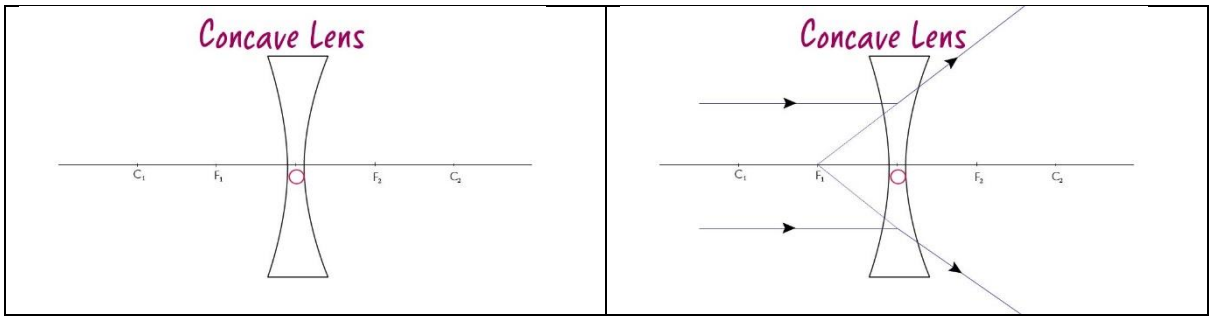
REFRACTION BY A CONCAVE LENS

Now that we know what is refraction, now let's see how refraction occurs in Concave Lens.

We will cover
(i) What is a Concave Lens
(ii) How to read a Concave Lens
(iii) Refraction by Concave Lens
(iv) Image formation by Concave Lens
(v) Uses of Concave Lens

Concave Lens

◊ A double concave lens is bounded by two spherical surfaces, curved inwards. It is thicker at the edges than at the middle.



◊ Concave lenses diverge light rays. Such lenses are called diverging lenses. A double concave lens is simply called a concave lens.

Reading a Concave Lens

◊ Each surface of the concave lens forms a part of a sphere. The centres of these spheres are called centres of curvature of the lens. The centre of curvature of a lens is usually represented by the letter C. Since there are two centres of curvature, we may represent them as C_1 and C_2.

◊ An imaginary straight line passing through the two centres of curvature of a lens is called its **principal axis**.

◊ The central point of a lens is its **optical centre**.

◊ A ray of **light through the optical centre** of a lens passes without suffering **any deviation**.

◊ The effective diameter of the circular outline of a spherical lens is called its **aperture**.

◊ Lens whose aperture is much less than its radius of curvature, such lenses are called **thin lenses with small apertures**.

◊ Several rays of light parallel to the principal axis are falling on a concave lens. These rays, after refraction from the lens, are appearing to diverge from a point on the principal axis. This point on the principal axis is called the **principal focus** of the concave lens.

◊ If you pass parallel rays from the opposite surface of the lens, you get another principal focus on the opposite side. Letter F is usually used to represent principal focus. However, a lens has two principal foci. They are represented by F_1 and F_2. The distance of the principal focus from the optical centre of a lens is called its **focal length**. The letter f is used to represent the focal length.

REFRACTION BY A CONCAVE LENS

Refraction by Concave Lens

(i) A ray of light from the object, parallel to the principal axis, after refraction from a concave lens, the ray appears to diverge from the principal focus located on the same side of the lens.

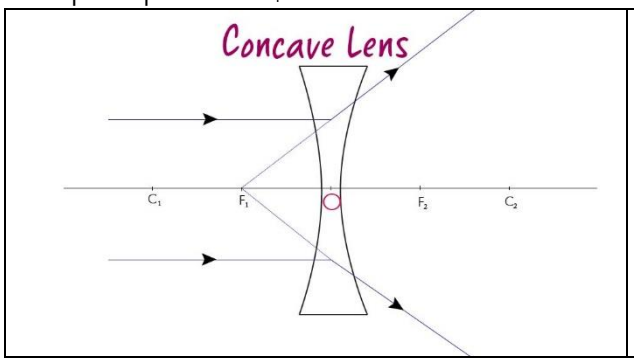
(ii) A ray of light appearing to meet at the principal focus of a concave lens, after refraction, will emerge parallel to the principal axis.

(iii) A ray of light passing through the optical centre of a lens will emerge without any deviation.

Image formation by Concave Lens

We consider two cases only

(i) Object is placed at F_1

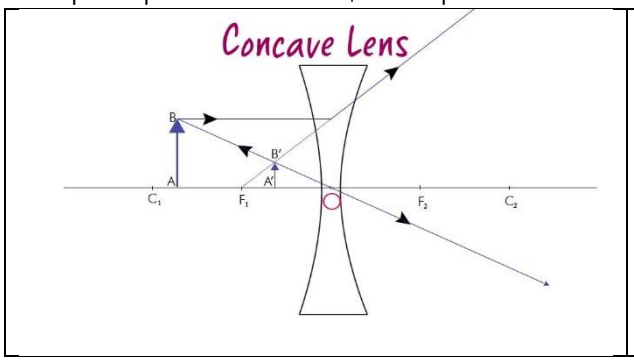


Position of Image:
At focus F_1

Size of Image:
Highly diminished and Point sized

Nature of Image:
Virtual and Erect

(ii) Object is placed between F_1 and Optical Centre O



Position of Image:
Between F_1 and optical Centre

Size of Image:
Diminished

Nature of Image:
Virtual and Erect

Uses of Concave Lens

Let us now focus on uses of concave lenses –

1. They are used in **spectacles**. They are used in spectacles for a special type of eye disease called myopia or short sightedness.

2. It is sometime used with Concave lens in optical instruments to clear the aberrations faced in seeing the objects clearly.

3. It is also sometimes used in cars or vehicles front lights.

4. These are also used in laser lights. They will increase the curvature in which the light falls and will make the area in which the light falls more accurately aimed.

5. Last but not the least these are also used in peepholes. Have you seen doors in which when you see through the hole then you can see the panoramic view of the outside world or the person standing outside your door. This is due to the concave lens fitted in the hole of the door.