light
(b) same
(c) smaller
(d) larger

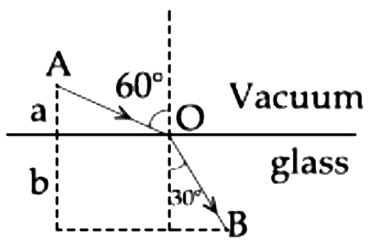
16. Green light wavelength 5460 Å is incident on an air-glass interface. If the refractive index of glass is 1.5, the wavelength of light in glass would be ($c = 3 \times 10^8\ \text{m s}^{-1}$)
AIPMT 1991
(a) 3640 Å (b) 5460 Å
(c) 4861 Å (d) none of these

17. Red light differs from blue light as they have:
JEE MAIN 2021 · 16 MAR · SHIFT 2
(a) Different frequencies and same wavelengths
(b) Different frequencies and different wavelengths
(c) Same frequencies and different wavelengths
(d) Same frequencies and same wavelengths

◆ Glass slab: lateral & normal shift 2 Qs

18. What is the lateral shift of a ray refracted through a parallel-sided glass slab of thickness ' h ' in terms of the angle of incidence ' i ' and angle of refraction ' r ', if the glass slab is placed in air medium?
JEE MAIN 2025 · 23 JAN · SHIFT 1
(a) h (b) $\frac{h\cos(i-r)}{\sin r}$ (c) $\frac{h\tan(i-r)}{\tan r}$ (d) $\frac{h\sin(i-r)}{\cos r}$

19. 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:
JEE MAIN 2019 · 10 APR · SHIFT 1



(a) $2a + 2b/\sqrt{3}$ (b) $2a + 2b/3$
(c) $2a + 2b$ (d) $2\sqrt{3}/a + 2b$

◆ Apparent depth & real depth 7 Qs

20. How much water should be filled in a container of height 21 cm, so that it appears half filled to the observer when viewed from the top of the container? ($\mu = 4/3$)
MHT CET 2026 · 13 MAY · SHIFT 2
(a) 8 cm (b) 10.5 cm (c) 12 cm (d) 14 cm

21. A glass slab of thickness 6.0 cm is placed on the piece of paper on which an inkdot is marked. By how much distance would an inkdot appear to be raised? The velocity of light in glass is $2 \times 10^8\ \text{ms}^{-1}$ and that in air is $3 \times 10^8\ \text{ms}^{-1}$.
MHT CET 2026 · 19 APR · SHIFT 1
(a) 2.0 cm (b) 3.0 cm (c) 4.0 cm (d) 5.0 cm

22. A glass slab of thickness 4.8 cm is placed on the piece of paper on which an ink dot is marked. By how much distance would an ink dot appear to be raised? (The refractive index of glass = 1.5)
MHT CET 2024 · 16 MAY · SHIFT 1
(a) 1.6 cm (b) 2.4 cm (c) 3.2 cm (d) 4.8 cm

23. Some water is filled in a container of height 30 cm. If it is to appear half filled to the observer when viewed from the top of the container, the height up to which water should be filled in it, is [Refractive index of water = $\frac{4}{3}$]
MHT CET 2024 · 4 MAY · SHIFT 2
(a) 15 cm (b) 18 cm (c) 20 cm (d) 24 cm

24. A microscope is focussed on a mark on a piece of paper and then a slab of glass of thickness 3 cm and refractive index 1.5 is placed over the mark. How should the microscope be moved to get the mark in focus again?
AIPMT 2006
(a) 2 cm upward (b) 1 cm upward
(c) 4.5 cm downward (d) 1 cm downward

25. To determine refractive index of glass slab using a travelling microscope, minimum number of readings required are:
JEE MAIN 2016 · 10 APR · SHIFT 1
(a) Two (b) Three (c) Four (d) Five

26. In an experiment of measuring the refractive index of a glass slab using travelling microscope in physics lab, a student measures real thickness of the glass slab as 5.25 mm and apparent thickness of the glass slab as 5.00 mm. Travelling microscope has 20 divisions in one cm on main scale and 50 divisions on vernier scale is equal to 49 divisions on main scale. The estimated uncertainty in the measurement of refractive index of the slab is $\frac{x}{10} \times 10^{-3}$, where x is _____
JEE MAIN 2023 · 29 JAN · SHIFT 2 *(Numerical)*

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

◆ Brewster's angle & polarisation 2 Qs

27. Let the speed of light and the polarising angle for a given medium be ' V ' and ' i_p ' respectively. The relation between them is: (C = speed of light in vacuum)

MHT CET 2025 · 23 APR · SHIFT 1

(a) $\mathrm{V} = \mathrm{C}\cos(\mathrm{i_p})$ (b) $V\cos(i_p) = C\sin(i_p)$

(c) $\mathrm{C} = \mathrm{V}\cot(\mathrm{i_p})$ (d) $\mathrm{V}\sin(\mathrm{i_p}) = \mathrm{C}\cos(\mathrm{i_p})$

28. The Brewster's angle ib for an interface should be:

NEET 2020 · PHASE 1

(a) $30^\circ < \mathrm{ib} < 45^\circ$ (b) $45^\circ < \mathrm{ib} < 90^\circ$

(c) $\mathrm{ib} = 90^\circ$ (d) $0^\circ < \mathrm{ib} < 30^\circ$

PHYSICS CIRCLE

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

ANSWER KEY

Shaded by level: **Easy**

02 Refraction, Glass Slab & Apparent Depth

1. (b)	2. (b)	3. (d)	4. (a)	5. (c)	6. (b)	7. (d)	8. (a)	9. (b)	10. (d)
11. (d)	12. (b)	13. (c)	14. (c)	15. (c)	16. (a)	17. (b)	18. (d)	19. (c)	20. (c)
21. (a)	22. (a)	23. (c)	24. (b)	25. (b)	26. 41	27. (d)	28. (b)		

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

RAY OPTICS · TOPIC 03

Total Internal Reflection

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

24	2	1
questions	concepts	easy

CONTENTS

03	Total Internal Reflection	Q 1–24	24 Qs
	Level 1 · Easy		24 Qs
	◆ **Critical angle & condition for TIR**		20 Qs
	◆ **Optical fibre & TIR applications**		4 Qs
	Answer key		

WATCH THE CONCEPT VIDEOS

Every chapter explained on YouTube. Subscribe to **Physics Circle**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

TOPIC 03

Total Internal Reflection

24 PYQs · Easy 24 · Medium 0 · Difficult 0 | MHT CET 11 · NEET 8 · JEE 5

Concepts covered: Critical angle & condition for TIR (20) · Optical fibre & TIR applications (4)

LEVEL 1 · EASY 24 questions

◆ Critical angle & condition for TIR 20 Qs

1. Light travels a distance 'x' in time 't_0' in air and '$4x$' in time 't_1' in another denser medium. The critical angle for this medium is

