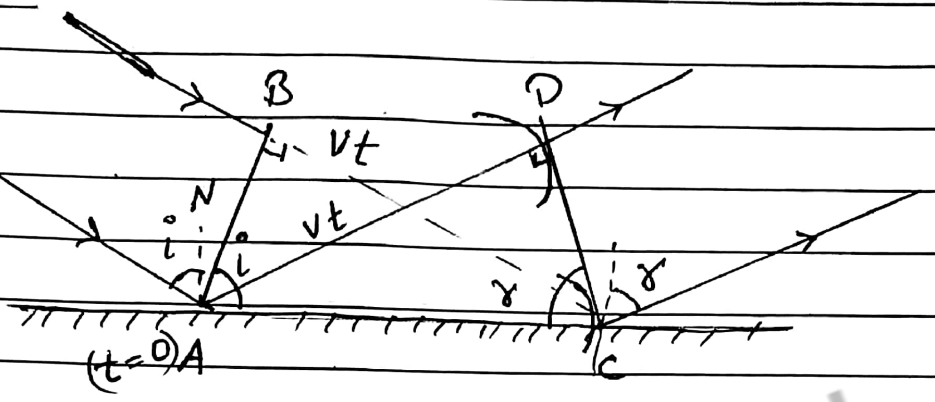
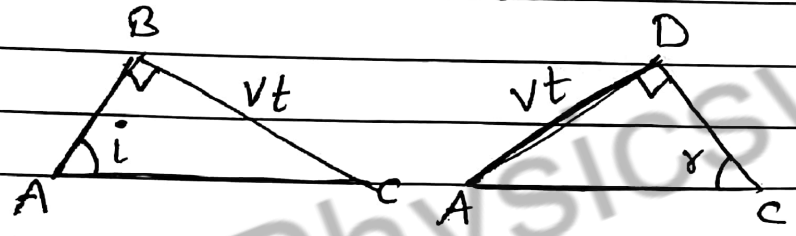
Wave Optics - 02

Proof of Laws of Reflection & Laws of Refraction using Huygens Principle.

Reflection:



$\Delta ABC \cong \Delta ADC$



Angles opposite to equal sides are equal

$\angle i = \angle \gamma$ I^st Law of Reflection

Incident wavefront (AB), Reflecting plane (AC) & Reflected wavefront (CD) are ⊥^r to plane of paper.

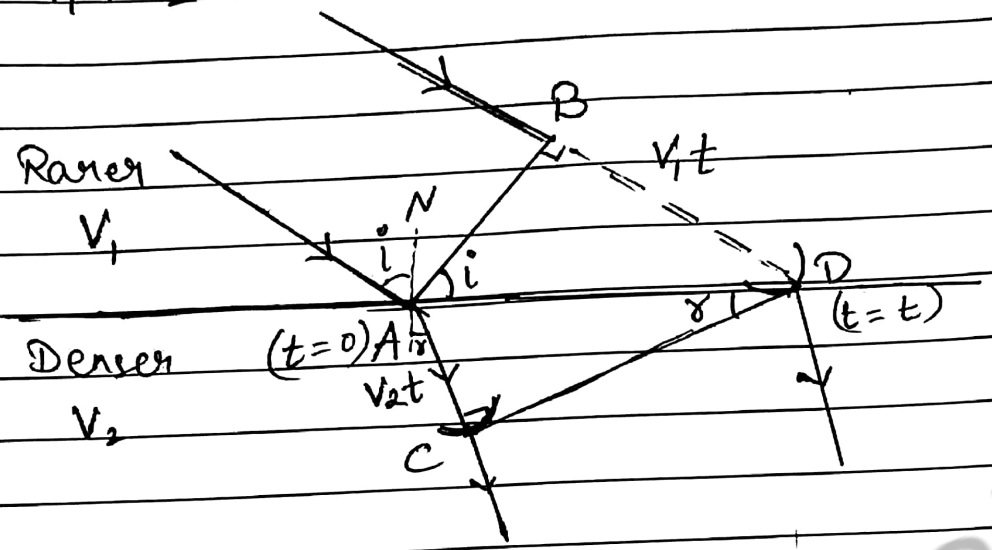
Incident ray is ⊥^r to AB
Normal is ⊥^r to AC
Reflected Ray is ⊥^r to CD

So Incident ray, Normal & Reflected ray lies in the (plane of paper) same plane.

II^nd Law of Reflection

Refraction:

$V_1 > V_2$



$\Delta ABD \quad \sin i = \frac{V_1 t}{AD}$ $\quad \Delta ACD \quad \sin \gamma = \frac{V_2 t}{AD}$

$$\frac{\sin i}{\sin \gamma} = \frac{V_1}{V_2} = \text{constant}$$

$$\frac{\sin i}{\sin \gamma} = \frac{\mu_2}{\mu_1} = {}_1\mu_2$$

Ist Law of Refraction (Snell's Law)

Incident wavefront (AB), Surface (AD) & Reflected wavefront (CD) are $\perp^r$ to plane of paper

Incident ray $\perp^r$ to AB
Normal $\perp^r$ to AD
Reflect ray $\perp^r$ to CD

IInd Law of Refraction $\Rightarrow$ Incident ray, Normal & Reflected ray lie in same plane (plane of paper)