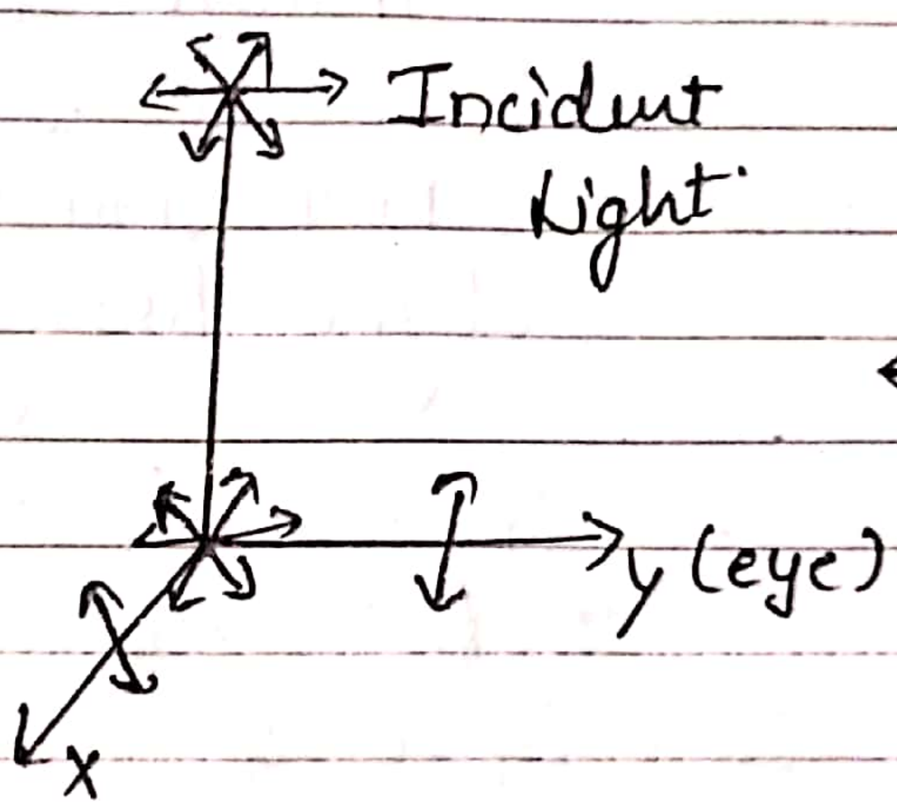
POLARIZATION BY SCATTERING.

When a beam of white light passes through a medium consisting of small particles of about same size as the wavelength of light, the light seen in the direction at right angle to incident beam appears bluish. This phenomenon is called *Scattering of light*.

Let us suppose that a beam of unpolarized light is incident on scatterer (particles responsible for scattering) along z-axis



← figure.

If we look along x-axis, then due to transverse nature of light, vibration must be lar to x-axis i.e ||el to y-axis. Similarly, If we look along y-axis, vibrations must be ||el to x-axis.

So, we find that light scattered in a direction lar to incident light is always plane polarized.

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Acc. to this law, intensity of polarized light transmitted from the analyzer varies as the square of the cosine of the angle between the plane of transmission of analyser and the polarizer.

#POLARIZATION By REFLECTION [PILE OF PLATE]

According to Brewster's law, When a beam of light is incident on the surface of a transparent medium, part of it is reflected and the rest refracted into the medium. When the angle of incidence is equal to polarizing angle for the medium, the reflected light is completely plane polarized having vibration perpendicul to the plane of incidence.

The transmitted light is not completly plane polarized containing both types of vibrations (in plane of the paper and tar to the paper). The intensity of the reflected light is very weak because it only consist 15% of vibrations perpendicular to the plane, remaining vibrations transmitted to the medium. So, to increase the intensity of plane polarized light, we should increas no. of reflection by placing thin parallel faced plates one on the top of the other. So with each reflection perpendicular vibrations filterout by reflection and transmitted light will left with plane polarized vibrations in plane of paper. Only 10 plates are found sufficient for this wBsR. Thus a pile of plates can be used to increase the intensity of reflected plane polarized light; shown in fig.

