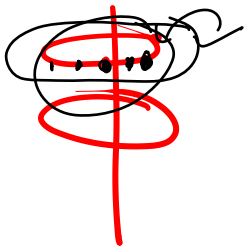


Huygen's Principle :

According to Huygen's Principle, each point of the wavefront is the source of secondary disturbance and the wavelets emanating from these points spread out in all directions with the speed of wave. The wavelets emanating from the wavefront are usually refered to as secondary wavelets.

Maxwell's Electromagnetic Theory :

↳ needs a medium to travels, sound wave

According to Maxwell, light is not a mechanical wave, It is a Electromagnetic wave, transverse in nature and travels with the speed of light.

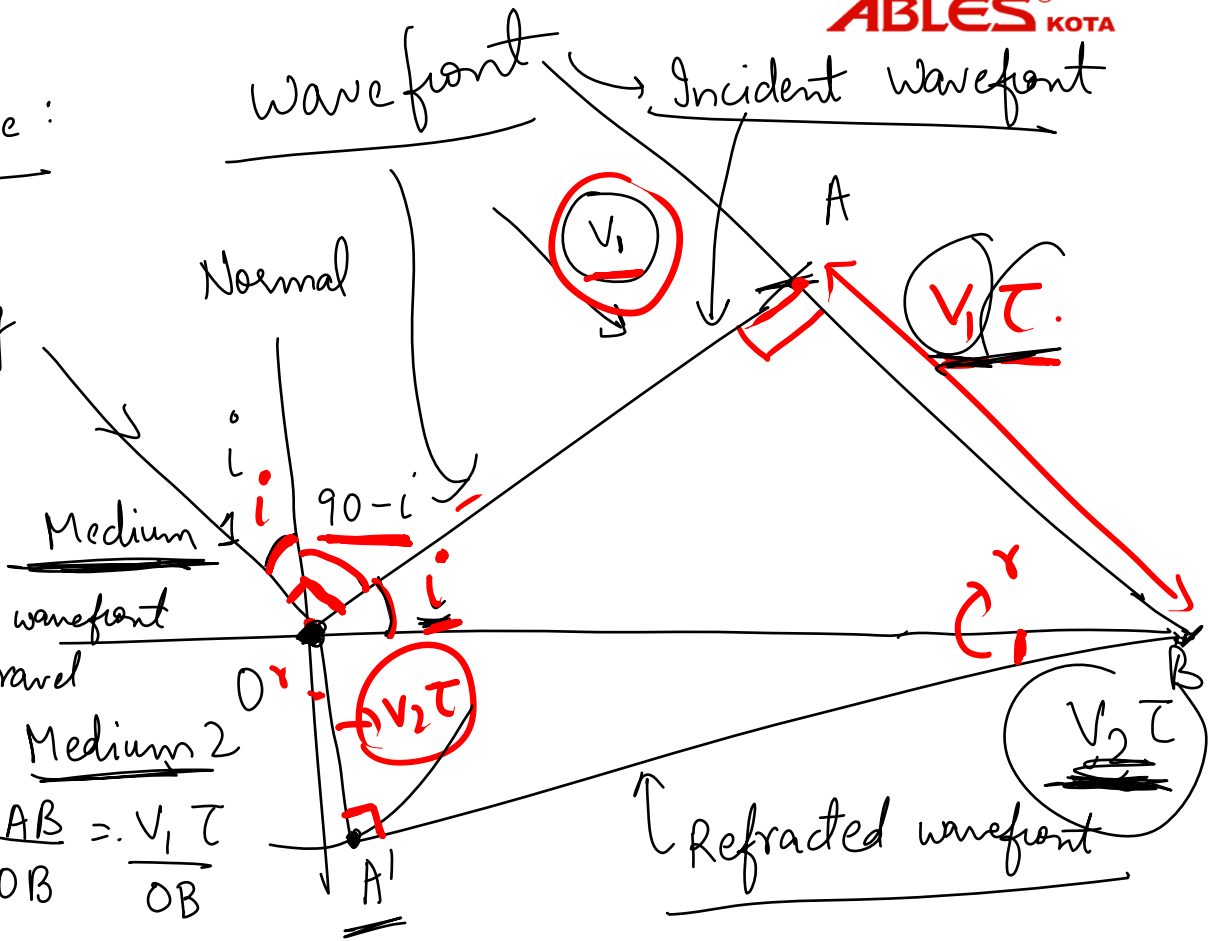
$$c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} = \frac{1}{\sqrt{4\pi \times 10^{-7} \times 8.85 \times 10^{-12}}} = 3 \times 10^8 \text{ m/s}.$$

μ_0 → Permeability

ε_0 → Permittivity of free space.

