BAL BHARATI PUBLIC SCHOOL, PITAMPURA, DELHI – 110034

SUBJECT: PHYSICS

CHAPTER: LIGHT – REFLECTION AND REFRACTION

GUIDELINES:

Dear Students

- There is only **1 Assignment**.
  Assignment 7: Based on sub topics given below.
  Complete the Assignment in the Physics Notebook.
- **Video links** have been provided for better understanding of the concept through visuals. Watch the videos carefully as these will help you in doing the assignment.
- Read the lesson from **NCERT textbook** also.
- Link for the lesson: http://ncert.nic.in/textbook/pdf/jesc110.pdf (page no176 to 181)

SUB TOPICS:

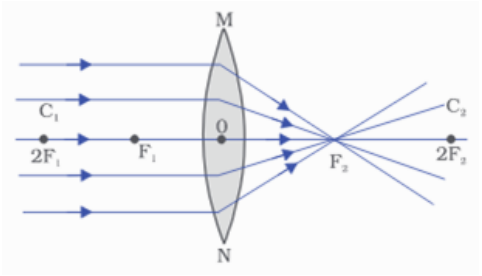
1. Basic Concept about Spherical Lenses and terms associated with Spherical lenses.
2. Rules for image formation in Concave and Convex Lenses.
3. Image formation by Concave Lens

Let's begin the journey of learning:

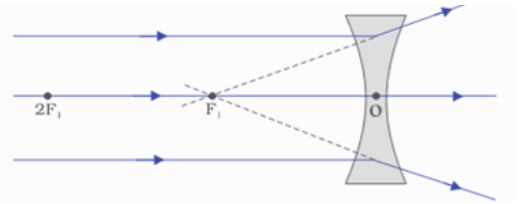
1. BASIC CONCEPT ABOUT SPHERICAL LENSES AND TERMS ASSOCIATED WITH SPHERICAL LENSES.

A transparent material bound by two surfaces, of which one or both surfaces are spherical, forms a lens.

Types of Lenses: Convex Lens and Concave Lens



CONVEX LENS: A lens may have two spherical surfaces, bulging outwards. Such a lens is called a double convex lens. It is simply called a convex lens. It is thicker at the middle as compared to the edges. Convex lens converges light rays as shown in fig. Hence ***convex lenses are called converging lenses***.



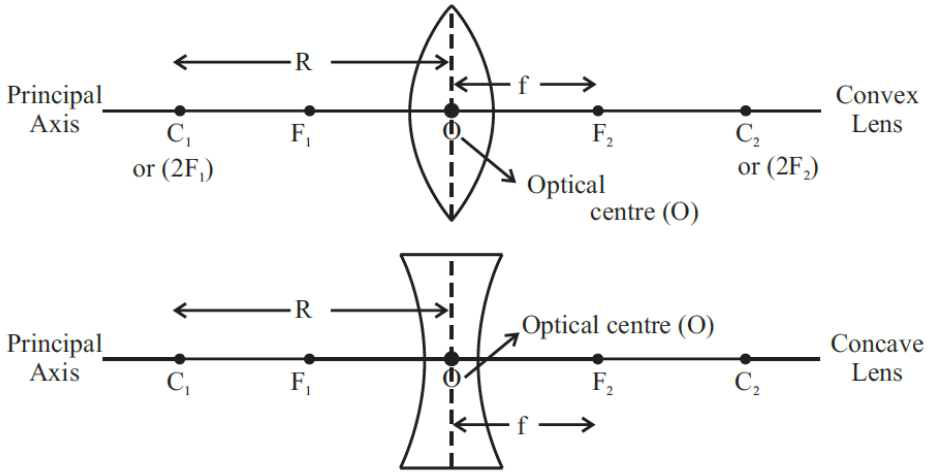
CONCAVE LENS: Lens bound by two spherical surfaces, curved inwards is called Concave Lens. It is thicker at the edges than at the middle. Concave lens diverges light rays as shown in fig. Hence ***Concave lenses are called Diverging lenses.***

There are ***certain terms associated with Spherical lenses:***

(i) **Centres of Curvature** :
- A lens has two spherical surfaces. Each of these surfaces 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 C1 and C2.

(ii) **Principal Axis**: An imaginary straight line passing through the two centres of curvature of a lens is called its principal axis.

