

JEE MAIN

WAVE OPTICS - PART 2 FORMULAE

DIFFRACTION | POLARIZATION

Now that's how you REVISE

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List of Content on Eduniti YouTube Channel:

1. PYQs Video Solution Topic Wise:
 - (a) JEE Main 2018/2020/2021 Feb & March
2. Rank Booster Problems for JEE Main
3. Part Test Series for JEE Main
4. JEE Advanced Problem Solving Series
5. Short Concept Videos
6. Tips and Tricks Videos
7. JEE Advanced PYQs
8. Formulae Revision Series

.....and many more to come



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Eduniti for Physics

TOPICS COVERED

1. Diffraction
2. Intensity variation in Diffraction from Single Slit
3. Fringe Pattern, Angular Position of Minima
4. Diffraction by Circular Aperture
5. Polarization of Light
6. Malus Law
7. Methods of Polarization of Light by
 - a) Reflection of Light (Brewster's Law)
 - b) Double Refraction
 - c) Scattering
 - d) Dichroism
8. Nicol Prism

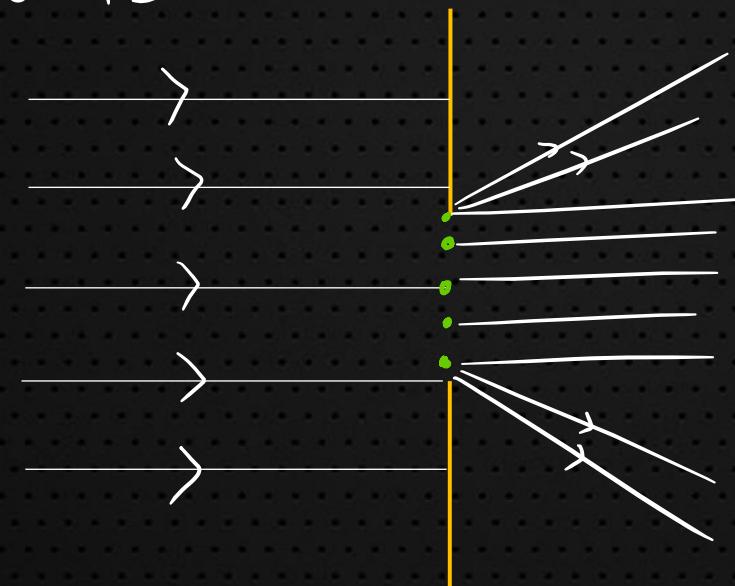


1. DIFFRACTION

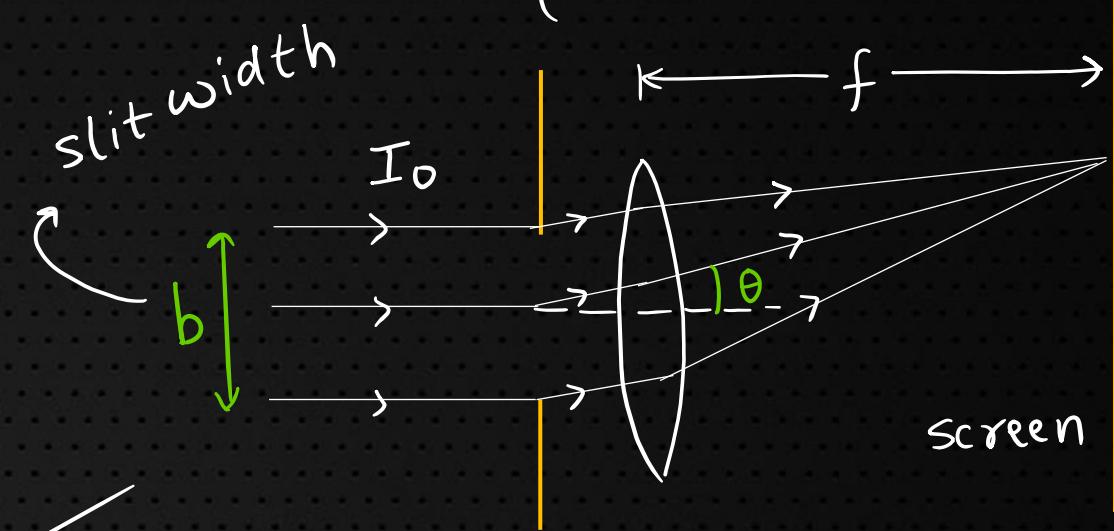
It is bending of Light around corners/edges.

If slit size is very Large, Diffraction effect is negligible.

