# Theories of Light

Corpuscular Theory

Light is treated as a stream of minute particles called corpuscles ejected from luminous source of light in all direction.

Light can passes through a transparent medium. While passing through a transparent medium it feels a force of attraction, that's why its velocity increases and this phenomena is called refraction

Again, when corpuscles tries to enter a polarized plan, a force of repulsion is produced, and it reflects.
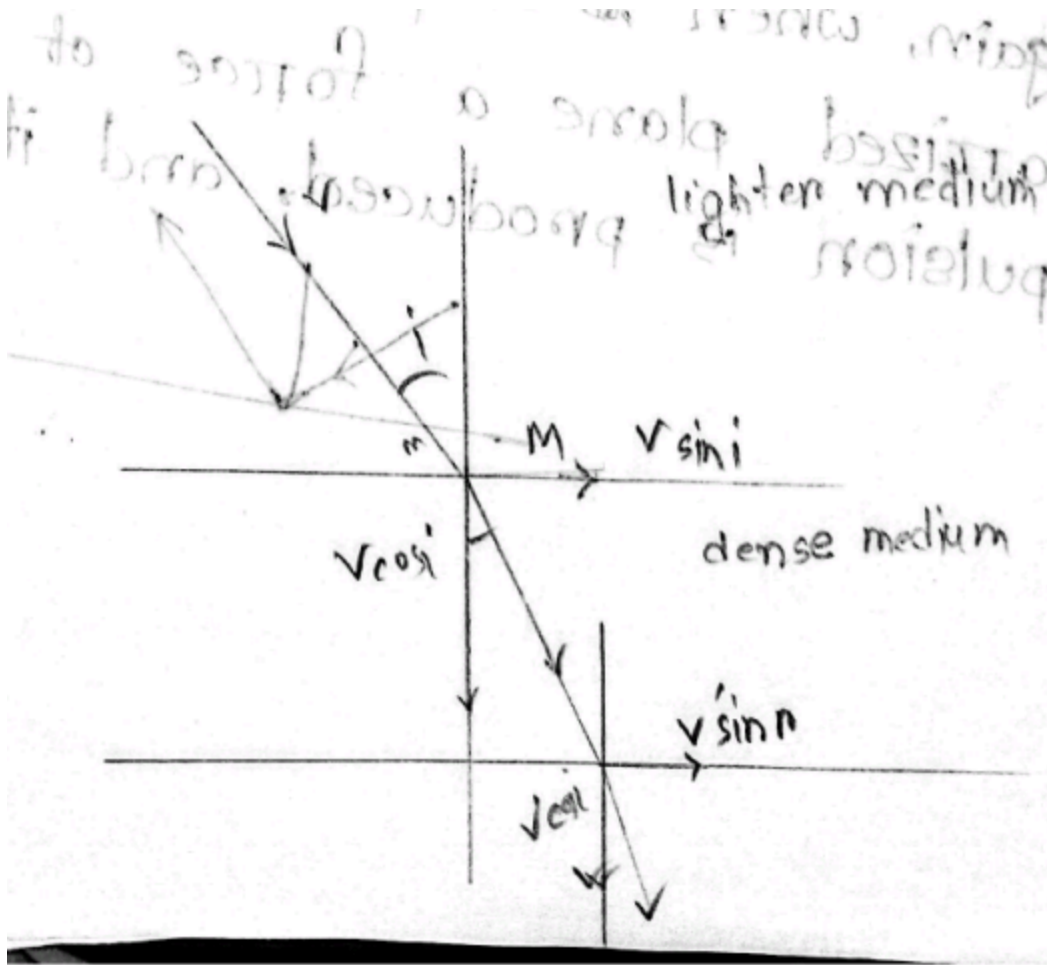
Reflection
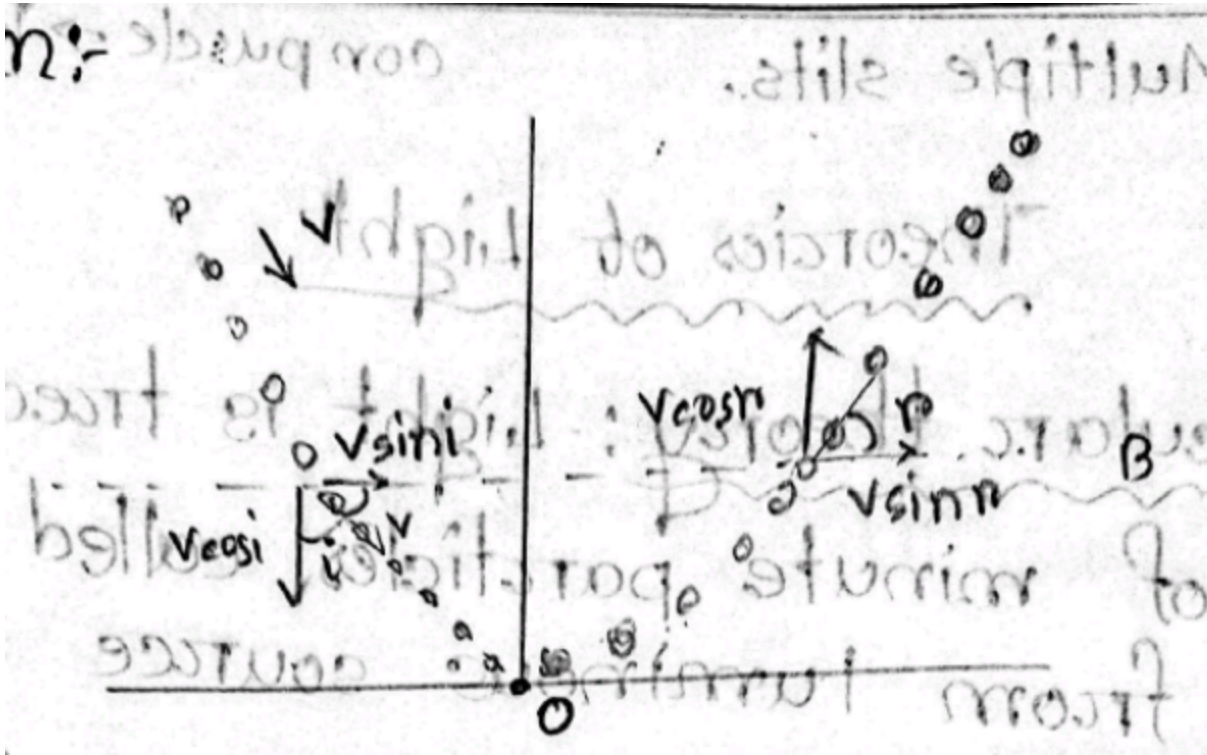
The more the light comes close to the surface, the more the $v \cos i$ decreases and at O point it become zero. Now the surface repulsion pushes back the particles in opposite direction.