MHT CET 2026 · 19 APR · SHIFT 2

(a) $\sin^{-1}\left(\frac{t_1}{t_0}\right)$ (b) $\sin^{-1}\left(\frac{4t_0}{t_1}\right)$
(c) $\sin^{-1}\left(\frac{4t_1}{t_0}\right)$ (d) $\sin^{-1}\left(\frac{t_0}{4t_1}\right)$

2. For a ray of light, the critical angle is minimum, when it travels from

MHT CET 2024 · 15 MAY · SHIFT 1

(a) glass to air (b) air to glass
(c) glass to water (d) water to glass

3. Critical angle of light passing from glass to air is minimum for wavelength of

MHT CET 2024 · 11 MAY · SHIFT 2

(a) red colour (b) yellow colour
(c) green colour (d) blue colour

4. For a light ray to undergo total internal reflection (i = angle of incidence, i_c = critical angle)

MHT CET 2024 · 11 MAY · SHIFT 1

(a) light travels from denser to rarer medium and $i < i_c$.
(b) light travels from rarer to denser medium and $i < i_c$.
(c) light travels from denser to rarer medium and $i > i_c$.
(d) light travels from rarer to denser medium and $i > i_c$.

5. One of the necessary condition for total internal reflection to take place is
(i = angle of incidence, i_c = critical angle)

MHT CET 2023 · 12 MAY · SHIFT 1

(a) $i < i_c$ (b) $i = i_c$ (c) $i = \frac{\pi^c}{2}$ (d) $i > i_c$

6. The speed of light in two media M_1 and M_2 are 1.5×10^8 m/s and 2×10^8 m/s respectively. If the light undergoes total internal reflection, the critical angle between the two media is

MHT CET 2022 · 11 AUG · SHIFT 2

(a) $\sin^{-1}\left(\frac{3}{2}\right)$ (b) $\sin^{-1}\left(\frac{2}{3}\right)$
(c) $\sin^{-1}\left(\frac{4}{3}\right)$ (d) $\sin^{-1}\left(\frac{3}{4}\right)$

7. The critical angle for light going from medium 'x' to medium 'Y' is θ. The speed of light in medium 'x' is 'V_x'. The speed of light in medium 'Y' is

MHT CET 2021 · 22 SEP · SHIFT 2

(a) $V_x \sin\theta$ (b) $V_x \tan\theta$ (c) $\frac{V_x}{\tan\theta}$ (d) $\frac{V_x}{\sin\theta}$

8. The critical angle for light going from medium A into medium B is θ. The speed of light in the medium A is V_A. What is the speed of light in the medium B?

MHT CET 2021 · 22 SEP · SHIFT 1

(a) $V_A \sin\theta$ (b) $V_A \tan\theta$ (c) $\frac{V_A}{\tan\theta}$ (d) $\frac{V_A}{\sin\theta}$

9. The refractive index of glass is 1.5 and that of water is 1.33. The critical angle for a ray of light going from glass to water is

MHT CET 2021 · 21 SEP · SHIFT 2

(a) $\sin^{-1}\left(\frac{4}{7}\right)$ (b) $\sin^{-1}\left(\frac{5}{8}\right)$
(c) $\sin^{-1}\left(\frac{8}{9}\right)$ (d) $\sin^{-1}\left(\frac{2}{3}\right)$

10. The critical angle for light going from medium 'x' to medium 'y' is 'θ'. The speed of light in medium 'x' is 'v_x'. The speed of light in medium 'y' is

MHT CET 2019 · 2 MAY · SHIFT 2

(a) $\frac{v_x}{\tan\theta}$ (b) $v_x \sin\theta$ (c) $v_x \tan\theta$ (d) $\frac{v_x}{\sin\theta}$

11. Light travels a distance x in time t_1 in air and 10x in time t_2 in another denser medium. What is the critical angle for this medium?

NEET 2023

(a) $\sin^{-1}\left(\frac{10t_2}{t_1}\right)$ (b) $\sin^{-1}\left(\frac{t_1}{10t_2}\right)$
(c) $\sin^{-1}\left(\frac{10t_1}{t_2}\right)$ (d) $\sin^{-1}\left(\frac{t_2}{t_1}\right)$

12. Two transparent media A and B are separated by a plane boundary. The speed of light in those media are 1.5×108 m/s and 2.0×108 m/s, respectively. The critical angle for a ray of light for these two media is

NEET 2022 · PHASE 1

(a) $\sin^{-1}(0.500)$ (b) $\sin^{-1}(0.750)$
(c) $\tan^{-1}(0.500)$ (d) $\tan^{-1}(0.750)$

13. If the critical angle for total internal reflection from a medium to vacuum is 45°, then velocity of light in the medium is,

NEET 2020 · PHASE 2

(a) 3×10^8 m/s (b) 1.5×10^8 m/s
(c) $\frac{3}{\sqrt{2}} \times 10^8$ m/s (d) $\sqrt{2} \times 10^8$ m/s

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

14. In total internal reflection when the angle of incidence is equal to the critical angle for the pair of media in contact, what will be angle of refraction?

NEET 2019

(a) equal to angle of incidence
(b) 90°
(c) 180°
(d) 0°

15. The speed of light in media M1 and M2 are 1.5×108 m/s and 2.0×108 m/s respectively. A ray of light enters from medium M1 to M2 at an incidence angle i. If the ray suffers total internal reflection, the value of i is

AIPMT 2010 · MAINS

(a) Equal to $\sin^{-1}\left(\frac{2}{3}\right)$
(b) Equal to or less than $\sin^{-1}\left(\frac{3}{5}\right)$
(c) Equal to or greater than $\sin^{-1}\left(\frac{3}{4}\right)$
(d) Less than $\sin^{-1}\left(\frac{2}{3}\right)$

16. A ray of light travelling in a transparent medium of refractive index μ, falls on a surface separating the medium from air at an angle of incidence of 45°. For which of the following value of μ the ray can undergo total internal reflection?

AIPMT 2010 · PRELIMS

(a) $\mu = 1.33$ (b) $\mu = 1.40$ (c) $\mu = 1.50$ (d) $\mu = 1.25$

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

JEE MAIN 2026 · 23 JAN · SHIFT 1

(a) $\cos^{-1}\left(\frac{8}{9}\right)$ (b) $\sin^{-1}\left(\frac{9}{8}\right)$
(c) $\cot^{-1}\left(\frac{3}{\sqrt{13}}\right)$ (d) $\tan^{-1}\left(\frac{8}{\sqrt{17}}\right)$

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

JEE MAIN 2024 · 8 APR · SHIFT 1

(a) 1 : 2 (b) $1 : \sqrt{2}$ (c) 2 : 1 (d) $\sqrt{2} : 1$

19. The critical angle for a denser-rarer interface is 45°. The speed of light in rarer medium is 3×10^8 m/s. The speed of light in the denser medium is:

JEE MAIN 2023 · 11 APR · SHIFT 1

(a) 2.12×10^8 m/s (b) 5×10^7 m/s
(c) $\sqrt{2} \times 10^8$ m/s (d) 3.12×10^7 m/s

20. Light travels in two media M_1 and M_2 with speeds 1.5×10^8 ms^{-1} and 2.0×10^8 ms^{-1} respectively. The critical angle between them is:

JEE MAIN 2022 · 26 JUL · SHIFT 2

(a) $\tan^{-1}\left(\frac{3}{\sqrt{7}}\right)$ (b) $\tan^{-1}\left(\frac{2}{3}\right)$
(c) $\cos^{-1}\left(\frac{3}{4}\right)$ (d) $\sin^{-1}\left(\frac{2}{3}\right)$

◆ Optical fibre & TIR applications 4 Qs

21. The phenomenon, which is not due to total internal reflection is

MHT CET 2025 · 21 APR · SHIFT 1

(a) mirage on hot summer days.
(b) brilliance of diamond
(c) difference between apparent real depth of a pond
(d) working of optical fibre.