But if small, effect is significant



2. INTENSITY IN DIFFRACTION (SINGLE SLIT)



$$I(\theta) = I_0 \frac{\sin^2 \beta}{\beta^2}, \quad \beta = \frac{\pi b \sin \theta}{\lambda}$$

MINIMA at $\beta = n\pi$

$$\therefore n\pi = \frac{\pi b \sin \theta}{\lambda}$$

$$\sin \theta = \frac{n\lambda}{b}$$

$$\theta = \frac{n\lambda}{b}$$

if θ is small.

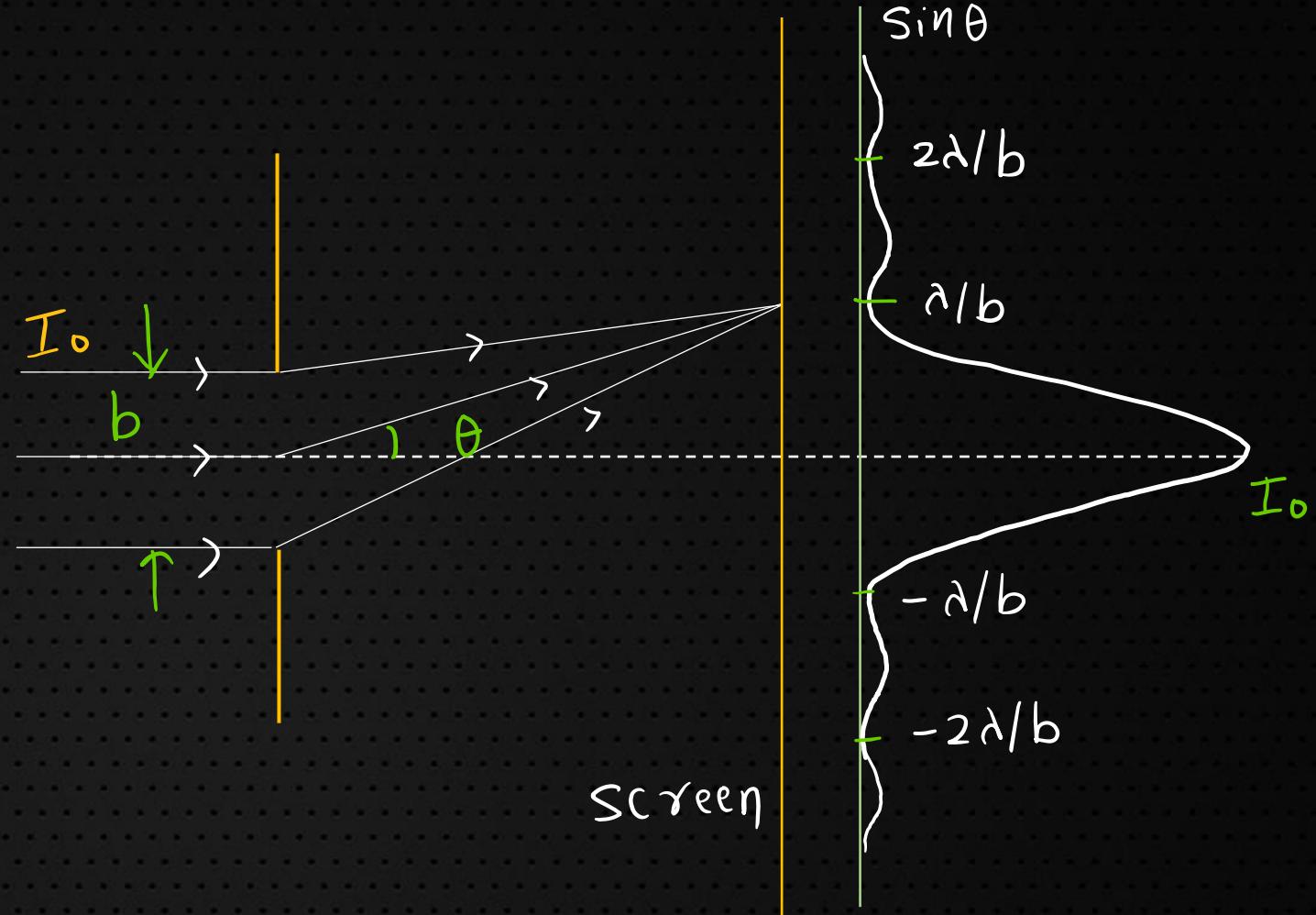


3. FRINGE PATTERN

(a) for $\theta = 0^\circ$, $I = I_0$

(b) n th MINIMA, $\sin \theta = \frac{n\lambda}{b}$ $n \neq 0$

(c) Unlike YDSE,
here both fringe width
and Intensity decreases as
you move away from central
Maxima.