(iii) **Optical centre**:
- The central point of a lens is its optical centre. It is usually represented by the letter O.



(iv) **Aperture**: The effective diameter of the circular outline of a spherical lens is called its aperture.

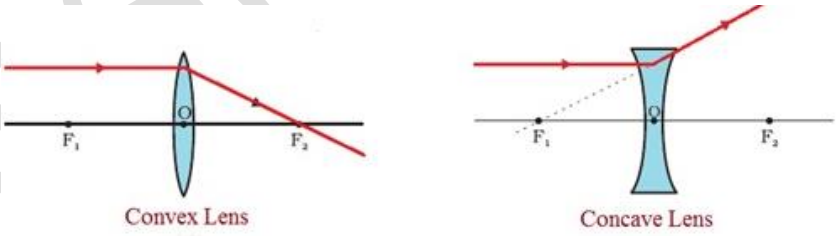
(v) Focus:

- When rays parallel to principal axis get refracted by convex lens, they converge to a point on principal axis, this point is called Principal focus.
- If you pass parallel rays from opposite side of lens you get another principal focus on the opposite side.
- A lens has two principal focus, usually named F1 and F2.
- When rays parallel to principal axis get refracted by concave lens, they appear to diverge from a point on the principal axis. This point is called Principal focus.
- Concave lens also have two foci, usually named F_1 and F_2.

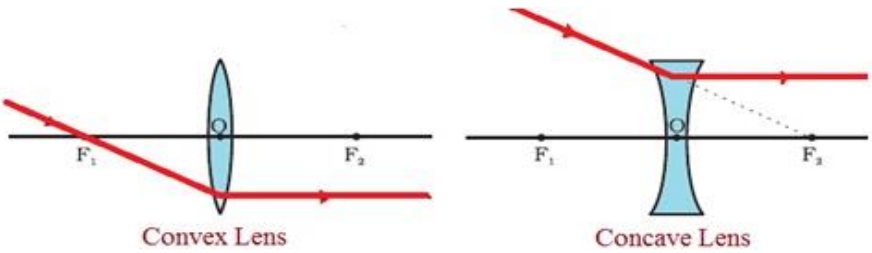
2. RULES FOR IMAGE FORMATION IN CONCAVE AND CONVEX LENSES.

For drawing ray diagrams in lenses, alike of spherical mirrors, we consider any two of the following rays –

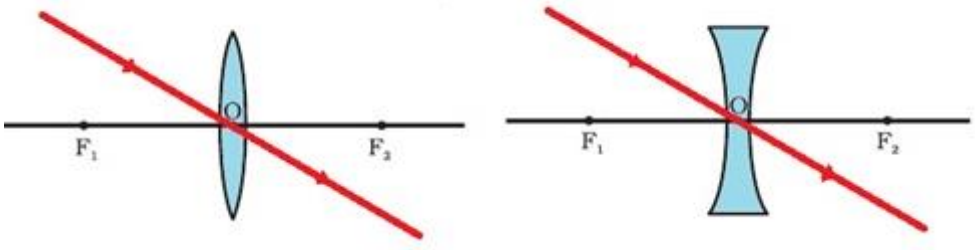
- A ray of light from the object, parallel to the principal axis, after refraction from a convex lens, passes through the principal focus on the other side of the lens. In case of a concave lens, the ray appears to diverge from the principal focus located on the same side of the lens.



- A ray of light passing through the principal focus, after refraction from a convex lens, will emerge parallel to the principal axis. A ray of light appearing to meet at the principal focus of a concave lens, after refraction, will emerge parallel to the principal axis.



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



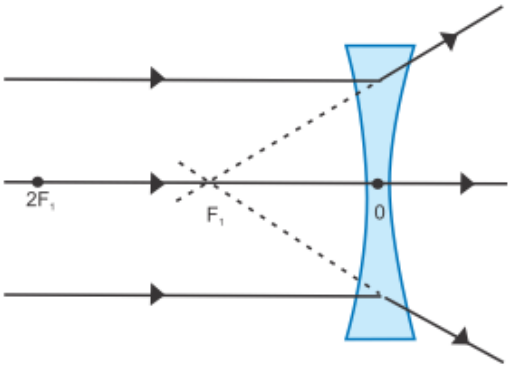
3. IMAGE FORMATION BY CONCAVE LENS

A concave lens will always give a virtual, erect and diminished image, irrespective of the position of the object.