Refraction of Plane Wave:

Light wave is traveling from rarer medium to denser medium



by the wavefront

τ be the time taken to travel from A to B

$$\sin i = \frac{P}{1} = \frac{AB}{OB} = \frac{V_1\tau}{OB}$$

$$\sin i = \frac{v_1 t}{OB} \qquad \sin r = \frac{v_2 t}{OB}$$

$$\Rightarrow \frac{\sin i}{\sin r} = \frac{\frac{v_1 t}{OB}}{\frac{v_2 t}{OB}} = \frac{v_1}{v_2}$$

$$\frac{\sin i}{\sin r} = \frac{v_1}{v_2}$$

$$\frac{\sin i_1}{\sin r} = \frac{c/n_1}{c/n_2}$$

$$n_1 = \frac{c}{v_1}, \quad v_1 = c/n_1$$

$$n_2 = c/v_2, \quad v_2 = c/n_2$$

$$\Rightarrow \frac{\sin i}{\sin r} = \frac{n_2}{n_1}$$

$$\Rightarrow \boxed{n_1 \sin i = n_2 \sin r}.$$

Snell's law

Refraction at a rarer medium:

Light travels from denser to rarer medium.

$$\sin i = \frac{V_1 \tau}{OB}$$

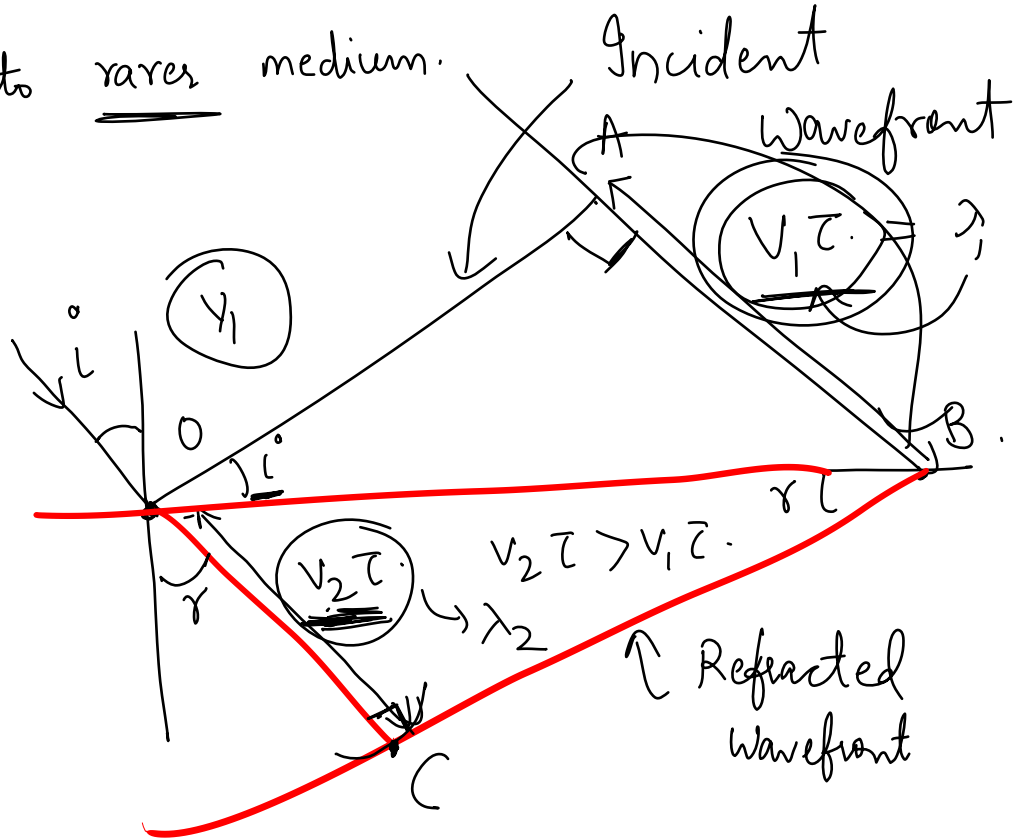
Medium 1

$$\sin r = \frac{V_2 \tau}{OB}$$

$$\frac{\sin i}{\sin r} = \frac{V_1}{V_2}$$

Medium 2

$V_2 > V_1$



$$\frac{\sin i}{\sin r} = \frac{V_1}{V_2}$$

$$n_1 = c/V_1$$

$$n_2 = c/V_2$$

$$\frac{\sin i}{\sin r} = \frac{c}{n_1 \times c} \times n_2$$

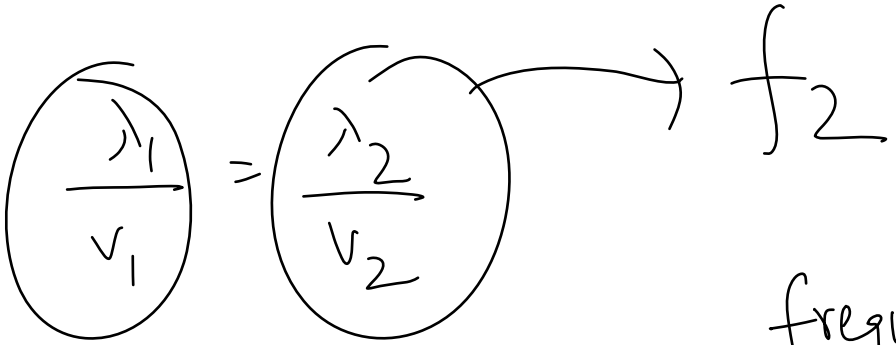
$$\Rightarrow n_1 \sin i = n_2 \sin r$$

$$\frac{\lambda_1}{\lambda_2} = \frac{v_1 t}{v_2 t} = \frac{AB}{OC}.$$

$$\Rightarrow \frac{\lambda_1}{\lambda_2} = \frac{v_1}{v_2}.$$

Wavelength, speed of propogation changes as the medium changes but the frequency remains the same.

$$v_1 > v_2 \Rightarrow \lambda_1 > \lambda_2.$$



frequency remains constant when medium changes.

$$f_1 = f_2.$$