$$I(\theta) = I_0 \frac{\sin^2 \beta}{\beta^2}, \quad \beta = \frac{\pi b \sin \theta}{\lambda}$$

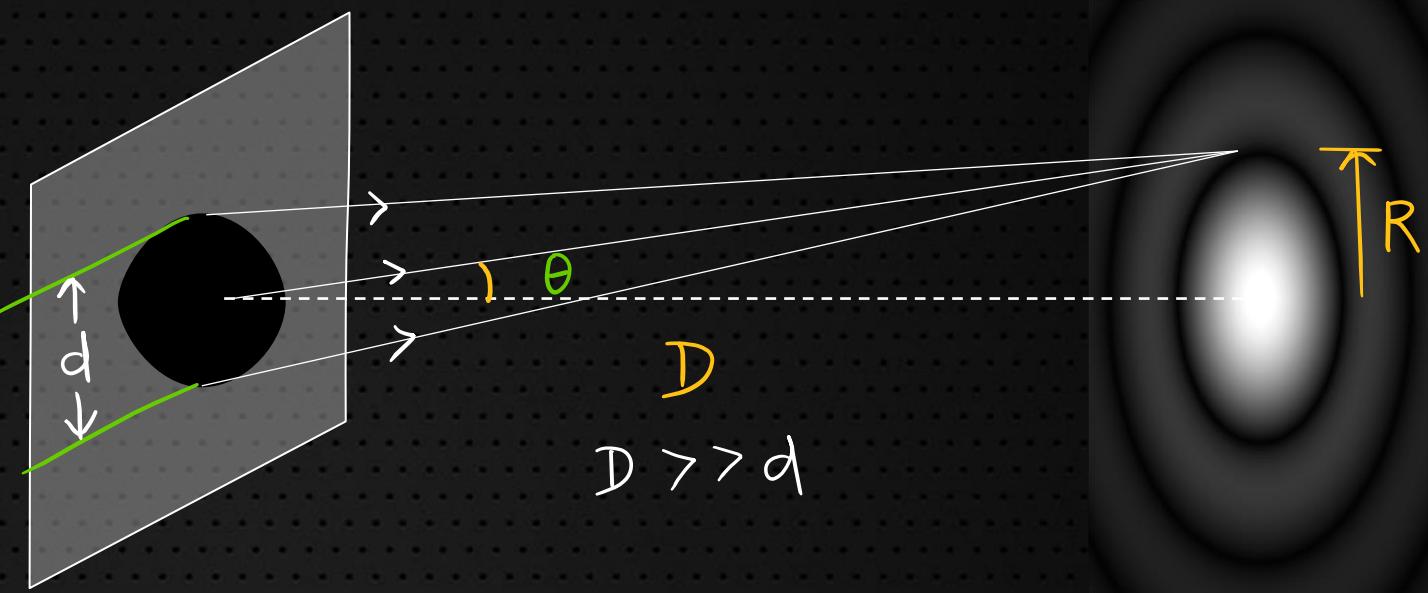


4. DIFFRACTION BY CIRCULAR APERTURE

First MINIMA ON SCREEN,

$$\theta = 1.22 \frac{d}{D}$$

(a) RADIUS of 1st Dark fringe
OR radius of central bright
fringe, $R = \theta D = 1.22 \frac{d D}{d}$



(b) If light is converged using
convex lens at the screen placed
at focal plane of Lens,

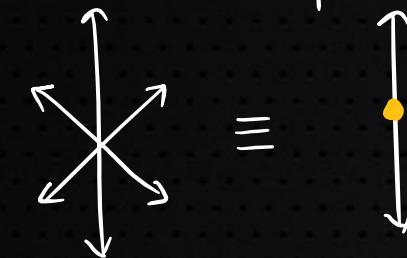
$$R = \theta f = 1.22 \frac{d f}{d}$$

Circular
fringes



5. POLARIZATION OF LIGHT

↳ Electric Field oscillating in one Plane.