$$v \sin r = v \sin i \Rightarrow i = r$$

Refraction

$$v \sin i = v \sin r$$

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

If $i > r$, then $v > v$, which conflicts with the Snell's law of refraction. This is a restriction of corpuscular theory

Wave Theory of Light

Light is a kind of disturbance that propagates through a hypothetical medium call ether according to Newton.

Transverse Wave: The wave moves in the direct perpendicular to the direction of the oscillation of the particles is called transverse wave

Huygens Principle
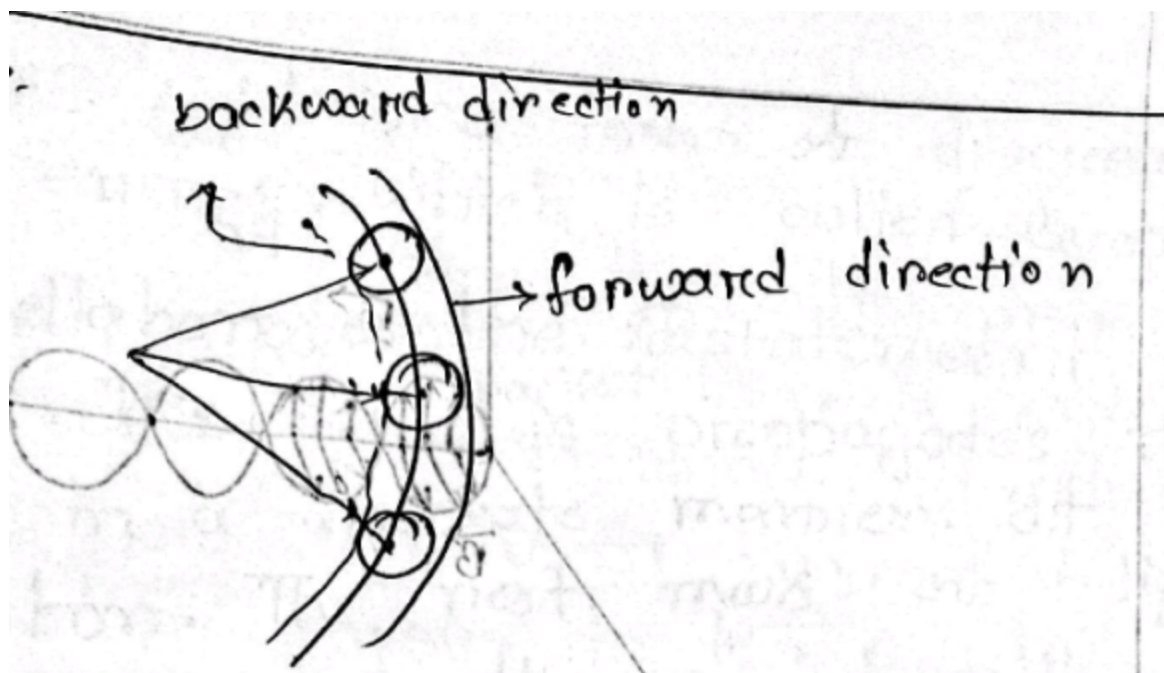
Every point on a primary wave front act as a secondary source of disturbance.
These secondary wave or wavelets spread out from each of these secondary source with the same speed as primary wave

