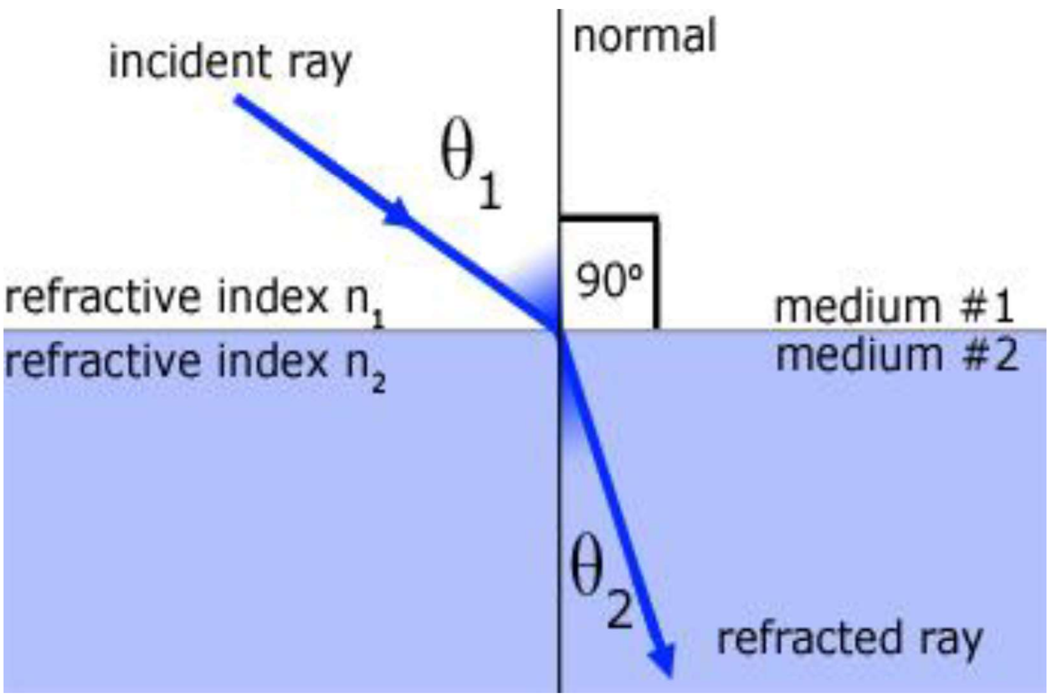
1-The Laws of Refraction

Consider a single light ray travelling through a low density material (eg air) and being refracted at the surface of a transparent material with higher density (eg glass).

The **normal** is a line drawn at right angles to the material's surface at the ray's point of entry.

The **angle of incidence** is the angle the light ray makes with the normal.

The **angle of refraction** is the angle the refracted light ray makes with the normal inside the material



1) The incident ray, the refracted ray and the normal at the point of entry are all in the same plane.

2) The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for a particular wavelength (Snell's Law). The ratio constant is called the relative refractive index 'n'

Refractive Index

The refractive index of a single medium can be defined as the ratio of the speed of light in a vacuum to the speed of light in the medium.
Here $\boldsymbol{n_m}$ is defined as the absolute refractive index

$$n_m = \frac{c_o}{c_m}$$

where,

$\boldsymbol{c_o}$ is the velocity of light in a vacuum
$\boldsymbol{c_m}$ is the velocity of light in the medium

let us consider our two materials(#1 & #2 from above).
Their absolute refractive indices are given by

$$n_1 = \frac{c_o}{c_1} \qquad n_2 = \frac{c_o}{c_2}$$

dividing the second equation by the first

$$\frac{n_2}{n_1} = \left(\frac{c_o}{c_2}\right)\left(\frac{c_1}{c_o}\right)$$

that is,

$$\frac{n_2}{n_1} = \left(\frac{c_1}{c_2}\right)$$

$$\frac{n_2}{n_1} = {}_1n_2$$

Snell's Law equation can now be rewritten as:

$$\frac{\sin\theta_1}{\sin\theta_2} = \frac{n_2}{n_1}$$

or

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

note: when a light ray travels from a less dense medium to a denser medium, it bends towards the normal(and vice versa).