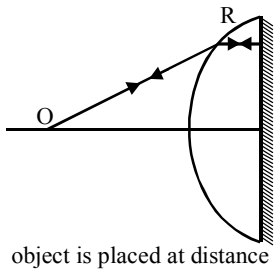
CLASS TEST

SECTION-I

Single Correct Answer Type **5 Q. [3 M (–1)]**

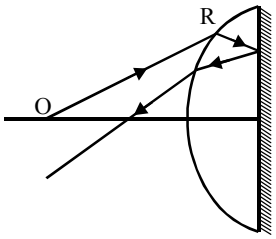
1. A thin plano-convex glass lens ($\mu = 1.5$) has its plane surface reflecting and R is the radius of curvature of curved part, then which of the following ray diagram is true for an object placed at O ?

(A)



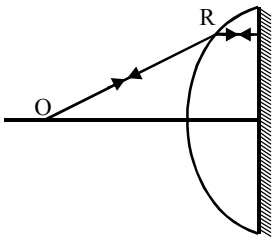
object is placed at distance 2R from lens

(B)



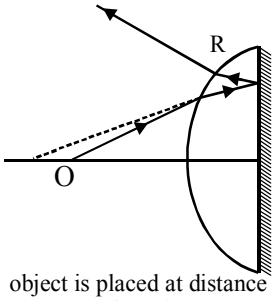
object is placed at distance 2R from lens

(C)



object is placed at distance 3R from lens

(D)

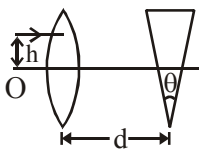


object is placed at distance 2R from lens

2. Two thin symmetrical lenses of different nature have equal radii of curvature R = 20 cm. The lenses are put close together and immersed in water. The converging focal length of the system is 24 cm. Find the difference between refractive indices of the two lenses. (refractive index for water = $\frac{4}{3}$)

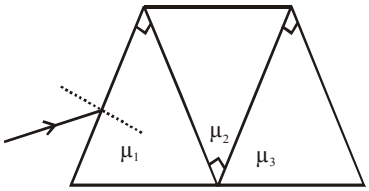
(A) $(\mu_1 - \mu_2) = \frac{1}{24}$ (B) $(\mu_1 - \mu_2) = \frac{1}{20}$ (C) $(\mu_1 - \mu_2) = \frac{5}{9}$ (D) $(\mu_1 - \mu_2) = \frac{4}{3}$

3. A ray of light parallel to the axis of converging lens (having focal length f) strikes it at a small distance 'h' from its optical centre. A thin prism having angle θ and refractive index μ is placed normal to the axis of lens at a distance 'd' from it. What should be the value of μ so that the ray emerges parallel to the lens axis?



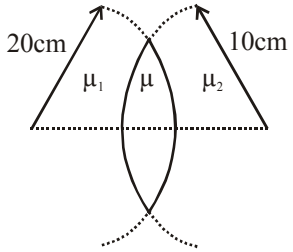
(A) $\frac{h}{f\theta}$ (B) $\frac{h}{f\theta} + 1$ (B) $\frac{h}{(d+f)\theta}$ (D) $\frac{h}{(d+f)\theta} + 1$

4. Three right-angled prisms of refractive indices μ_1, μ_2 and μ_3 are joined together as shown in the figure. If the ray passes through the whole system undeviated then :-



(A) $\mu_1^2+\mu_2^2+\mu_3^2=1$ (B) $\mu_1^2+\mu_3^2=1+\mu_2^2$ (C) $\mu_1^2+\mu_2^2=1+\mu_3^2$ (D) $\mu_1^2=\mu_2^2+\mu_3^2+1$

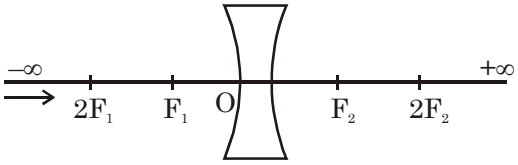
5. Radii of curvature of surfaces of a biconvex lens are 10 cm and 20 cm and refractive index of its material is $\mu = 1.5$. If the refractive indices of the medium on the two sides of the lens are μ_1 and μ_2, then the parallel rays incident on the lens from left will focus at a distance of f_2 (distance being measured from the optical centre of the lens) where f_2 is equal to :-



(A) $\dfrac{20\mu_1}{4.5-(2\mu_1+\mu_2)}$ (B) $\dfrac{20\mu_2}{4.5-(\mu_1+2\mu_2)}$ (C) $\dfrac{20\mu_2}{4.5-(2\mu_1+\mu_2)}$ (D) $\dfrac{20\mu_1}{4.5-(\mu_1+2\mu_2)}$

Multiple Correct Answer Type 2 Q. [4 M (–1)]

6. A object is moving on the optical axis of a diverging lens from –∞ to O optical centre of the lens. Choose the **CORRECT** statement(s) about the image of particle :

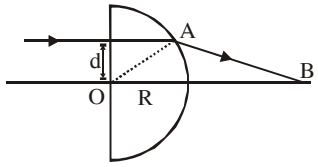


(A) When object is moving between $(-\infty, 2F_1)$ its image will be virtual & diminished.
(B) When object is moving between $(2F_1, F_1)$ its image will be real and diminished.
(C) When object is moving between F_1 to O its image will be virtual & enlarge.
(D) For complete motion of object, image will lie on same side of the lens.