22. Which of the following is not due to total internal reflection?

AIPMT 2011 · PRELIMS

(a) Working of optical fibre
(b) difference between apparent and real depth of a pond
(c) Mirage on hot summer days
(d) Brilliance of diamond

23. Optical fibre are based on

AIPMT 2001

(a) total internal reflection
(b) less scattering
(c) refraction
(d) less absorption coefficient.

24. Which of the following is used in optical fibres?

AIEEE 2002

(a) total internal reflection
(b) scattering
(c) diffracttion
(d) refraction

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

ANSWER KEY

Shaded by level: **Easy**

03 Total Internal Reflection

1. (b)	2. (a)	3. (d)	4. (c)	5. (d)	6. (d)	7. (d)	8. (d)	9. (c)	10. (d)
11. (c)	12. (b)	13. (c)	14. (b)	15. (c)	16. (c)	17. (d)	18. (d)	19. (a)	20. (a)
21. (c)	22. (b)	23. (a)	24. (a)						

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

PHYSICS CIRCLE

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

RAY OPTICS · TOPIC 04

Spherical Surfaces & Thin Lenses

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

32	5	1
questions	concepts	easy

CONTENTS

04	Spherical Surfaces & Thin Lenses	Q 1–32	32 Qs
	Level 1 · Easy		32 Qs
	◆ **Lens maker's formula**		6 Qs
	◆ **Lens in a liquid**		11 Qs
	◆ **Lens formula & magnification**		11 Qs
	◆ **Power of a lens**		2 Qs
	◆ **Displacement method & lens experiments**		2 Qs
	Answer key		

WATCH THE CONCEPT VIDEOS

Every chapter explained on YouTube. Subscribe to **Physics Circle**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

TOPIC 04

Spherical Surfaces & Thin Lenses

32 PYQs · Easy 32 · Medium 0 · Difficult 0 | MHT CET 9 · NEET 9 · JEE 14

Concepts covered: Lens maker's formula (6) · Lens in a liquid (11) · Lens formula & magnification (11) · Power of a lens (2) · Displacement method & lens experiments (2)

LEVEL 1 · EASY 32 questions

◆ Lens maker's formula 6 Qs

1. A biconvex lens has radii of curvature, 20 cm each. If the refractive index of the material of the lens is 1.5, the power of the lens is
NEET 2022 · PHASE 1
(a) +2 D (b) +20 D (c) +5 D (d) Infinity

2. The power of a biconvex lens is 10 dioptre and the radius of curvature of each surface is 10 cm. Then the refractive index of the material of the lens is,
NEET 2020 · PHASE 2
(a) $\frac{3}{2}$ (b) $\frac{4}{3}$ (c) $\frac{9}{8}$ (d) $\frac{5}{3}$

3. A plano-convex lens is made of material of refractive index 1.6. The radius of curvature of the curved surface is 60 cm. The focal length of the lens is
AIPMT 1999
(a) 50 cm (b) 100 cm (c) 200 cm (d) 400 cm

4. A convex lens is made from glass material having refractive index of 1.4 with same radius of curvature on both sides. The ratio of its focal length and radius of curvature is ____.
JEE MAIN 2026 · 4 APR · SHIFT 2
(a) 0.5 (b) 2.5 (c) 0.8 (d) 1.25

5. The radii of curvature for a thin convex lens are 10 cm and 15 cm respectively. The focal length of the lens is 12 cm. The refractive index of the lens material is
JEE MAIN 2025 · 3 APR · SHIFT 1
(a) 1.4 (b) 1.8 (c) 1.5 (d) 1.2

6. For the thin convex lens, the radii of curvature are at 15 cm and 30 cm respectively. The focal length of the lens is 20 cm. The refractive index of the material is:
JEE MAIN 2024 · 6 APR · SHIFT 2
(a) 1.2 (b) 1.5 (c) 1.4 (d) 1.8

◆ Lens in a liquid 11 Qs

7. A double convex air bubble in water behaves as
MHT CET 2023 · 10 MAY · SHIFT 1
(a) convergent lens (b) divergent lens
(c) plane slab (d) concave mirror

8. A convex lens is dipped in a liquid whose refractive index is equal to refractive index of lens material. Then its focal length will
MHT CET 2021 · 21 SEP · SHIFT 2
(a) increase (b) remain unchanged
(c) become infinite (d) become zero

9. When a biconvex lens of glass having refractive index 1.47 is dipped in a liquid, it acts as a plane sheet of glass. This implies that the liquid must have refractive index
AIPMT 2012 · PRELIMS
(a) equal to that of glass
(b) less than one
(c) greater than that of glass
(d) less than that of glass

10. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then its focal length will
AIPMT 2003
(a) become zero
(b) become infinite
(c) become small, but non-zero
(d) remain unchanged

11. Focal length of a convex lens of refractive index 1.5 is 2 cm. Focal length of lens when immersed in a liquid of refractive index of 1.25 will be
AIPMT 1988
(a) 10 cm (b) 2.5 cm (c) 5 cm (d) 7.5 cm

12. A lens having refractive index 1.6 has focal length of 12 cm, when it is in air. Find the focal length of the lens when it is placed in water. (Take refractive index of water as 1.28)
JEE MAIN 2025 · 7 APR · SHIFT 1
(a) 355 mm (b) 655 mm (c) 288 mm (d) 555 mm

13. A convex lens made of glass (refractive index = 1.5) has focal length 24 cm in air. When it is totally immersed in water (refractive index = 1.33), its focal length changes to
JEE MAIN 2025 · 29 JAN · SHIFT 2
(a) 96 cm (b) 72 cm (c) 24 cm (d) 48 cm

14. A biconvex lens of refractive index 1.5 has a focal length of 20 cm in air. Its focal length when immersed in a liquid of refractive index 1.6 will be:
JEE MAIN 2024 · 29 JAN · SHIFT 1
(a) –16 cm (b) +16 cm (c) +160 cm (d) –160 cm

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

15. 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 R1 and R2 respectively.
JEE MAIN 2021 · 16 MAR · SHIFT 2
(a) Zero (b) Infinite
(c) 1 (d) $\frac{R_1R_2}{R_1-R_2}$

