BHAGIRATHI BAL SHIKSHA SADAN SEC SCHOOL

Class - X

Sub - Science (Physics)

Topic - Light - Reflection and Refraction.

Refraction of Light: — When a ray of light enters from one medium to another, it bends from its path. This phenomenon is called refraction of light.

Laws of Refraction: — There are two laws for it:—

(i) The incident ray, the refracted ray and the normal all lie in the same plane.

(ii) The ratio of sine of the angle of incidence to the sine of the angle of refraction for a particular pair of media is constant. This is also called "Snell's Law".

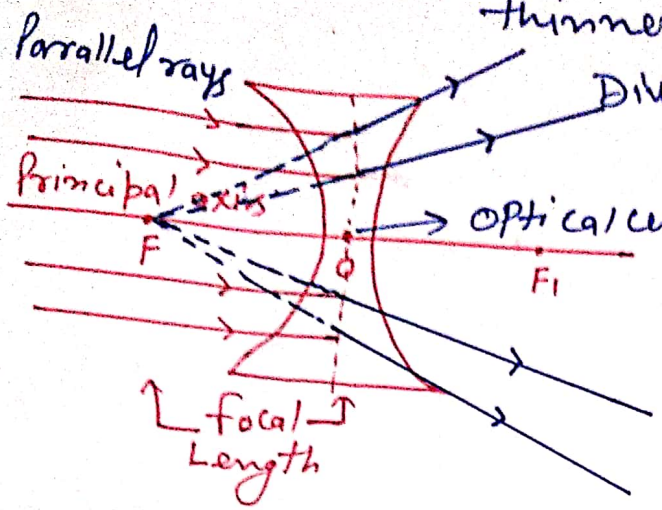
Refractive Index: — It is the ratio of speed of light in vaccum to the speed of light in a medium. $R.I = \frac{c}{n_g} = \frac{\text{speed in vaccum}}{\text{speed in other material}}$

Refraction by Spherical Lenses: —

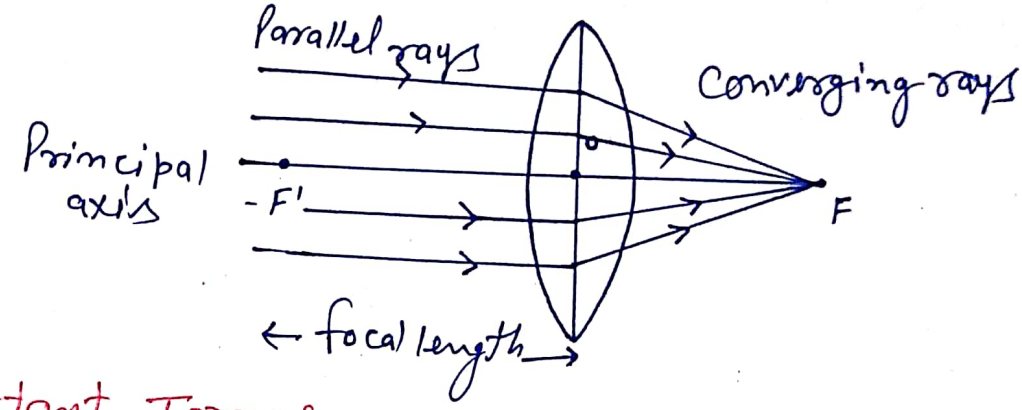
Lens: — A lens is a piece of transparent glass bound by two spherical surfaces. They are of two types:—

(i) **Concave Lens:** - It is thin in the middle but thicker at the edges.

(ii) **Convex Lens:—** It is thick at the centre but thinner at the edges.



Concave Lens



Convex Lens

Some Important Terms:—

(i) **Optical centre:—** The centre of a lens is known as its optical centre (O).

(ii) **Principal axis:—** The principal axis of a lens is an imaginary line passing through the optical centre of the lens and perpendicular to both the faces of the lens.

(iii) **Focal length:—** The focal length of the lens is the distance between optical centre and Principal focus of the lens.

Lens formula:— Lens formula gives the relation ship between object distance (u) Image distance (v) and focal length (f).

It is expressed as - $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

Magnification: — It is the ratio of the height of the Image to the height of the object

So magnification, $m = \frac{h'}{h} = \frac{v}{u}$

where h' = Height of Image and
h = Height of object.

