What is Refraction?

- The bending of light as it passes obliquely (at an angle) from one medium to another.
- Occurs because of the change of speed of light in different mediums.
- The change in the light's speed causes a change in its wavelength. The frequency stays the same.
- Based on optical density
  - As optical density increases, the speed of light decreases

Index of Refraction

- Based on the speed of light in the medium.
- Ratio of the speed of light in a vacuum to the speed of light in a medium.
- Too hard to measure the speed, so we use the change in the angle as it passes between mediums.

$$n = \frac{c}{v} = \frac{\lambda}{\lambda_m} = \frac{\sin \theta_i}{\sin \theta_r}$$

Laws of Refraction

- 1st Law
  - All rays and normal line lie in the same geometric plane
- 2nd Law
  - The index of refraction in a homogeneous medium is constant
- 3rd Law
  - Lower to higher density => bends towards normal
  - Higher to lower density => bends away from normal

Snell's Law

- When light travels from one medium to another, the indices of refraction are related in the following equation

$$n_i \sin \theta_i = n_r \sin \theta_r$$

- The "i" side of the equation refers to where the light is coming from. The "r" side refers to where the light is going to.
- A table showing the index of refraction for different substances can be found in your book on page 710
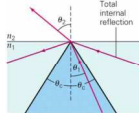
Total Internal Reflection

- Can only happen when light travels from a medium with a higher index of refraction to a medium with a lower index of refraction
- Occurs when light hits the boundary at an angle exceeding the critical angle.
- The light is reflected back into the medium.
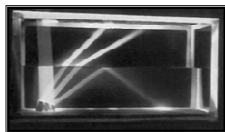
Critical Angle

- The critical angle can be found by using :

$$\sin \theta_c = \frac{n_r}{n_i} \quad \text{or} \quad \sin \theta_c = \frac{1}{n} \quad \text{for air}$$

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