7. A real object is kept in front of a lens in air. The object is a linear extended object with its length perpendicular to the optical axis of lens. With reference to different cases of image formation by lens, choose the correct options :
(A) If the image has a magnification –2.5 then image is real and power of lens is positive.
(B) If the magnification of the image is +0.5 then image is virtual and power of lens is negative
(C) If length of image is the same as that of object then image is real and power of lens is positive.
(D) If length of image is the same as that of object then image is virtual and power of lens is negative.

Linked Comprehension Type (1 Para × 3Q.) [3 M (-1)]
(Single Correct Answer Type)

Paragraph for Question 8 to 10



A semi cylinder made of a transparent plastic has a refraction index of n = √2 and a radius of R. There is a narrow incident light ray perpendicular to the flat side of the semi cylinder at d distance from the axis of symmetry.

8. What can the maximum value of d be so that the light ray can still leave the other side of the semi cylinder?

(A) $d = \frac{R}{\sqrt{2}}$ (B) $d = \frac{R}{2\sqrt{2}}$ (C) $\frac{R}{2}$ (D) None of these

9. When the value of d chosen is such that TIR just takes place then time for which light remains inside the cylinder is

(A) 4R/c (B) $\frac{4\sqrt{2}R}{c}$ (C) $\frac{2\sqrt{2}R}{c}$ (D) 2R/c

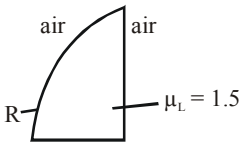
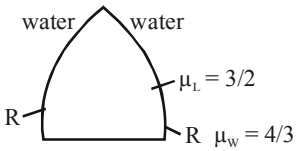
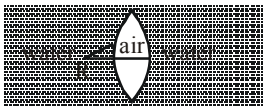
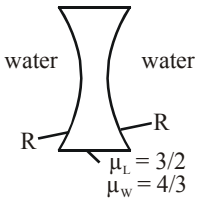
10. Distance d is now varied, so that the ray always emerges from the other side of the semi cylinder. What is the range of OB?

(A) $2\sqrt{2}R > OB > R\sqrt{2}$ (B) $5\sqrt{2}R > OB > R$

(C) $\infty > OB > R\sqrt{2}$ (D) $\infty > OB > 2R\sqrt{2}$

Matching List Type (4 × 4) 1Q. [3 M (–1)]

11. Using the lens maker formula, relate the focal length of thin lens in List-I with value in List-II.

	List-I		**List-II**
(P)		(1)	4R
(Q)		(2)	–2R
(R)		(3)	–4R
(S)		(4)	2R

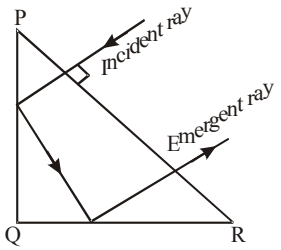
Codes :

	P	Q	R	S
(A)	1	3	4	2
(B)	4	2	1	3
(C)	3	2	1	4
(D)	4	1	2	3

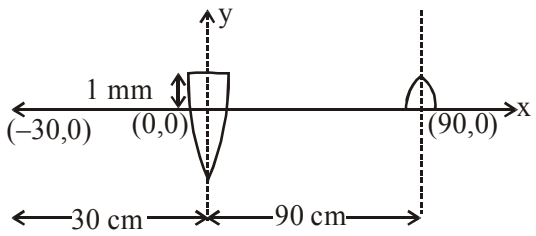
SECTION-III

Numerical Grid Type (Ranging from 0 to 9) **7 Q. [4 M (0)]**

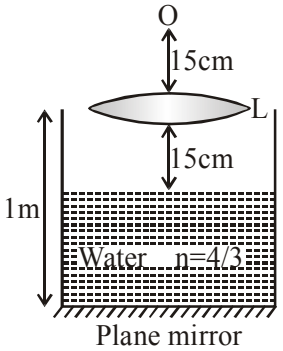
1. For a right angled prism PQR immersed in water, the incident and emergent rays are parallel as shown in figure. The minimum value of refractive index of the prism is $\frac{N\sqrt{2}}{3}$. Then find the value of N.



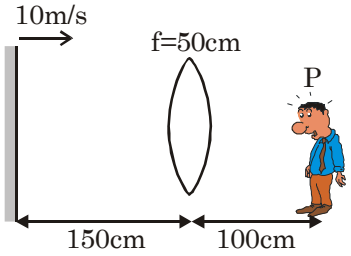
2. A thin convex lens having focal length 20 cm is cut into two parts 1 mm above the principle axis. The lower portion is placed with optical centre at origin and upper portion at (90, 0) as shown in the figure. A point object is placed at (–30, 0). Find the magnitude of y–coordinates (in mm) of the image. Assuming paraxial ray approximation to remain valid.



