

Points to Remember

Light is a form of energy, which travels in the form of waves.

* **Ray** – path of light

* **Beam** – Group of rays

Refraction

The deviation of ray of light, when it travels from one transparent medium into another obliquely.

* **First law of refraction** : *The incident ray, the refracted ray of light and the normal to the refracting surface all lie in the same plane.*

* **Second law of refraction (or) Snell's law**: *The ratio of the sine of the angle of incidence and sine of the angle of refraction is equal to the ratio of refractive indices of the two media.*

Scattering of Light

The phenomenon in which the beam of light is redirected in all directions when it interacts with a particle of a medium. The interacting particle of the medium is called as 'scatterer'. **Types:**

i) **Elastic scattering** : *The energy of the incident beam of light & the scattered beam of light are same.*

ii) **Inelastic scattering** : *The energy of the incident beam of light & the scattered beam of light are not same.*

Lenses

Lens: It is an optically transparent medium bounded by two spherical refracting surfaces (concave & convex lens) or one plane and one spherical surface (Plano-concave & Plano-convex lens).

Power of a Lens	The ability of a lens to converge (convex lens) or diverge (concave lens) the light rays falling on it is called as its power. $P=1/f$. SI unit – dioptre(D)
Microscope	Used to see tiny (very small) objects. Types : 1) Simple microscope 2) Compound microscope
Travelling microscope	One of the best instrument for measuring very small length with high degree of accuracy at the order of 0.01mm.
Telescope	Telescope is an optical instrument to see the distant objects. * Types according to optical property : Refracting and Reflecting telescope * Types according to Observed things : Astronomical and Terrestrial telescope

Human eye

Parts : Cornea, Iris, Pupil, Retina, Eye lens, Ciliary muscles.

Power of accommodation	<i>The ability of the eye lens to focus nearby as well as the distant objects.</i>
Persistence of vision	<i>If the time interval between two consecutive light pulses is less than $\frac{1}{16}$ second, human eye cannot distinguish them separately.</i>
Far point	<i>The maximum distance up to which the eye can see objects clearly.</i>
Near point (or) Least distance of vision	<i>The minimum distance required to see the objects distinctly without strain</i>

Defects of Eye

* Myopia	<i>Short sightedness, inability to see distant objects.</i>
* Hypermetropia	<i>Long sightedness, inability to see nearby objects</i>
* Presbyopia / Old age Hypermetropia	<i>On ageing, ciliary muscles become weak & eye-lens become rigid and so eye loses its power of accommodation.</i>
* Astigmatism	<i>Inability to see parallel and horizontal lines clearly.</i>

★ Velocity of light, $c = v \lambda$

★ Snell's law, $\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$

★ Rayleigh's law, 'S' $\propto \frac{1}{\lambda^4}$

★ Lens Formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

★ Power of a Lens, $P = \frac{1}{f}$

★ Magnification of lens = $\frac{v}{u} = \frac{h'}{h}$

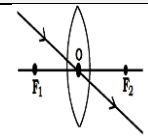
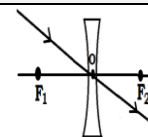
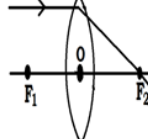
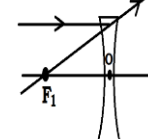
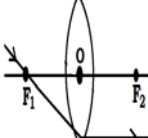
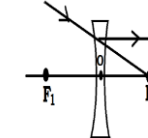
★ Lens makers formula, $\frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$

★ For Myopia, required concave lens, $f = \frac{xy}{x-y}$

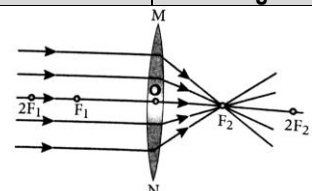
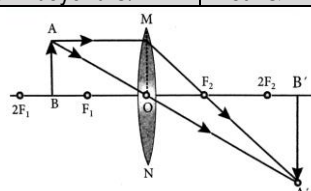
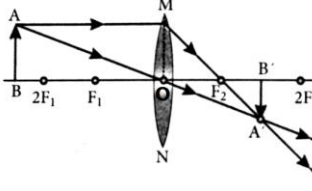
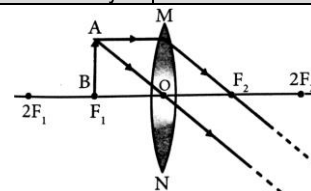
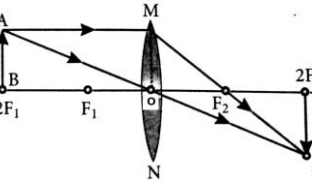
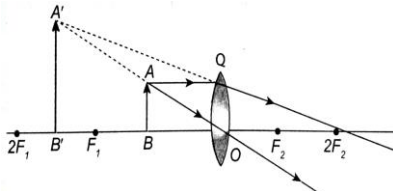
★ For Hypermetropia, required convex lens $f = \frac{dD}{d-D}$

★ 1 Dioptre = 1 m^{-1}

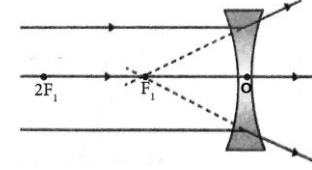
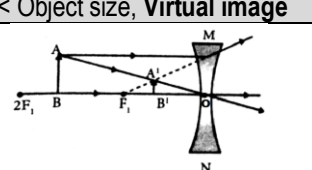
Rules for Images formed due to refraction through a convex & concave lens

		Convex lens	Concave lens
Rule - 1	When light strikes obliquely at optical centre, it continues to follow its path without any deviation.		
Rule - 2	When rays strike parallel to the principal axis, refracted rays are <i>converged to (convex lens) or diverged from (concave lens) principal axis.</i>		
Rule - 3	When ray passes through (convex lens) or directed towards (concave lens) the principal focus, refracted ray will be parallel to the principal axis.		

REFRACTION THROUGH A CONVEX LENS

<p>Object position : Infinity Image position : At F</p> <p>Image size \ll Object size, Real image</p> 	<p>Object position : between F & 2F Image position : beyond C/2F</p> <p>Image size $>$ Object size, Real & inverted image</p> 
<p>Object position : beyond C / 2F Image position : between F & 2F</p> <p>Image size $<$ Object size, Real & inverted image</p> 	<p>Object position : At F Image position : Infinity</p> <p>Image size \gg Object size, Real & inverted image</p> 
<p>Object position : At C / 2F Image position : At 2F</p> <p>Image size = Object size, Real & inverted image</p> 	<p>Object position : F & O Image position : At F</p> <p>Image size $>$ Object size, Virtual & Erect image</p> 

REFRACTION THROUGH A CONCAVE LENS

<p>Object position : Infinity Image position : At F</p> <p>Image size \ll Object size, Virtual image</p> 	<p>Object position : Any finite distance from the lens Image position : Between F & O</p> <p>Image size $<$ Object size, Virtual image</p> 
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Distance between the object & lens decreased, Distance between the image & lens decreases

Note: Here AB is the Object and A'B' is the Image