Refraction Formula

Light travels in a straight line,and we are aware of that.This is true on the condition that the light rays are traveling in the same medium, having the same density throughout. What occurs when light enters from one see-through medium to another? Does it still travel along a straight line path or changes its direction? A ray of light, traveling from the lower side of the stick passes from water into air and gets diverted (refracted) away from the normal (as it passes from a denser medium 'water'into rarer medium 'air'). Another ray of light gets refracted in another direction. The two refracted rays when produced backwards, appear to meet at a point nearer to the water surface than the original point. The above-formed image is termed as avirtual image.

Therefore, the immersed part of the stick gives the impression of being raised and bent, forms a virtual image. Thus, we see that when the light rays are made to go from one transparent medium to another transparent medium, the light rays alter their direction at the boundary separating the two media. In the above instance, when light rays traveling in water go into another medium, i.e. air, they alter their direction on entering the air. The bending of light when it passes obliquely from one transparent medium to another is termed as Refraction of light.

In other words, the alteration in the direction of light when it crosses through obliquely from one see-through medium to another is termed as refraction of light.

A transparent substance in which light travels is known as a medium. A medium in which light's speed is more is known as an optically rarer medium. Air is an optically rarer medium compared to glass and water. A medium in which light's speed is less is termed as an optically denser medium. An optically denser medium than water and air would be glass.Different media are believed to have different optical densities.The speed of light depends on the optical density of the medium. Bigger the difference in the speeds of light in the two mediums, larger will be the deviation in the track of light in the secondary medium. In other words, there will be a bigger refraction of light.

Laws of Refraction of Light

The refraction of light in travelling from one medium to another takes place according to two laws which are termed as the laws of refraction of light.

The First law of refraction: The normal, the incident ray, and refracted ray at the point of incidence, all lie in a similar plane.

The Second law of refraction: The second law of refraction provides a relationship amid the angle of refraction and the angle of incidence. This relationship was perceived experimentally by Willebrod Snell in 1621. Thus, the second law of refraction is termed as *Snell's law of refraction*.

Conferring to Snell's law of refraction of light, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for the light of a given color and for a given pair of media.

If i is the angle of incidence and r is the angle of refraction then according to Snell's law of refraction of light,

$$\frac{sin\ i}{sin\ r} = constant$$

This constant value is termed as the *refractive index* of the second medium with regards to the first.