16. A thin glass (refractive index 1.5) lens has optical power of $-5\ D$ in air. Its optical power in a liquid medium with refractive index 1.6 will be
AIEEE 2005
(a) $-1\ D$ (b) $1\ D$ (c) $-25\ D$ (d) $25\ D$

17. A convex lens of refractive index 1.5 and focal length 18cm in air is immersed in water. The change in focal length of the lens will be _____ cm.
(Given refractive index of water $= \frac{4}{3}$)
JEE MAIN 2023 · 24 JAN · SHIFT 2 *(Numerical)*

◆ Lens formula & magnification 11 Qs

18. A convex lens of focal length F produces a real image $'n'$ times the size of the object. The image distance is
MHT CET 2026 · 12 MAY · SHIFT 2
(a) $\frac{F}{(n+1)}$ (b) $\frac{F}{(n-1)}$
(c) $F(n-1)$ (d) $F(n+1)$

19. A convex lens of focal length $\frac{1}{3}$ m forms a real, inverted image twice the size of the object. The distance of the object from the lens is
MHT CET 2025 · 19 APR · SHIFT 2
(a) 0.5 m (b) 0.166 m (c) 0.33 m (d) 1 m

20. A convex lens of focal length ' f ' m forms a real, inverted image twice in size of the object. The object distance from the lens in metre is
MHT CET 2024 · 3 MAY · SHIFT 1
(a) 0.5 f (b) 0.66 f (c) f (d) 1.5 f

21. The size of the real image produced by a convex lens of focal length F is 'm' times the size of the object. The image distance from the lens is
MHT CET 2023 · 11 MAY · SHIFT 1
(a) $\frac{F}{(m-1)}$ (b) $\frac{(m-1)}{F}$
(c) $F(m+1)$ (d) $F(m-1)$

22. A convex lens of focal length f is used to form an image whose size is one fourth that of size of the object. Then the object distance is
MHT CET 2021 · 20 SEP · SHIFT 2
(a) 2f (b) 5f (c) 4f (d) 3f

23. A convex lens of focal length 'F' produces a real image 'n' times the size of the object. The image distance is
MHT CET 2021 · 20 SEP · SHIFT 1
(a) F(n + 1) (b) F(n – 1)
(c) $\frac{F}{(N+1)}$ (d) $\frac{F}{(n-1)}$

24. In a concave lens, a ray of light emanating from the object parallel to the principal axis of the lens after refraction:
NEET 2026
(a) passes through $2F$, which is the radius of curvature of the lens.
(b) appears to diverge from the first principal focus.
(c) emerges parallel to the principal axis.
(d) passes through the second principal focus.

25. Given below are two statements:
Statement (I): When an object is placed at the centre of curvature of a concave lens, image is formed at the centre of curvature of the lens on the other side.
Statement (II): Concave lens always forms a virtual and erect image.
In the light of the above statements, choose the correct answer from the options given below:
JEE MAIN 2024 · 9 APR · SHIFT 1
(a) Statement I is false but Statement II is true
(b) Both Statement I and Statement II are false
(c) Both Statement I and Statement II are true
(d) Statement I is true but Statement II is false

26. 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?
JEE MAIN 2021 · 31 AUG · SHIFT 1
(a) 1, ∞ (b) Very high, ∞
(c) $\frac{1}{2}$, $\frac{f}{2}$ (d) $\frac{1}{4}$, $\frac{f}{4}$

27. The distance between object and its two times magnified real image as produced by a convex lens is 45 cm. The focal length of the lens used is _____ cm.
JEE MAIN 2024 · 30 JAN · SHIFT 1 *(Numerical)*

28. The same size images are formed by a convex lens when the object is placed at 20 cm or at 10 cm from the lens. The focal length of convex lens is _____ cm.
JEE MAIN 2021 · 25 FEB · SHIFT 1 *(Numerical)*

◆ Power of a lens 2 Qs

29. Converging or diverging ability of a lens or mirror is called
MHT CET 2023 · 12 MAY · SHIFT 1
(a) focal power (b) focal length
(c) magnifying power (d) linear magnification

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

30. 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]

JEE MAIN 2025 · 24 JAN · SHIFT 1

(a) 0.04 (b) 0.1 (c) 0.40 (d) 0.01

◆ Displacement method & lens experiments 2 Qs

31. Which of the following measurements require 'index correction'?

RE-NEET 2026

(a) Measurement of speed of sound using resonance tube
(b) Measurement of resistance of a wire using meter bridge
(c) Measurement of gravitational acceleration using simple pendulum
(d) Measurement of focal length of lenses using optical bench

32. A plano-convex lens of unknown material and unknown focal length is given. With the help of a spherometer we can measure the,

NEET 2020 · PHASE 2

(a) refractive index of the material
(b) focal length of the lens
(c) radius of curvature of the curved surface
(d) aperture of the lens

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

ANSWER KEY

Shaded by level: **Easy**

04 Spherical Surfaces & Thin Lenses

1. (c)	2. (a)	3. (b)	4. (d)	5. (c)	6. (b)	7. (b)	8. (c)	9. (a)	10. (b)
11. (c)	12. (c)	13. (a)	14. (d)	15. (b)	16. (b)	17. 54	18. (d)	19. (a)	20. (d)
21. (c)	22. (b)	23. (a)	24. (b)	25. (a)	26. (c)	27. 10	28. 15	29. (a)	30. (a)
31. (d)	32. (c)								

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

RAY OPTICS · TOPIC 05

Combination of Lenses

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

19	3	1
questions	concepts	easy

CONTENTS

05	Combination of Lenses	Q 1–19	19 Qs
	Level 1 · Easy		19 Qs
	◆ **Lenses in contact**		13 Qs
	◆ **Separated lenses & systems**		1 Qs
	◆ **Cutting & joining lenses**		5 Qs
	Answer key		

WATCH THE CONCEPT VIDEOS

Every chapter explained on YouTube. Subscribe to **Physics Circle**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

TOPIC 05

Combination of Lenses

19 PYQs · Easy 19 · Medium 0 · Difficult 0 | MHT CET 8 · NEET 6 · JEE 5

Concepts covered: Lenses in contact (13) · Separated lenses & systems (1) · Cutting & joining lenses (5)

LEVEL 1 · EASY 19 questions

◆ Lenses in contact 13 Qs

1. An optician makes spectacles having a combination of a convex lens of focal length 40 cm in contact with a concave lens of focal length 25 cm. The power of this combination of lenses in dioptre is

MHT CET 2024 · 16 MAY · SHIFT 2

(a) -6.67 (b) -1.5 (c) $+6.67$ (d) $+1.5$

2. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of combination is

MHT CET 2024 · 10 MAY · SHIFT 2

(a) -1.5D (b) -6.5D (c) $+6.5$D (d) $+1.5$D

3. The focal length of combination of lenses formed with lenses having power of +2.50 D and -3.75 D will be

MHT CET 2024 · 2 MAY · SHIFT 2

(a) -20 cm (b) -40 cm (c) -60 cm (d) -80 cm

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

MHT CET 2023 · 10 MAY · SHIFT 2

(a) -0.1 cm (b) -10 cm (c) -20 cm (d) $+10$ cm

5. A convex lens of focal length ' f ' is placed in contact with a concave lens of the same focal length. The equivalent focal length of the combination is