Power of Lens: — It is defined as the ability of the lens to converge or diverge the light rays - mathematically, The power of a lens is the reciprocal of its focal length in metres.

So power, $P = \frac{1}{\text{focal length (in m)}} = \frac{100}{f \text{ (in cm)}}$

S.I unit of the power of a lens is dioptre (D).
The Power of a convex lens is Positive and the power of a Concave lens is Negative.

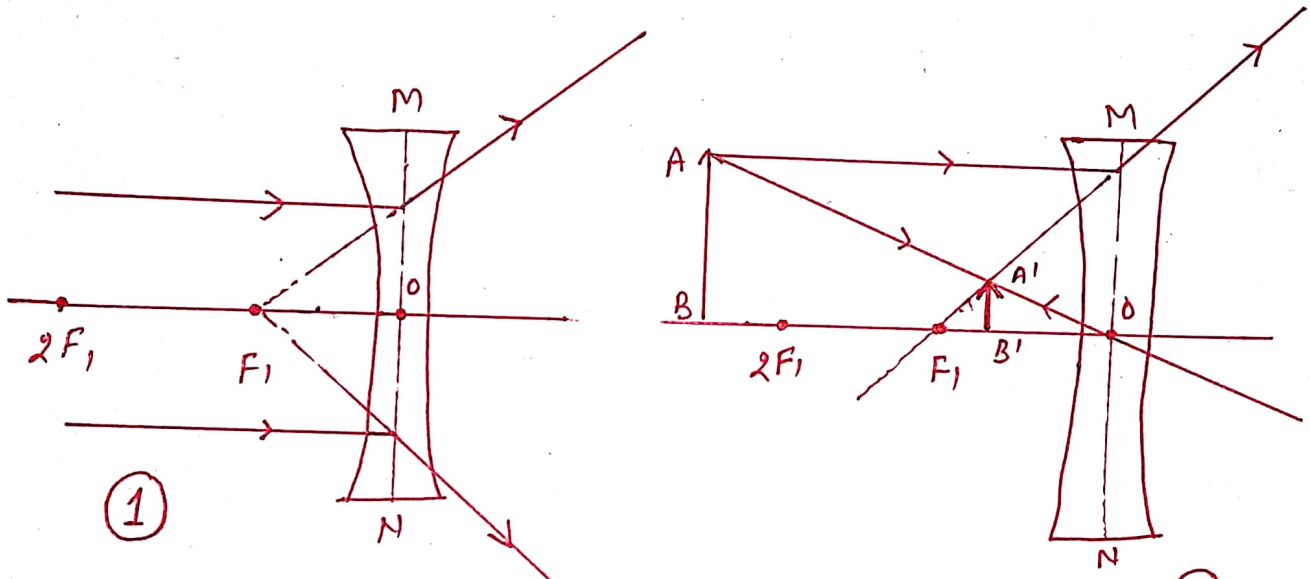
-:: Image formation by Convex Lens ::- TABLE-1

	Position of the object.	Position of the Image.	Size of the Image	Nature of the Image.
1.	At Infinity	At F_2 (focus)	Highly Diminished.	Real and Inverted.
2.	Beyond $2F_1$	Between F_2 and $2F_2$	Diminished.	Real and Inverted.
3.	At $2F_1$	At $2F_2$.	Same size as object.	Real and Inverted.
4.	Between F_1 and $2F_1$	Beyond $2F_2$.	Enlarged.	Real and Inverted.
5	At F_1 (focus)	At Infinity.	Highly Enlarged.	Real and Inverted.
6.	Between F_1 and optical centre(O)	on the same side of lens as object.	Enlarged.	Virtual and erect.

TABLE-2

:- Image formation by Concave Lens :-

	Position of the Object.	Position of the Image.	Size of the Image.	Nature of the Image.
1.	At Infinity	At the focus F_1	Highly Diminished point sized.	Virtual and erect
2.	Between infinity and optical centre	Between focus F_1 and optical centre.	Diminished.	Virtual and erect.



:- Assignment to do :- (2)

Q NO1:- Define 1 dioptre of Power of a lens.

Q NO2:- find the Power of a Concave lens of focal length 2m.

Q NO3:- from the Table-1, draw ray diagram to obtain the image of the objects in each position.

Q NO4:- Light enters from the air to glass having refractive indix 1.50. what is the speed of light in the glass. [$C = 3 \times 10^8$ M/S]

Q NO5:- write the uses of concave lens and convex lens.