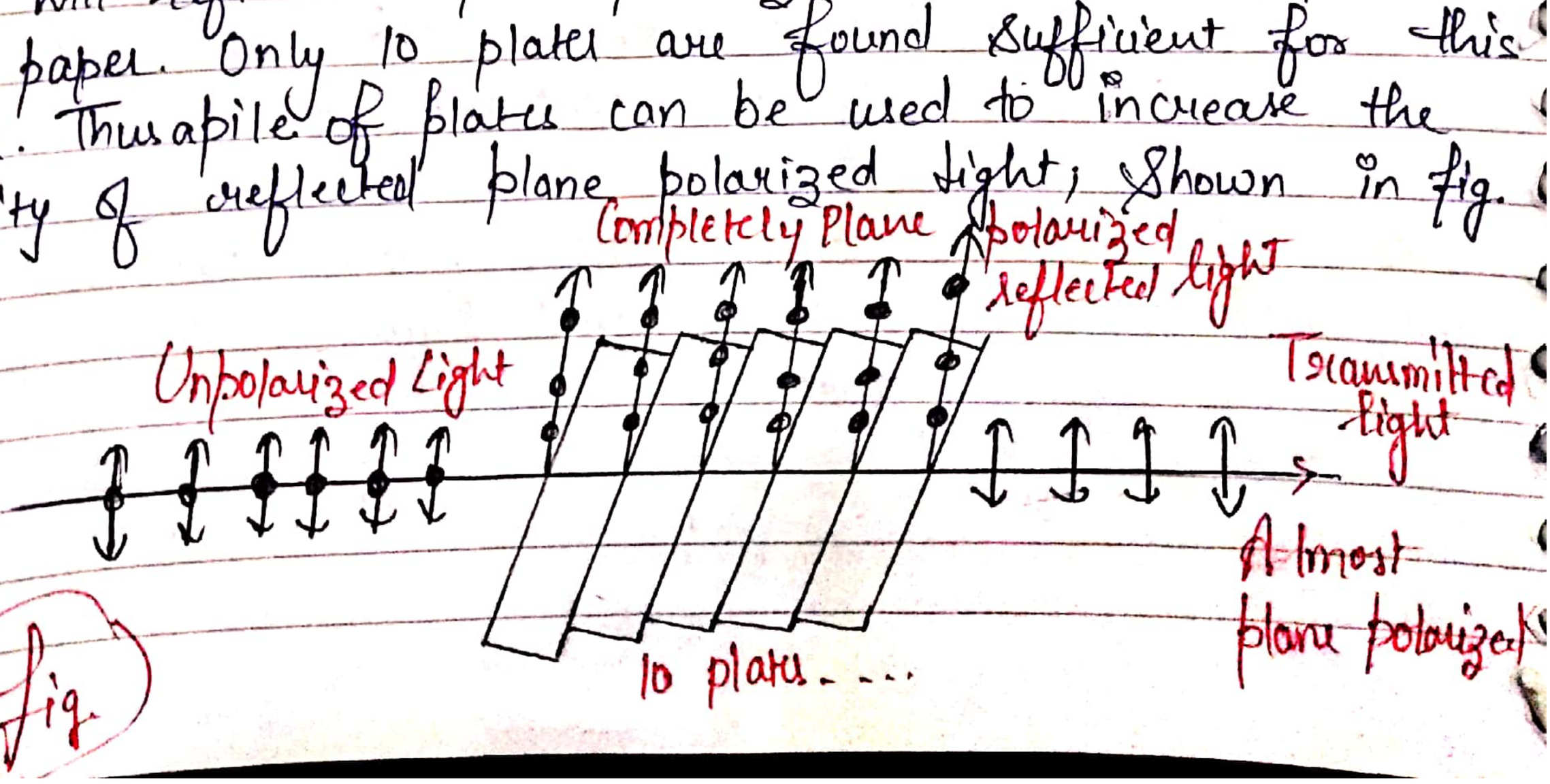


Fig.

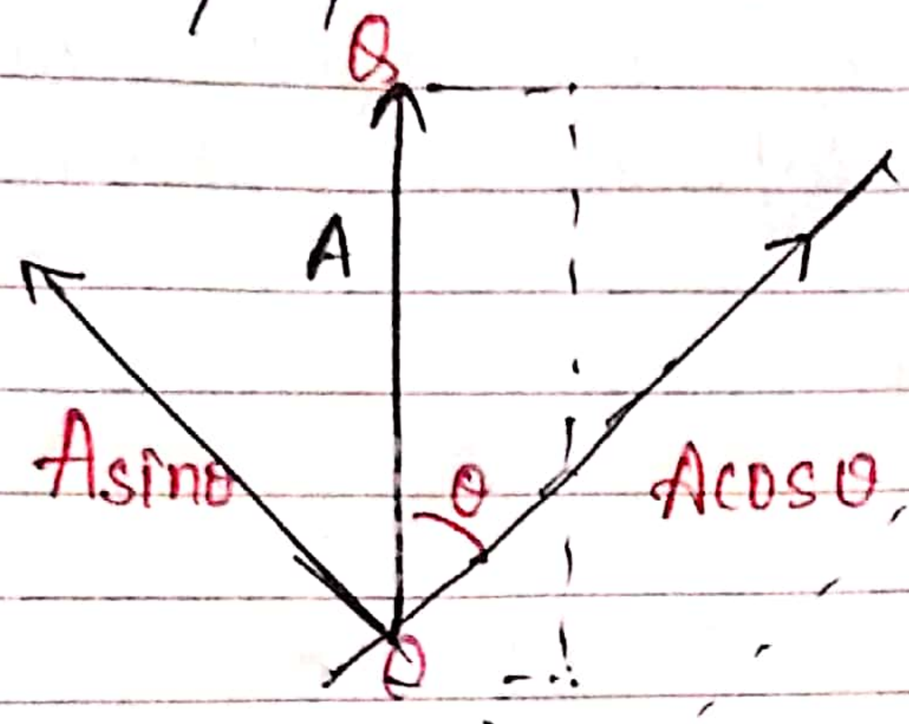
Let $OQ = A$ be the amplitude of vibrations transmitted by polarizer

θ = angle between plane of polarizer and analyzer

Resolve A into two component:

A cosθ parallel to plane of transmission of analyzer

A sinθ perpendicular to " " " " "



Only A cosθ is transmitted through the analyzer

Now, Intensity of transmitted light through the analyzer,

$$I \propto (A\cos\theta)^2$$

$$I = kA^2\cos^2\theta$$

$$\Rightarrow I = I_0\cos^2\theta \quad \text{where } I_0 = kA^2$$

$\Rightarrow$ When $\theta = 0^\circ \Rightarrow \boxed{I = I_0}$

When $\theta = 90^\circ \Rightarrow \boxed{I = 0}$

So, when ~~Polar~~ Plane of polarizer & analyzer are parallel, emitted light intensity is maximum while when both planes are Lar, intensity is zero.