MHT CET 2019 · 2 MAY · SHIFT 2

(a) f (b) infinity (c) $\frac{f}{2}$ (d) zero

6. In a certain camera, a combination of four similar thin convex lenses are arranged axially in contact. Then the power of the combination and the total magnification in comparison to the power (p) and magnification (m) for each lens will be, respectively

NEET 2025

(a) $4p$ and m^4 (b) p^4 and m^4
(c) $4p$ and $4m$ (d) p^4 and $4m$

7. Two thin lenses are of same focal lengths (f), but one is convex and the other one is concave. When they are placed in contact with each other, the equivalent focal length of the combination will be:

NEET 2023

(a) $f/4$ (b) $f/2$ (c) Infinite (d) Zero

8. Two thin lenses of focal lengths f1 and f2 are in contact and coaxial. The power of the combination is

AIPMT 2008

(a) $\frac{f_1+f_2}{2}$ (b) $\frac{f_1+f_2}{f_1 f_2}$ (c) $\sqrt{\frac{f_1}{f_2}}$ (d) $\sqrt{\frac{f_2}{f_1}}$

9. A convex lens and a concave lens, each having same focal length of 25 cm, are put in contact to form a combination of lenses. The power in diopters of the combination is

AIPMT 2006

(a) zero (b) 25
(c) 50 (d) infinite.

10. If a convex lens of focal length 80 cm and a concave lens of focal length 50 cm are combined together, what will be their resulting power?

AIPMT 1996

(a) $+7.5$ D (b) -0.75 D (c) $+6.5$ D (d) -6.5 D

11. A thin convex lens and a thin concave lens are kept in contact and are co-axial. Which of the following statements is correct for this combination of two lenses?

JEE MAIN 2026 · 5 APR · SHIFT 2

(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

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

JEE MAIN 2024 · 4 APR · SHIFT 1

(a) 50 cm (b) 20 cm (c) 25 cm (d) 500 cm

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

AIEEE 2007

(a) $+10$ cm (b) -20 cm (c) -10 cm (d) $+20$ cm

◆ Separated lenses & systems 1 Q

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

JEE MAIN 2025 · 7 APR · SHIFT 1

(a) 5 D (b) 1 D (c) 20 D (d) 10 D

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

◆ Cutting & joining lenses 5 Qs

15. An equiconvex lens of focal length F is cut in to two equal parts along the vertical axis. The focal length of each part will be

MHT CET 2026 · 15 APR · SHIFT 1

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

16. A double convex lens of focal length 'F' is cut into two equal parts along the vertical axis. The focal length of each part will be

MHT CET 2023 · 11 MAY · SHIFT 2

(a) $2\,\mathrm{F}$ (b) F (c) $\frac{F}{2}$ (d) $4\,\mathrm{F}$

17. The equi-convex lens has a focal length ' f '. If the lens is cut along the line perpendicular to the principal axis and passing through the pole, what will be the focal length of any half part?

MHT CET 2019 · 2 MAY · SHIFT 1

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

18. An equiconvex lens has power P. It is cut into two symmetrical halves by a plane containing the principal axis. The power of one part will be,

NEET 2019

(a) P (b) 0 (c) $\frac{P}{2}$ (d) $\frac{P}{4}$

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

JEE MAIN 2023 · 13 APR · SHIFT 2 *(Numerical)*

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

ANSWER KEY

Shaded by level: **Easy**

05 Combination of Lenses

1. (b)	2. (a)	3. (d)	4. (b)	5. (b)	6. (a)	7. (c)	8. (b)	9. (a)	10. (b)
11. (a)	12. (b)	13. (c)	14. (d)	15. (c)	16. (a)	17. (b)	18. (a)	19. 5	

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

RAY OPTICS · TOPIC 06

Prism, Dispersion & Scattering

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

35	6	1
questions	concepts	easy

CONTENTS

06	Prism, Dispersion & Scattering	Q 1–35	35 Qs
	Level 1 · Easy		35 Qs
	◆ **Prism formula & minimum deviation**		12 Qs
	◆ **Thin prism & normal emergence**		8 Qs
	◆ **Deviation graph (δ–i)**		2 Qs
	◆ **Dispersion & dispersive power**		3 Qs
	◆ **Aberrations of lenses**		4 Qs
	◆ **Rainbow, scattering & colours**		6 Qs
	Answer key		

WATCH THE CONCEPT VIDEOS

Every chapter explained on YouTube. Subscribe to **Physics Circle**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

TOPIC 06

Prism, Dispersion & Scattering

35 PYQs · Easy 35 · Medium 0 · Difficult 0 | MHT CET 10 · NEET 13 · JEE 12

Concepts covered: Prism formula & minimum deviation (12) · Thin prism & normal emergence (8) · Deviation graph (δ–i) (2) · Dispersion & dispersive power (3) · Aberrations of lenses (4) · Rainbow, scattering & colours (6)

LEVEL 1 · EASY 35 questions

◆ Prism formula & minimum deviation 12 Qs

1. For a symmetric (equilateral) prism, the prism formula can be written as

MHT CET 2024 · 15 MAY · SHIFT 1

(a) $2\sin\left(30+\frac{\delta m}{2}\right)$ (b) $\frac{2}{\sqrt{3}}\sin\left(30+\frac{\delta m}{2}\right)$

(c) $2\sin\left(60+\frac{\delta m}{2}\right)$ (d) $\frac{2}{\sqrt{3}}\sin\left(60+\frac{\delta m}{2}\right)$

2. In an equilateral prism the ray undergoes minimum deviation when it is incident at an angle of 50°. The angle of minimum deviation is

MHT CET 2024 · 4 MAY · SHIFT 1

(a) 50° (b) 40° (c) 25° (d) 20°

3. When a monochromatic ray of light is passed through an equilateral glass prism, it is found that the refracted ray in glass is parallel to the base of the prism. If 'i' and 'e' denote the angles of incidence and emergence respectively, then

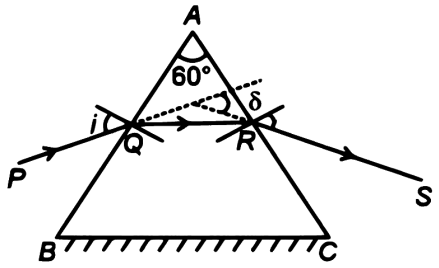
MHT CET 2023 · 14 MAY · SHIFT 2

(a) $i > e$ (b) $i < e$

(c) $i = e$ (d) $i + e = 90^\circ$

4. A ray of monochromatic light is passing through an equilateral prism (ABC) as shown in the figure. The refracted ray (QR) is parallel to its base (BC) and the angle of incidence (i) is 50°. Then the angle of deviation (δ) is:

NEET 2026



(a) 45° (b) 35° (c) 40° (d) 55°

5. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are

NEET 2016 · PHASE 1

(a) $45^o; \sqrt{2}$ (b) $30^o; \frac{1}{\sqrt{2}}$ (c) $45^o; \frac{1}{\sqrt{2}}$ (d) $30^o; \sqrt{2}$

6. A ray of light is incident on a 60° prism at the minimum deviation position. The angle of refraction at the first face (i.e., incident face) of the prism is

AIPMT 2010 · MAINS

(a) zero (b) 30° (c) 45° (d) 60°

7. The refractive index of the material of the prism is $\sqrt{3}$, then the angle of minimum deviation of the prism is

AIPMT 1999

(a) 30° (b) 45° (c) 60° (d) 75°

8. Angle of minimum deviation is equal to the half of the angle of prism in an equilateral prism. The refractive index of the prism is ____

JEE MAIN 2026 · 6 APR · SHIFT 2

(a) 1.5 (b) $\sqrt{3}$ (c) $\sqrt{2}$ (d) 1.65

9. 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:

JEE MAIN 2025 · 3 APR · SHIFT 1

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

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

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

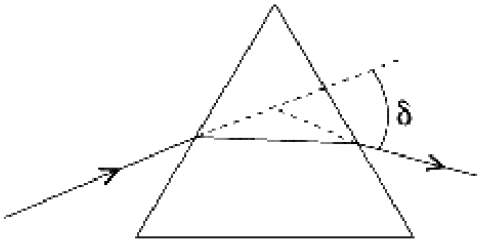
JEE MAIN 2024 · 31 JAN · SHIFT 1

(a) $\delta_m = 180^\circ - 3\,A$ (b) $\delta_m = 180^\circ - 4A$

(c) $\delta_m = 180^\circ - 2A$ (d) $\delta_m = 180^\circ - A$

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

11. 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:

JEE MAIN 2021 · 16 MAR · SHIFT 1

(a) Statements (B) and (C) are true
(b) Only statements (A) and (B) are true
(c) Statements (A), (B) and (C) are true
(d) Only statement (D) is true

12. The refractive index of an equilateral prism is $\sqrt{2}$. The angle of emergence under minimum deviation position of prism, in degree, is _____.

JEE MAIN 2022 · 30 JUN · SHIFT 1 *(Numerical)*

◆ Thin prism & normal emergence 8 Qs

13. A thin glass prism has refractive index 1.5. The correct relation between the angle of minimum deviation (δm) and angle of refraction (r) is

MHT CET 2026 · 20 APR · SHIFT 2

(a) $\delta m = \frac{r}{2}$ (b) $\delta m = 2r$
(c) $\delta m = r$ (d) $\delta m = \frac{3r}{2}$

14. The angle of minimum deviation produced by a thin prism in air is δ_1. If it is immersed in water the angle of minimum deviation is
$\left[a_g = \frac{3}{2}, a_w = \frac{4}{3}\right]$

MHT CET 2024 · 15 MAY · SHIFT 2

(a) $2\delta_1$ (b) $\frac{\delta_1}{2}$ (c) $\frac{\delta_1}{3}$ (d) $\frac{\delta_1}{4}$

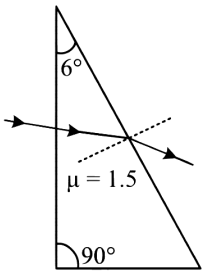
15. A thin hollow prism of refracting angle 3°, filled with water gives a deviation of 1°. The refractive index of water is

MHT CET 2019 · 2 MAY · SHIFT 1

(a) 1.59 (b) 1.33 (c) 1.46 (d) 1.51

16. A horizontal ray of light is incident on the right angled prism with prism angle 6°. If the refractive index of the material of the prism is 1.5, then the angle of emergence will be:

NEET 2023



(a) 9° (b) 10° (c) 4° (d) 6°

17. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to:

NEET 2020 · PHASE 1

(a) $\frac{2A}{\mu}$ (b) μA (c) $\frac{\mu A}{2}$ (d) $\frac{A}{2\mu}$

18. A ray of light is incident at an angle of incidence i, on one face of a prism of angle A (assumed to be small) and emerges normally from the opposite face. If the refractive index of the prism is μ. the angle of incidence i, is nearly equal to

AIPMT 2012 · PRELIMS

(a) μA (b) $\frac{\mu A}{2}$ (c) $\frac{A}{\mu}$ (d) $\frac{A}{2\mu}$

19. A ray of light is incident at an angle of incidence i, on one face of a prism of angle A (assumed to be small) and emerges normally from the opposite face. If the refractive index of the prism is μ, the angle of incidence i, is nearly equal to

AIPMT 1989

(a) μA (b) $\frac{\mu A}{2}$ (c) $\frac{A}{\mu}$ (d) $\frac{A}{2\mu}$

20. A prism of angle A = 1° has a refractive index $\mu = 1.5$. A good estimate for the minimum angle of deviation (in degrees) is close to $\frac{N}{10}$.
Value of N is ____.

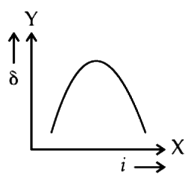
JEE MAIN 2020 · 5 SEP · SHIFT 2 *(Numerical)*

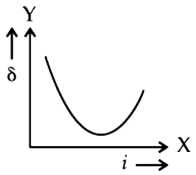
© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

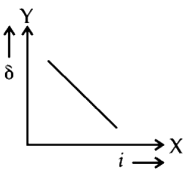
◆ Deviation graph (δ-i) 2 Qs

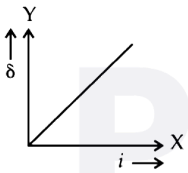
21. The expected graphical representation of the variation of angle of deviation 'δ' with angle of incidence 'i' in a prism is:

JEE MAIN 2021 · 27 JUL · SHIFT 2

(a) 

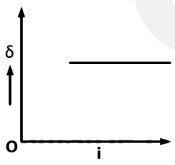
(b) 

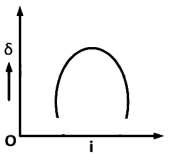
(c) 

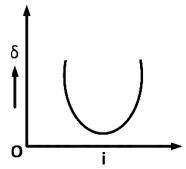
(d) 

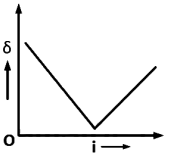
22. The graph between angle of deviation (δ) and angle of incidence (i) for a triangular prism is represented by

JEE MAIN 2013

(a) 

(b) 

(c) 

(d) 

◆ Dispersion & dispersive power 3 Qs

23. In the phenomenon of refraction of light for the same angle of incidence

MHT CET 2026 · 15 APR · SHIFT 2

(a) angle of refraction is same for different colours.
(b) angle of refraction is different for different colours.
(c) angle of refraction does not depend upon the colour of the light used.
(d) angle of refraction depends on critical angle.

