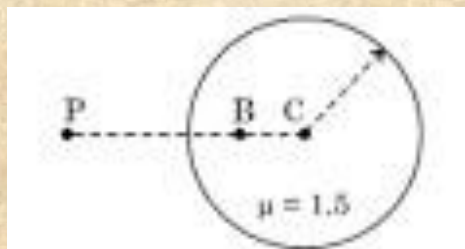


c) intensity of image decreases d) intensity of image increases.

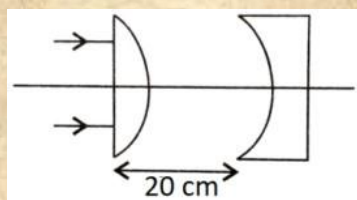
8. If a ray of light is incident on a plane mirror at an angle of incident of 30° , then deviation produced by mirror is

a) 30° b) 60° c) 90° d) 120°

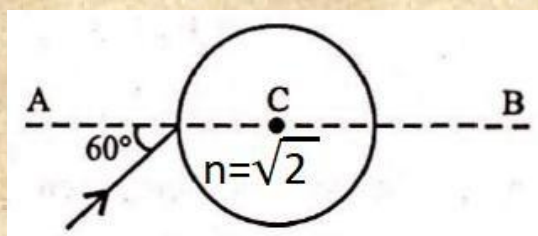
9. An air bubble is trapped at point B ($CB = 20$ cm) in a glass sphere of radius 40 cm and refractive index 1.5 as shown in figure. Find the nature and position of the image of the bubble as seen by an observer at point P.



10. In the given figure, the radius of curvature of curved face in the plano-convex and the plano-concave lens is 15 cm each. The refractive index of the material of the lenses is 1.5. Find the final position of the image formed.



11. A ray of light falls on a transparent sphere of $n = \sqrt{3}$ at an angle of incidence 60° with the diameter AB of the sphere having centre C. The ray emerges from the sphere parallel to the line AB. Find the angle of emergence.



12. Assertion (A) : A convex lens, when immersed in a liquid, disappears.

Reason (R) : The refractive indices of material of the lens and the liquid are equal.

- a) Both (A) and (R) are true (R) is correct explanation of (A).
 b) Both (A) and (R) are true (R) is not correct explanation of (A).
 c) (A) is true, but (R) is false.
 d) (A) is false and (R) is also false.

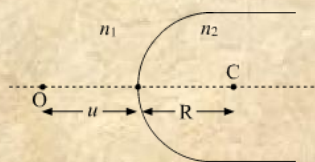
13. A window is provided in the middle of a wall. Its image is obtained on the opposite wall at a distance 'd' from it using a lens. If the window and its image are of the same size, then the focal length of the lens used is

a) $+\frac{d}{4}$ b) $+\frac{d}{2}$ c) $-\frac{d}{4}$ d) $-\frac{d}{2}$

14. An object approaches a converging lens with a uniform speed of 5 m/s and stops at the focus. How

will the image move with respect to the lens? Specify its nature.

15. A biconvex lens made up of glass of refractive index 1.5, forms a real image of an object in air. If the whole set-up were immersed in a liquid of refractive index 1.7, then how will the nature of the image be affected?
16. A concave lens of refractive index 1.5 is immersed in a medium of refractive index 1.65. What is the nature of the lens?
17. A convex lens ($n = 1.52$) has a focal length of 15.0 cm in air. Find its focal length when it is immersed in liquid of refractive index 1.65. What will be the nature of the lens?
18. The radii of curvature of the faces of a double-convex lens are 20 cm and 30 cm. its power is $\frac{25}{6}D$. What is the refractive index of the glass of the lens?
19. The focal length of an equi-concave lens is $\frac{3}{4}$ time of radius of curvature of its surface. Find the refractive index of the material of the lens. Under what condition will this lens behave as a converging lens?
20. A serene is placed 80 cm from an object. The image of the object on the screen is formed by a convex lens placed between the mat two different locations separated by a distance 20 cm. Determine the focal length of the lens.
21. A beam of light converges at a point P. Now a convex lens is placed in the path of the convergent beam at 15 cm from point P. At what point does a beam converge if the convex lens has a focallength 10 cm?
22. An object is placed 30 cm in front of a plano-convex lens with its spherical surface of radius of curvature 20 cm. if the refractive index of the material of the lens is 1.5, find the position and nature of the image formed.
23. (a) Derive lens maker's formula for a biconvex lens.
(b) A point object is placed at a distance of 12 cm on the principal axis of a convex lens of focal length 10 cm. A convex mirror is placed coaxially on the other side of the lens at a distance of 10 cm. If the final image coincides with the object, sketch the ray diagram and find the focal length of the convex mirror.
24. (a) Derive the mathematical relation between refractive indices n_1 and n_2 of two media and radius of curvature R for refraction at a convex spherical surface. Consider the object to be a point source lying on the principal axis in rarer medium of refractive index n_1 and a real image formed in the denser medium of refractive index n_2 . Hence, derive lens maker's formula.
(b) Light from a point source in air falls on a convex spherical glass surface of refractive index 1.5 and radius of curvature 20 cm. The distance of light source from the glass surface is 100 cm. At what position is the image formed?
25. (a) A point object 'O' is kept I a medium of refractive index n_1 I front of a convex spherical surface of radius of curvature R which separates the second medium of refractive index n_2 from the first one, as shown in the figure.
26. Draw the ray diagram showing the image formation and deduce the relationship between the object distance and the image distance in terms of n_1 , n_2 and R.



(b) (i) When the image formed above acts as a virtual object for a concave spherical surface separating the medium n_1 from n_2 ($n_1 > n_2$), draw this ray diagram and write the similar (similar to (a)) relation.

(ii) Hence, obtain the expression for the lens maker's formula.

27. A biconcave lens of power P vertically splits into two identical plano concave parts. The power of each part will be

- a) $2P$ b) $P/2$ c) P d) $P/\sqrt{2}$

28. What is the power of an equiconvex lens of refractive index n_2 dipped in a liquid of refractive index n_1 where $n_1 < n_2$?

i) Define SI unit of power of a lens.

(ii) A plano convex lens is made of glass of refractive index 1.5. The radius of curvature of the convex surface is 25 cm.

(a) Calculate the focal length of lens.

(b) If an object is placed 50 cm in front of the lens, find the nature and position of the image formed.

29. The lens maker's formula is useful to design lenses of desired focal length using surfaces of suitable radii of curvature. The focal length also depends on the refractive index of the material of the lens and the surrounding medium. The refractive index depends on the wavelength of the light used. The power of a lens is related to its focal length.

Answer the following question based on the above:

(a) How will the power of a lens be affected with an increase of wavelength of light?

(b) The radius of curvature of two surfaces of a convex lens is R each. For what value of μ of its material will its focal length become equal to R ?

(c) The focal length of a concave lens of $\mu = 1.5$ is 20 cm in air. It is completely immersed in water of $\mu = \frac{4}{3}$. Calculate its focal length in water.

OR

(c) An object is placed in front of a lens which forms its erect image of magnification 3. The power of the lens is 5 D. Calculate the distance of the object and the image from the lens.