Image Formation by Spherical Lens

Spherical Lenses

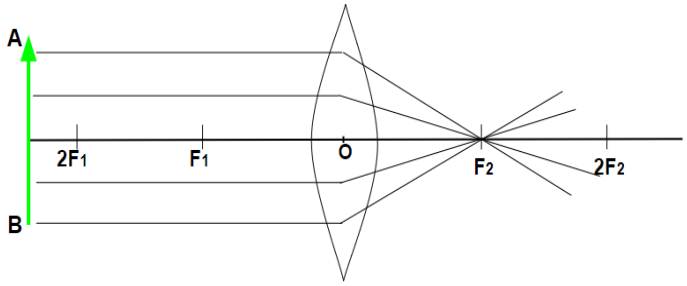
Spherical Lenses are optical lenses with curved surfaces that cause the light rays to converge or diverge. Spherical lenses are transparent pieces cut off from a bigger sphere. These lenses either converge or diverge light rays to form an image.

Spherical Lenses are divided into two major types which are:

- Concave Lens
- Convex Lens

Concave Lens or Divergent Lenses

- Concave lens is a spherical lens whose reflecting surface is curved inwards.
- It is also known as a 'Diverging Lens' as they diverge or spread the beam of light in different directions.
- Concave lenses are used as corrective lenses for people having myopia or short-sightedness.
- They are used in spectacles, lasers, flashlights, cameras, etc.
- Concave lenses create a virtual image of the object.
- Concave lenses are thicker at the edges and thinner in the middle.



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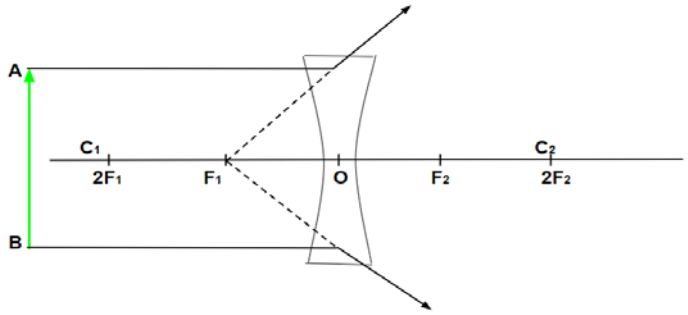
Convex Lens or Convergent Lenses

- Convex lens is an optical lens whose reflecting surface bulges outwards.
- It is known as a 'Converging Lens' as it converges the light rays at a point.
- They are used in eyeglasses, magnifying glasses, microscopes, cameras, etc.
- The image formed by convex lenses is virtual and erect.
- Convex lenses are thicker in the middle and thinner at the edges.



Terms Related to Spherical Lenses

(a) Optical Centre

The centre point of a lens which lies on its principal axis is known as its optical center. The optical centre is denoted by letter O.

(b) Principal Axis

The principal axis of a lens is defined as a straight line passing through the optical center and the centre of curvature.

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(c) Principal Focus

The principal focus of a lens is a point on its principal axis wherein the rays of light parallel to it and after passing through it converge (for a convex lens) or appear to diverge (for a concave lens). The principal focus of a lens is denoted by the letter F.

(d) Focal Length

The distance between the optical center and the principal focus of a spherical lens is termed as the “Focal Length”. The focal length of a spherical lens is denoted by the letter f.

Focal length of a spherical lens can also be defined as half of the radius of curvature.

$2f = R$ or $f = R/2$

This is also the reason that the center of curvature is usually denoted as 2F for a spherical lens instead of C.

(e) Radius of curvature

“Radius of curvature” of a spherical lens is defined as the distance between its optical center and the center of curvature. The radius of curvature is denoted is by the letter R.

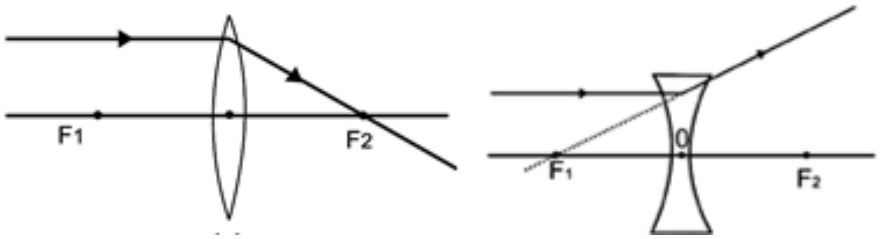
(f) Centre of curvature

The centre of curvature of the lens is defined as the center of sphere of a part of which a spherical lens is formed.

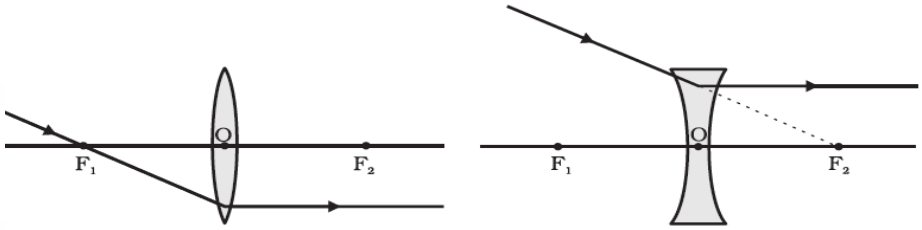
Image Formation by Spherical Lens

The image formation by lenses requires a minimum of two light rays, and for drawing the ray diagram, we can use the following rules:

1. A ray of light moving parallel to the principal axis, after refraction, converges to or appears to diverge from the principal focus.



2. A ray of light passing through or moving towards the principal focus, after refraction, moves parallel to the principal axis.



3. A ray of light passing through the optical center is undeviated.