Light Reflection and Refraction

- **Light:** It is a form of energy which when reflected by objects falls on the eyes and enables us to see the objects. Light propagates as electromagnetic waves. It does not require a medium for its propagation.

- The speed of light in free space or vacuum is $3\times10^{8}\,ms^{-1}$.All colours of light travel with different speeds. The speed of light in a medium is less than that in vacuum.

- **Reflection:** The bouncing back of light rays incident on a surface in the opposite direction in the same medium is called reflection of light.

- **Reversibility of light:** If a ray of light is reversed, it always retraces its previous path. Object and image positions are interchangeable.

- **Refraction:** The bending of light rays when they pass from one optical medium to another is called refraction of light.

- **Refractive index:** The refractive index of a single medium is measured with respect to air or

$$vacuum._{air}\,\mu_{medium}=\frac{\sin i}{\sin r}$$

The refractive index of a medium $\mu_m =$

$$\frac{\text{velocity of light in vacuum or air}}{\text{velocity of light in medium}}=\frac{c}{c'}$$

- Different colours travel with different velocities in a medium. Velocity of light is maximum for red and minimum for violet in a medium.

- All colours travel with the same velocity in vacuum (air).

- The refractive index is minimum for red and maximum for violet.

- When a light ray passes from one medium into another, the frequency remains constant but the velocity and wavelength change.

- **Principal focus and focal length:** Light can pass through a lens from either directions. Therefore, a lens has two principal foci which are situated at equal distances from the optical centre, one on either side of the lens. These are called first focal point F_1 and the second focal point F_2.The focal length of a lens is the distance between the optical centre and principal focus of the lens.

- **Power of lens**
  The power of a lens is defined as the reciprocal of its focal length. The S.I. unit is diopter. The power of a converging lens is positive and that of a diverging lens is negative.

- **Magnification**
  The linear magnification is defined as the ratio of the size of the image to the size of the object.

$$\therefore \text{Magnification}(M)=\frac{v}{u}=\frac{\text{height of the object (I)}}{\text{height of the}\,object\,(O)}$$