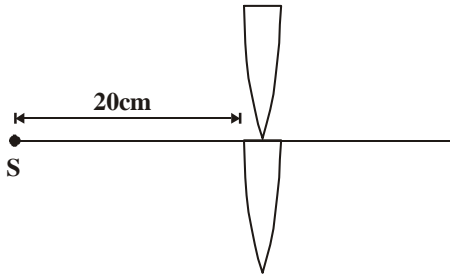
3. In the figure shown, O is a point object placed above the lens L of focal length 10 cm. The distance between the object O and its image formed in the plane mirror is n × 20 cm find n.



4. At the instant shown in the figure, find the magnitude of velocity 'v' (in m/s) of image of person as seen by himself. Fill $\frac{9v}{5}$ in OMR sheet.

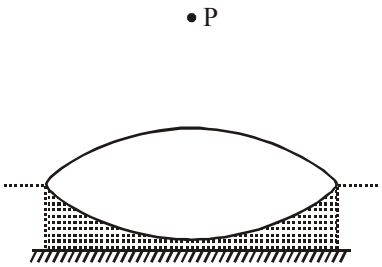


5. A convex lens of focal length 12 cm and 4 mm aperture is cut in to two equal halves and are placed as shown in the figure. A point source S is placed on the principal axis of the lens at a distance 20 cm from the lens as shown in the figure. Find the separation (in mm) between the images formed.



6. A lens forms the image of sun on a screen 30 cm away. How far (in decimeter) from the first lens should a second lens of focal length 30 cm be placed (between first lens and screen) so that the screen has to be moved 8 cm towards the first lens for the new image to be in focus?

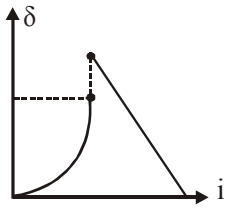
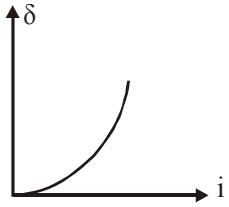
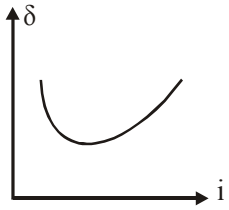
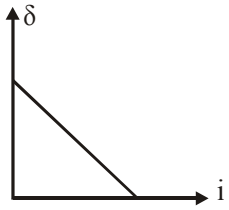
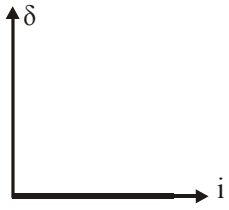
7. Figure shows an equiconvex lens of $\mu = 1.50$, in contact with a liquid layer on the top of a plane mirror. When a point object is placed at 45 cm from lens, it is found that image coincides with object. When liquid is removed and experiment is repeated, the new distance for object and image to coincide is found to be 30 cm. Then refractive index of liquid would be $\frac{n}{3}$. Find the value of n.



SECTION-IV

Matrix Match Type (4 × 5) **1 Q. [8 M (for each entry +2(0)]**

1. Match the entries of column-I with the entries of column-II, which describes the angle of deviation of ray with angle of incidence.

Column-I		**Column-I**	
(A)	A ray is falling on a plane smooth mirror	(P)	
(B)	A ray is going from a rarer to denser medium	(Q)	
(C)	A ray is going from a denser to rarer medium	(R)	
(D)	A ray is falling parallel slab	(S)	
		(T)	

CLASS TEST # 10 (TNAS) **ANSWER KEY**

SECTION-I

Single Correct Answer Type **5 Q. [3 M (–1)]**

1. Ans. (A) **2. Ans. (C)** **3. Ans. (B)** **4. Ans. (B)**
5. Ans. (B)

Multiple Correct Answer Type **2 Q. [4 M (–1)]**

6. Ans. (A, D) **7. Ans. (A,B,C)**

Linked Comprehension Type **(1 Para × 3Q.) [3 M (-1)]**
(Single Correct Answer Type)

8. Ans. (A) **9. Ans. (A)** **10. Ans. (C)**

Matching List Type (4 × 4) **1Q. [3 M (–1)]**

11. Ans. (D)

SECTION-III

Numerical Grid Type (Ranging from 0 to 9) **7 Q. [4 M (0)]**

1. Ans. 4 **2. Ans. 3** **3. Ans. 9** **4. Ans. 4**
5. Ans. 5 **6. Ans. 1** **7. Ans. 4**

SECTION-IV

Matrix Match Type (4 × 5) **1 Q. [8 M (for each entry +2(0)]**

1. Ans. (A) S (B) Q, (C) P, (D) T