24. 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:

JEE MAIN 2025 · 7 APR · SHIFT 2

(a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(b) (A) is correct but (R) is not correct
(c) (A) is not correct but (R) is correct
(d) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

25. Given below are two statements:

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

Statement II: The refractive indices are different for different wavelengths in dispersive medium. In the light of the above statements, choose the correct answer from the options given below:

JEE MAIN 2024 · 5 APR · SHIFT 2

(a) Both Statement I and Statement II are true
(b) Statement I is true but Statement II is false
(c) Statement I is false but Statement II is true
(d) Both Statement I and Statement II are false

◆ Aberrations of lenses 4 Qs

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

MHT CET 2026 · 13 APR · SHIFT 2

(a) scattering (b) chromatic aberration
(c) spherical aberration (d) polarisation

27. 'Circle of least confusion' refers to which one of the following defects occurring in images formed by mirrors or lenses?

MHT CET 2021 · 23 SEP · SHIFT 2

(a) Distortion (b) Coma
(c) Astigmatism (d) Spherical aberration

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

28. The focal length of converging lens is measured for violet, green and red colours. It is respectively f_v, f_g, f_r. We will get
AIPMT 1997
(a) $f_v < f_r$ (b) $f_g > f_r$ (c) $f_v = f_g$ (d) $f_g < f_r$

29. 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 points on the principal axis after refraction. This is called:
JEE MAIN 2023 · 24 JAN · SHIFT 2
(a) Spherical aberration (b) Scattering
(c) Polarisation (d) Chromatic aberration

◆ Rainbow, scattering & colours 6 Qs

30. Which of the following is NOT involved in the formation of secondary rainbow?
MHT CET 2023 · 10 MAY · SHIFT 1
(a) Refraction
(b) Angular dispersion
(c) Interference
(d) Total internal reflection

31. During a cloudy day, a primary and a secondary rainbow may be created, then the:
NEET 2022 · PHASE 2
(a) secondary rainbow is due to single internal reflection and is formed above the primary one.
(b) primary rainbow is due to double internal reflection and is formed above the secondary one.
(c) primary rainbow is due to double internal reflection and is formed below the secondary one.
(d) secondary rainbow is due to double internal reflection and is formed above the primary one.

32. Pick the wrong answer in the context with rainbow.
NEET 2019
(a) An observer can see a rainbow when his front is towards the sun.
(b) Rainbow is a combined effect of dispersion refraction and reflection of sunlight.
(c) When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed.
(d) The order of colours is reversed in the secondary rainbow.

33. Rainbow is formed due to
AIPMT 2000
(a) scattering and refraction
(b) internal reflection and dispersion
(c) reflection only
(d) diffraction and dispersion.

34. The blue colour of the sky is due to the phenomenon of
AIPMT 1994
(a) scattering (b) dispersion
(c) reflection (d) refraction

35. Which of the following statement is correct?
JEE MAIN 2022 · 25 JUL · SHIFT 1
(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.

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

ANSWER KEY

Shaded by level: **Easy**

06 Prism, Dispersion & Scattering

1. (a)	2. (b)	3. (c)	4. (c)	5. (d)	6. (b)	7. (c)	8. (c)	9. (d)	10. (c)
11. (c)	12. 45	13. (c)	14. (d)	15. (b)	16. (a)	17. (b)	18. (a)	19. (a)	20. 5
21. (b)	22. (c)	23. (b)	24. (b)	25. (a)	26. (b)	27. (d)	28. (a)	29. (d)	30. (c)
31. (d)	32. (a)	33. (b)	34. (a)	35. (a)					

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

RAY OPTICS · TOPIC 07

Optical Instruments & the Eye

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

32	5	1
questions	concepts	easy

CONTENTS

07	Optical Instruments & the Eye	Q 1–32	32 Qs
	Level 1 · Easy		32 Qs
	◆ **Human eye & defects**		2 Qs
	◆ **Simple microscope**		2 Qs
	◆ **Compound microscope**		2 Qs
	◆ **Telescopes**		16 Qs
	◆ **Resolving power & reflecting telescopes**		10 Qs
	Answer key		

WATCH THE CONCEPT VIDEOS

Every chapter explained on YouTube. Subscribe to **Physics Circle**

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

TOPIC 07

Optical Instruments & the Eye

32 PYQs · Easy 32 · Medium 0 · Difficult 0 | MHT CET 15 · NEET 9 · JEE 8

Concepts covered: Human eye & defects (2) · Simple microscope (2) · Compound microscope (2) · Telescopes (16) · Resolving power & reflecting telescopes (10)

LEVEL 1 · EASY 32 questions

◆ Human eye & defects 2 Qs

1. Exposure time of camera lens at $f/2.8$ setting is $\frac{1}{200}$ second. The correct time of exposure at $f/5.6$ is

AIPMT 1995 *(Not in current JEE/NEET syllabus)*

(a) 0.20 second (b) 0.40 second
(c) 0.02 second (d) 0.04 second

2. 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 non-uniform and distorted. The doctor diagnosed the problem as:

JEE MAIN 2021 · 18 MAR · SHIFT 1

(a) Astigmatism
(b) Myopia with Astigmatism
(c) Presbyopia with Astigmatism
(d) Myopia and Hypermetropia

◆ Simple microscope 2 Qs

3. A simple microscope is used to see the object first in blue light and then in red light. Due to the change from blue to red light, what is the effect on its magnifying power?

MHT CET 2026 · 16 APR · SHIFT 1

(a) decreases
(b) increases
(c) remains constant
(d) first increase and then decreases

4. Simple microscope is used to see the object first in blue light and then a red light. Due to the change from blue to red light, its magnifying power

MHT CET 2024 · 10 MAY · SHIFT 1

(a) decreases
(b) increases
(c) remains same
(d) first increases and then decreases

◆ Compound microscope 2 Qs

5. In compound microscope, the focal length and the aperture of the objective used is respectively

MHT CET 2024 · 10 MAY · SHIFT 2

(a) large and large (b) large and small.
(c) small and large. (d) small and small.

6. The image formed by an objective of a compound microscope is

AIEEE 2003

(a) virtual and diminished
(b) real an diminished
(c) real and enlarged
(d) virtual and enlarged

◆ Telescopes 16 Qs

7. 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

MHT CET 2026 · 19 MAY · SHIFT 2

(a) 10 times taller. (b) 10 times nearer.
(c) 20 times nearer. (d) 20 times taller.

