Subject name : **Physics**

Semester : **Sem-II**

Name of the teacher : **Bidhan Chandra Jana**

Name of the topic : Geometrical optics (Laws of reflection and refraction at a plane surface, Fermat's Principle)

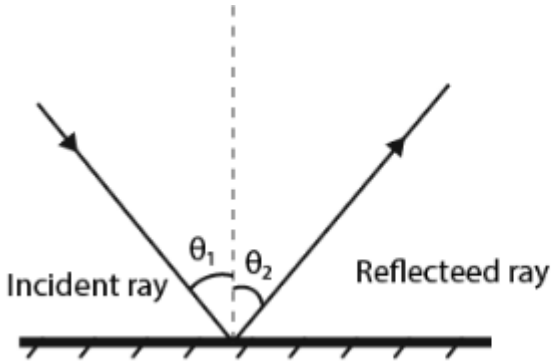
Laws of Reflection:

The process through which light rays falls on the surface and gets bounced back is known as reflection of light. Laws of reflection states that,

(i) The angle of the reflected ray is equal to the angle of the incident ray, with respect to the normal to the surface that is to a line perpendicular to the surface at the point of contact.

$$\text{Angle of incidence}(\theta_1) = \text{Angle of reflection}(\theta_2)$$

(ii) The incident ray, the reflected ray and the normal to the surface at the point of incidence all lie in the same plane.



θ_1 = angle of Incident ray

θ_2 = angle of Reflection

Laws of Refraction:

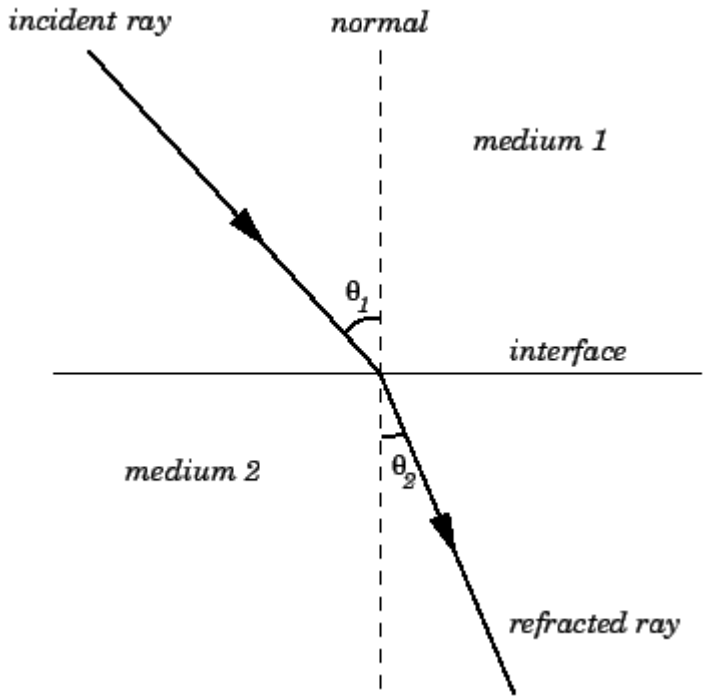
Refraction of light is a phenomenon wherein light bends and travels from one transparent substance to another where its speed is different.

Laws of refraction states that,

(i) The incident ray, refracted ray, and the normal to the interface of two media at the point of incidence all lie on the same plane.

(ii) The ratio of sine of angle of incidence to the sine of angle of refraction is a constant, for the light of a given colour and for the given pair of media. This is also known as Snell's law of refraction.
This constant is equal to the refractive index of second media with respect to first media.

$$\frac{sin\theta 1}{sin\theta 2} = constant(n)$$



Refractive index:

Consider a ray of light passing from medium 1 to medium 2 as shown in above figure.

v1= speed of light in medium 1

v2= speed of light in medium 2

The refractive index of medium 2 with respect to 1 can be written as below:

$$n = \frac{speed\ of\ light\ in\ medium\ 1}{speed\ of\ light\ in\ medium\ 2} = \frac{v1}{v2}$$

Fermat's Principle :

According to fermat's principle, a light ray, in going between two points through a number of reflection or refraction, must traverse as optical path length which is stationary with respect to variations of the path. In this formulation, the paths may be maxima or minima.