The surface that touches the secondary wavelets at any point gives the new wave front.
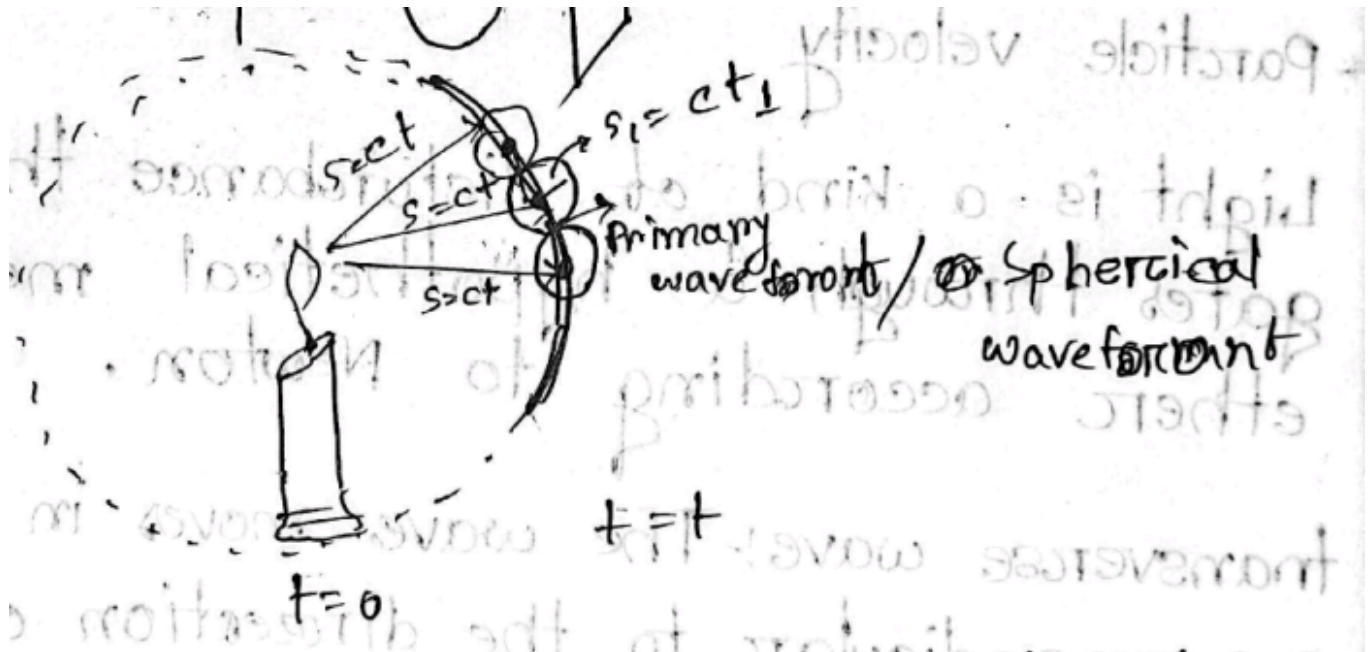
Limitations:

According to Huygens theory, there will be <mark>secondary wave front both in backward and forward direction</mark>. It was based on the existence of the medium ether. But Michaelson-Morley experiment shows that there is no existence of such medium
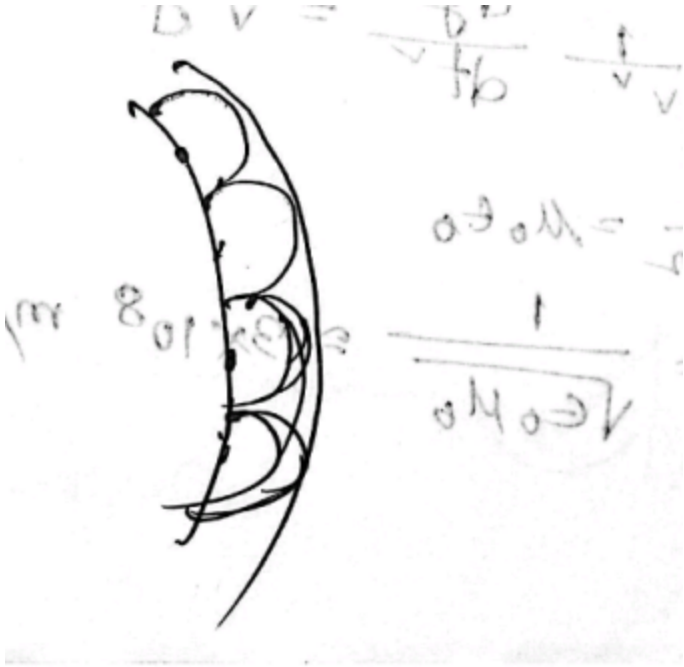
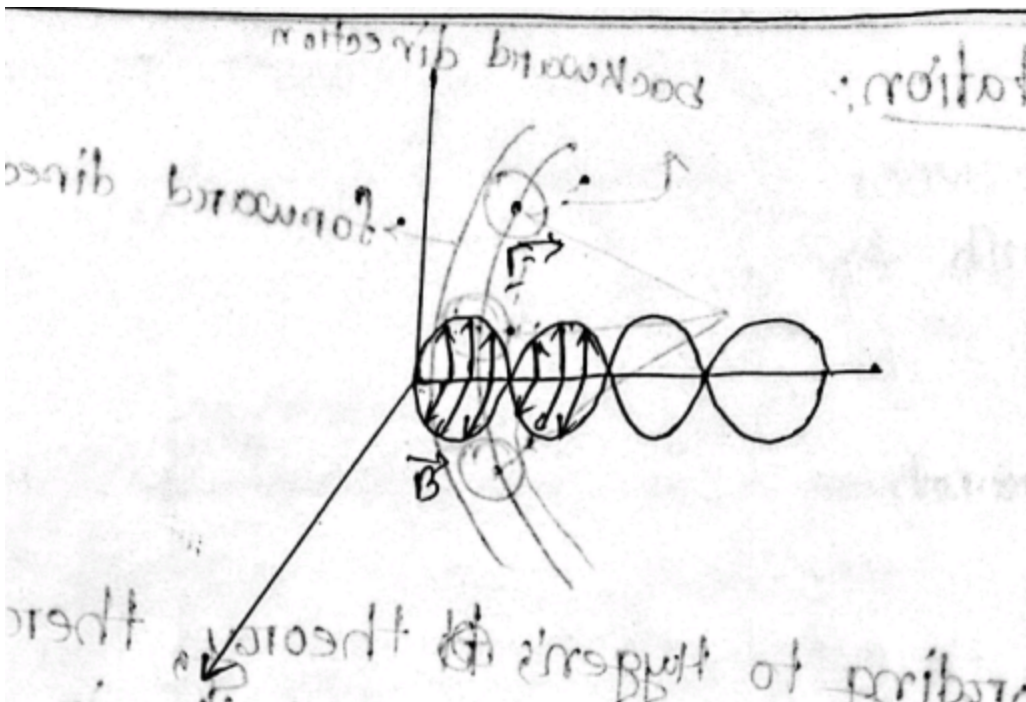**Solution comes with the theory of Stokes:**
The intensity $= 1 + \cos\theta$
For, forward direction, $I = 1 + \cos 0° = 2$
For, backward direction, $I = 1 + \cos 180° = 0$

So, there will be <mark>no backward secondary wave front</mark>.

Differential Equation of Wave Motion

$$\frac{d^2 y}{dt^2} = v^2 \frac{d^2 y}{dx^2}$$

From Maxwell's equation,

$$^2 E = {}_o\epsilon_o \frac{d^2 E}{dt^2}$$

$$^2 B = {}_o\epsilon_o \frac{d^2 B}{dt^2}$$

Now,

$$\frac{d^2y}{dt^2} = v^{2^2}y$$

$$\frac{1}{v^2}\frac{d^2y}{dt^2} = {}^2y$$

$$\therefore \frac{1}{v^2} = {}_o\epsilon_o$$

$$v = \frac{1}{\sqrt{\epsilon_{oo}}} \approx 3 \times 10^8 m/s$$

Max plank said light is a form of discrete packets of energy, which is called quanta. Einstein elaborates the statement of Max Plank, light packet propagates through the space in a discrete manner. It is called photon. The rest mass of photo is zero. So the speed will be infinity.