8. For large magnifying power of a telescope

MHT CET 2026 · 11 APR · SHIFT 1

(a) object must be large
(b) focal length of objective is large
(c) focal length of eyepiece is large
(d) focal length of objective and eyepiece must be large

9. Focal length of objective of an astronomical telescope is 1.5 m. Under normal adjustment, length of telescope is 1.56 m. Focal length of the eyepiece is

MHT CET 2024 · 4 MAY · SHIFT 1

(a) 0.06 m (b) 1.04 m (c) 2.34 m (d) 3.06 m

10. The magnifying power of a refracting type of astronomical telescope is ' m '. If focal length of eyepiece is doubled then the magnifying power will become

MHT CET 2021 · 23 SEP · SHIFT 1

(a) m (b) 2 m (c) $\frac{m}{2}$ (d) $\frac{\mathrm{m}}{4}$

11. An object is clearly seen through an astronomical telescope of length 50 cm. The focal lengths of its objective and eye-piece respectively, can be

MHT CET 2020 · 19 OCT · SHIFT 2

(a) 5 cm and 45 cm (b) –45 cm and –5 cm
(c) 45 cm and –5 cm (d) 45 cm and 5 cm

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

12. The magnifying power of a telescope is high, if its objective and eyepiece have respectively
MHT CET 2020 · 16 OCT · SHIFT 1
(a) small focal lengths
(b) large focal lengths
(c) small and large focal length
(d) large and small focal length

13. The magnifying power of a telescope is nine. When it is adjusted for parallel rays, the distance between the objective and eyepiece is 20 cm. The focal length of objective and eyepiece are respectively
MHT CET 2019 · 3 MAY · SHIFT 1
(a) 10 cm, 10 cm (b) 18 cm, 2 cm
(c) 15 cm, 5 cm (d) 11 cm, 9 cm

14. A small telescope has an objective of focal length 140 cm and an eye piece of focal length 5.0 cm. The magnifying power of telescope for viewing a distant object is:
NEET 2024
(a) 34 (b) 28 (c) 17 (d) 32

15. An astronomical refracting telescope is being used by an observer to observe planets in normal adjustment. The focal lengths of the objective and eye piece used in the construction of the telescope are 20 m and 2 cm respectively. Consider the following statements about the telescope: (a) The distance between the objective and eye piece is 20.02 m
(b) The magnification of the telescope is (−) 1000
(c) The image of the planet is erect and diminished
(d) The aperture of eye piece is smaller than that of objective
The correct statements are:
NEET 2022 · PHASE 2
(a) (a), (b) and (d) (b) (a), (b) and (c)
(c) (b), (c) and (d) (d) (c), (d) and (a)

16. If the focal length of objective lens is increased then magnifying power of
AIPMT 2014
(a) microscope will increase but that of telescope decrease.
(b) microscope and telescope both will increase.
(c) microscope and telescope both will decrease.
(d) microscope will decrease but that of telescope will increase.

17. The magnifying power of a telescope is 9. When it is adjusted for parallel rays the distance between the objective and eyepiece is 20 cm. The focal length of lenses are
AIPMT 2012 · PRELIMS
(a) 10 cm, 10 cm (b) 15 cm, 5 cm
(c) 18 cm, 2 cm (d) 11 cm, 9 cm

18. An astronomical telescope of tenfold angular magnification has a length of 44 cm. The focal length of the objective is
AIPMT 1997
(a) 44 cm (b) 440 cm (c) 4 cm (d) 40 cm

19. Four lenses of focal length ± 15 cm and ± 150 cm are available for making a telescope. To produce the largest magnification, the focal length of the eyepiece should be
AIPMT 1994
(a) $+15$ cm (b) $+150$ cm
(c) -150 cm (d) -15 cm

20. In normal adjustment, for a refracting telescope, the distance between objective and eye piece is 30 cm. The focal length of the objective, when the angular magnification of the telescope is 2, will be:
JEE MAIN 2022 · 28 JUL · SHIFT 1
(a) 20 cm (b) 30 cm (c) 10 cm (d) 15 cm

21. The magnifying power of a telescope with tube 60 cm is 5. What is the focal length of its eye piece?
JEE MAIN 2020 · 8 JAN · SHIFT 1
(a) 40 cm (b) 10 cm (c) 30 cm (d) 20 cm

22. 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:
JEE MAIN 2016
(a) 20 times taller (b) 20 times nearer
(c) 10 times taller (d) 10 times nearer

◆ Resolving power & reflecting telescopes 10 Qs

23. An astronomical telescope has a large aperture to
MHT CET 2024 · 9 MAY · SHIFT 2
(a) have high resolution.
(b) have low dispersion.
(c) increase the span of observation.
(d) have large wavelength.

24. A person is observing a bacteria through a compound microscope. For better analysis and to improve the resolving power he should
MHT CET 2024 · 4 MAY · SHIFT 1
(a) increase the wavelength of 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.

25. The telescopes, for a given wavelength, the objectives with large aperture are used for
MHT CET 2024 · 2 MAY · SHIFT 1
(a) greater magnification.
(b) greater resolution.
(c) reducing lens aberration.
(d) ease of manufacture.

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

26. By increasing the aperture of the objective lens, wavelength of light, focal length of the objective lens and the resolving power of an astronomical telescope respectively

MHT CET 2020 · 19 OCT · SHIFT 2

(a) is not affected, increases, increases
(b) decreases, increases, is not affected
(c) increases, decreases, is not affected
(d) is not affected, increases, decreases

27. A telescope has large diameter of the objective. Then its resolving power is

MHT CET 2019 · 2 MAY · SHIFT 1

(a) independent of the diameter of the objective
(b) low
(c) zero
(d) high

28. A lens of large focal length and large aperture is best suited as an objective of an astronomical telescope since:

NEET 2021

(a) a large aperture contributes to the quality and visibility of the images.
(b) a large area of the objective ensures better light gathering power.
(c) a large aperture provides a better resolution.
(d) All the above.

29. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

NEET 2018

(a) small focal length and large diameter
(b) large focal length and small diameter
(c) large focal length and large diameter
(d) small focal length and small diameter

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

JEE MAIN 2023 · 8 APR · SHIFT 1

(a) make chromatic aberration zero
(b) remove spherical aberration
(c) reduce the problem of mechanical support
(d) move the eyepiece outside the telescopic tube

31. 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.

JEE MAIN 2013 · 23 APR · SHIFT 1

(a) Statement-1 is true and Statement-2 is false.
(b) Statement-1 is false and Statement-2 is true.
(c) Statements-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.

32. An astronomical telescope has a large aperture to

AIEEE 2002

(a) reduce spherical aberration
(b) have high resolution
(c) increase span of observation
(d) have low dispersion

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying

ANSWER KEY

Shaded by level: **Easy**

07 Optical Instruments & the Eye

1. (c)	2. (b)	3. (a)	4. (a)	5. (c)	6. (c)	7. (c)	8. (b)	9. (a)	10. (c)
11. (d)	12. (d)	13. (b)	14. (b)	15. (a)	16. (d)	17. (c)	18. (d)	19. (a)	20. (a)
21. (b)	22. (b)	23. (a)	24. (b)	25. (b)	26. (a)	27. (d)	28. (d)	29. (c)	30. (d)
31. (c)	32. (b)								

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

© Physics Circle · Free sample from physicscircle.in · Not for sale or copying