

Refraction of Light at Curved Surfaces

1. Write the lens maker's formula and explain the terms in it. (AS1)
2. How do you verify experimentally that the focal length of a convex lens is increased when it is kept in water? (AS1)
3. How do you find the focal length of a lens experimentally? (AS1)
4. Draw ray diagrams for the following positions and explain the nature and position of image.
 - i. Object is placed at C_2
 - ii. Object is placed between F_2 and optic centre P . (AS5)
5. Man wants to get a picture of a zebra. He photographed a white donkey after fitting a glass, with black stripes on to the lens of his camera. What photo will he get? Explain. (AS1)
6. Two converging lenses are to be placed in the path of parallel rays so that the rays remain parallel after passing through both lenses. How should the lenses be arranged? Explain with a neat ray diagram. (AS1)
7. The focal length of a converging lens is 20cm. 2 cm. height object is 60cm from the lens. Where will the image be formed and what kind of image is it? And also find the height of the image (AS1) (Ans: A real, diminished, inverted image formed at 30cm from the lens)
- 8.. A double convex lens has two surfaces of equal radii ' R ' and refractive index $n = 1.5$. Find the focal length ' f '. (AS1)
9. Harsha tells Siddhu that the double convex lens behaves like a convergent lens. But Siddhu knows that Harsha's assertion is wrong and corrected Harsha by asking some questions. What are the questions asked by Siddhu? (AS2)
10. Can a virtual image be photographed by a camera?(AS2)
11. How do you appreciate the coincidence of the experimental facts with the results obtained by a ray diagram in terms of behaviour of images formed by lenses? (AS6)
12. Find the refractive index of the glass which is a symmetrical convergent lens if its focal length is equal to the radius of curvature of its surface. (AS7) (Ans:1.5)
13. Find the radii of curvature of a convexo –concave convergent lens made of glass with refractive index $n=1.5$ having focal length of 24cm. One of the radii of curvature is double the other. (Ans: $R_1 = 6\text{cm}$, $R_2 = 12\text{cm}$) (AS7)

14) A convex lens is made up of three different materials as shown in the figure. How many of images does it form? (AS2)

15) You have a lens. Suggest an experiment to find out the focal length of the lens.(AS3)

16) A parallel beam of rays is incident on a convergent lens with a focal length of 40cm. Where a divergent lens with a focal length of 15 cm should be placed for the beam of rays to remain parallel after passing through the two lenses? Draw a ray diagram. (AS5)

17) The distance between two point sources of light is 24cm .Where should a convergent lens with a focal length of $f=9\text{cm}$ be placed between them to obtain the images of both sources at the same point? (AS7)

18) Suppose you are inside the water in a swimming pool near an edge. A friend is standing on the edge. Do you find your friend taller or shorter than his usual height? Why?(AS7)

1) Which one of the following materials cannot be used to make a lens? []
a) water b) glass c) plastic d) clay

2) Which of the following is true? []
a) the distance of virtual image is always greater than the object distance for convex lens
b) the distance of virtual image is not greater than the object distance for convex lens
c) convex lens always forms a real image
d) convex lens always forms a virtual image

3) Focal length of the plano-convex lens is when its radius of curvature of the surface is R and n is the refractive index of the lens. []
a) $f = R$ b) $f = R/2$ c) $f = R/(n-1)$ d) $f = (n-1)/R$

4) The value of the focal length of the lens is equal to the value of the image distance when the rays are []
a) passing through the optic centre b) parallel to the principal axis
c) passing through the focus d) in all the cases

5) Which of the following is the lens maker's formula []
a) $1/f = (n-1)(1/R_1 + 1/R_2)$ b) $1/f = (n+1)(1/R_1 - 1/R_2)$
c) $1/f = (n-1)(1/R_1 - 1/R_2)$ d) $1/f = (n+1)(1/R_1 + 1/R_2)$