1) When object is placed at infinity

Image is :

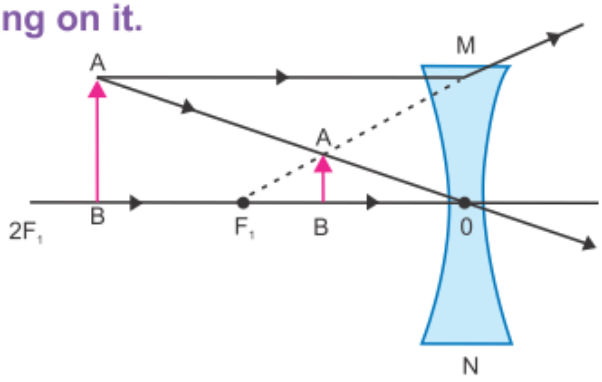
- formed at F_1
- virtual and erect
- highly diminished



2) A concave lens diverges all rays falling on it.

Therefore for all positions, image is :

- on the same side of object
- virtual and erect
- diminished



Position of the object	Position of the image	Relative size of the image	Nature of the image
At infinity	At focus F_1	Highly diminished, point-sized	Virtual and erect
Between infinity and optical centre O of the lens	Between focus F_1 and optical centre O	Diminished	Virtual and erect

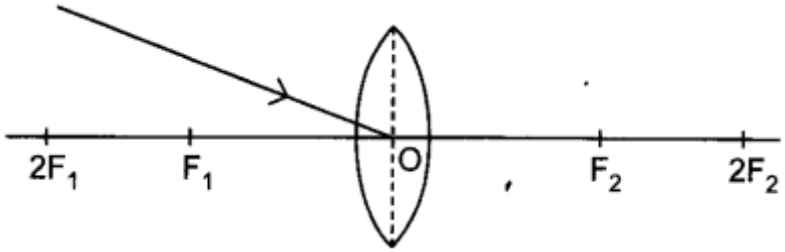
For better understanding, kindly go through the video link given below:

https://youtu.be/3Tf2-FV-W74: For image formation by Concave lens

ASSIGNMENT 7

Q.1 Redraw the given diagrams and show the path of the refracted ray:

(a)



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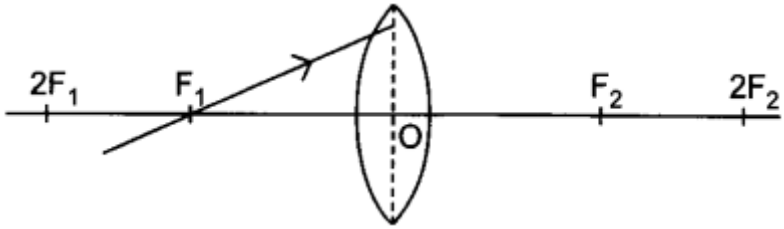
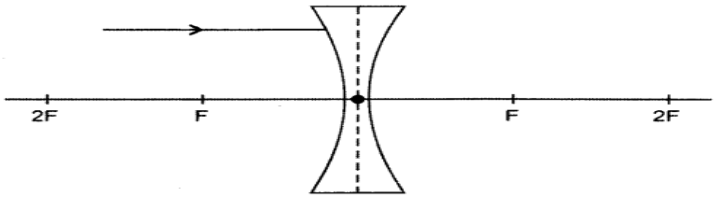
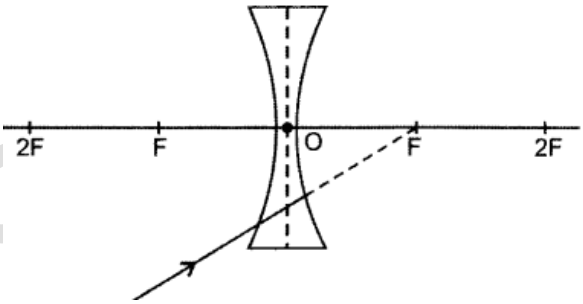


(c)



(d)



Q.2 Draw ray diagram showing the converging nature of Convex Lens.

Q.3 If the image formed by a lens is diminished in size and erect for all positions of the object, what type of lens is it?

Q.4 Name the point on the lens through which a ray of light passes without deviating.

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