**My Lectures from :**
Web Notes : Geometrical Optics(Lectures Notes #10),
Ray Optics (Lectures Notes #11)
Other Notes: Chapter_34 ,Optics Examples 1,
Optics Examples 2

1. A collimated laser beam shines on a tank of water. Part of the beam reflects off the top surface and part off the bottom surface as show in the figure. Show that the two beams heading back into the incident medium are parallel.
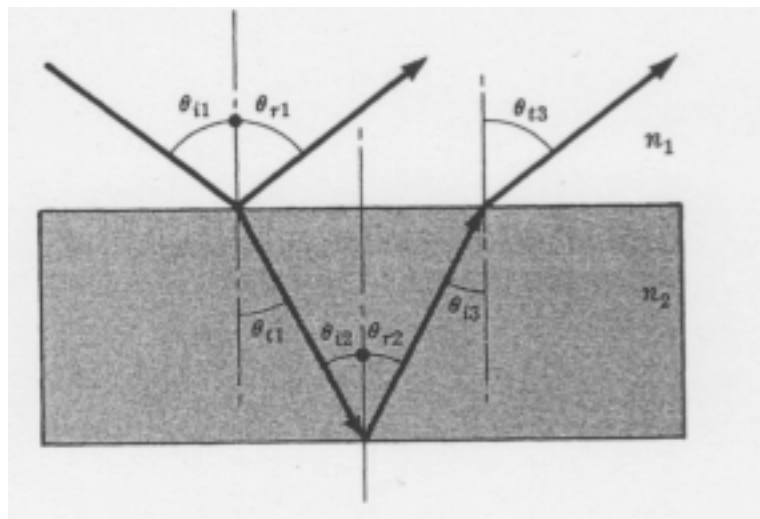
2. Consider the block of glass shown in the figure. If the point source S is 30 cm from the vertex of the hemispherical end and if the latter has a radius of 10 cm, locate the image seen by the observer.
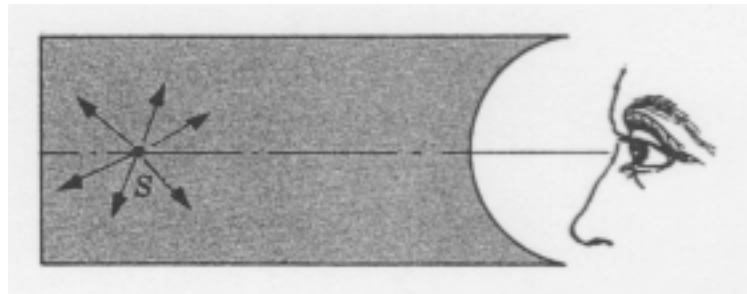

3. What must be the radius of curvature of the rod's right end in the figure below if the parallel bundle of rays is to come to a focus 100 cm from the vertex? The glass rod (n = 1.46) is immersed in ethyl alcohol (n = 1.36).

100 cm
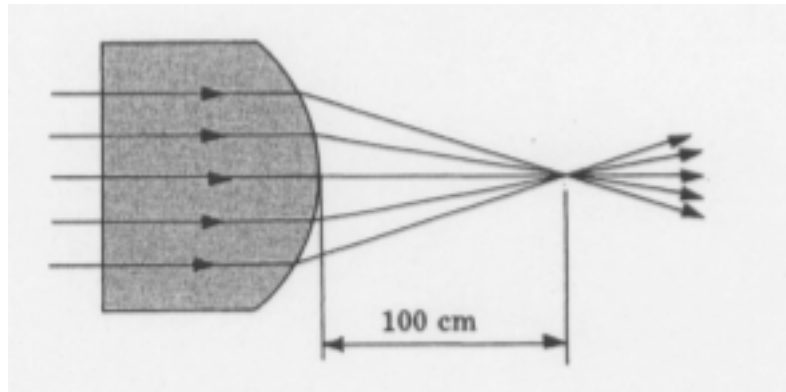
4. A 3-cm high wine bottle cork is sitting 75 cm from a thin
   positive lens of 25-cm focal length. Describe the resulting
   image completely.

5. Suppose that an object positioned 10 inches to the left of a
   positive lens is imaged 30 inches to the right of the lens.
   Where will the image appear if the object is now moved so
   that it is 2.5 inches from the lens. Completely describe the
   image in both cases.

6. A thin bi-convex lens (n = 1.5) has radii of curvature of 30
   cm and 60 cm. if it is to cast a half-sized image of a lamp
   on a paper screen, what must be the lens-lamp and lens-screen
   distances? Construct an appropriate ray diagram.

7. A compound lens consists of two thin bi-convex lenses L_1 and
   L_2 of focal lengths 10 cm and 20 cm, separated by a distance
   of 80 cm. Describe the image corresponding to a 5-cm tall
   object 15 cm from the first lens. Construct a ray diagram to
   scale. Calculate the location of the intermediate image and
   see that it checks with your drawing.

8. A pencil is held so that it is tilted away from a plane
   mirror. Construct a ray diagram locating the image.

9. Two plane mirrors are at right angles to each other on a
   table. A green frog is placed on the table. How many images
   of itself will the frog see? Draw a ray diagram.

10. A concave spherical mirror has a radius R and is centered at
    C. A real erect object R/6 tall is located a distance 1.5R
    from the mirror's vertex. Draw a ray diagram showing the
    formation of the image. Compute the magnification and image
    location.

11. Envision a ray with two plane mirrors as shown in the figure below. Prove that the ray will be deviated through an angle 2θ regardless of its incident angle.
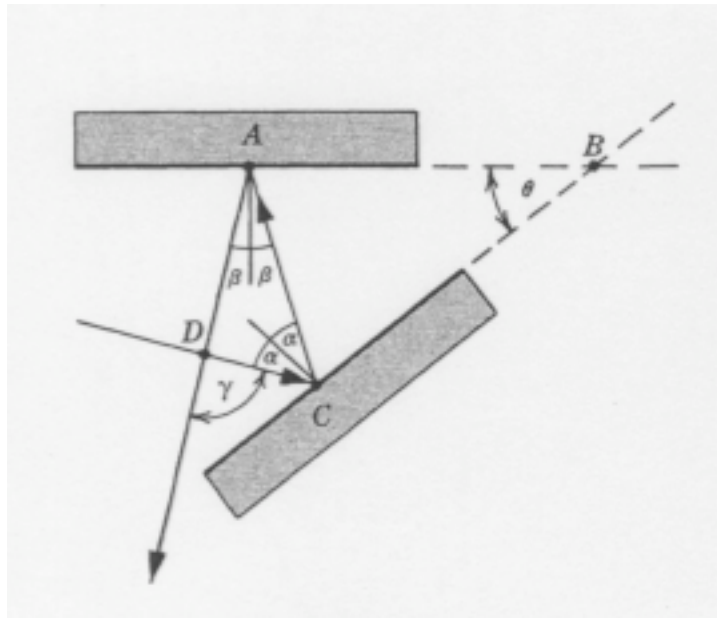
12. An object is placed 10 cm in front of a converging lens of focal length 10 cm. A diverging lens of focal length −15 cm is placed 5 cm behind the converging lens. Find the position, size and character of the final image.