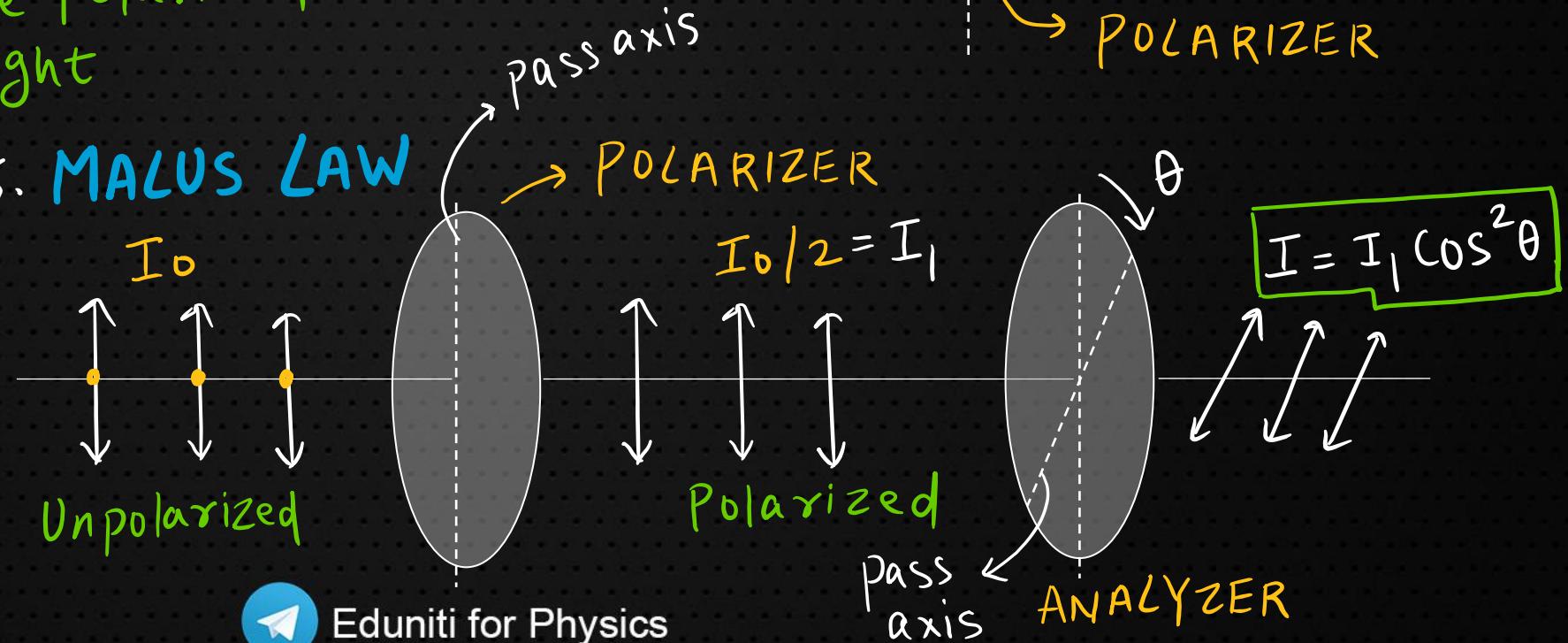


UNPOLARIZED LIGHT

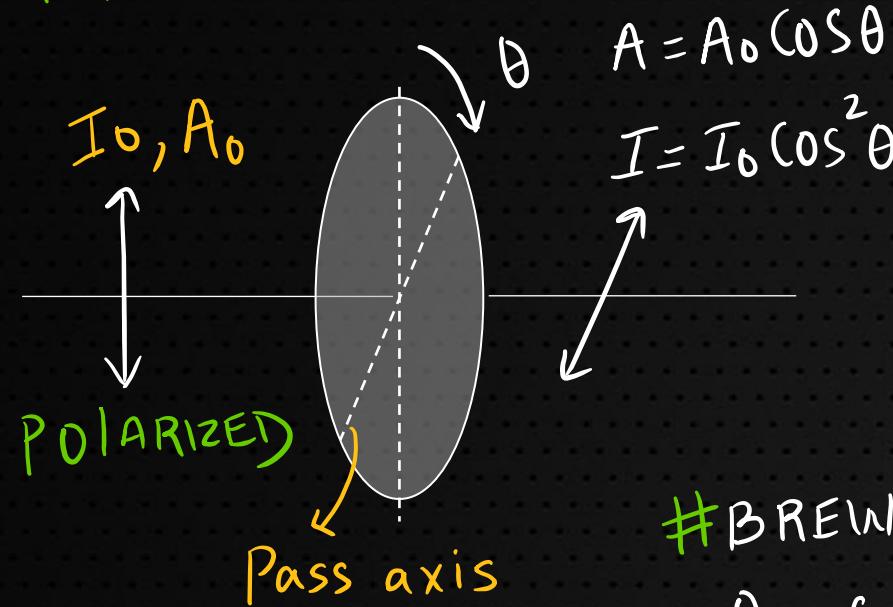


Plane Polarized Light

6. MALUS LAW

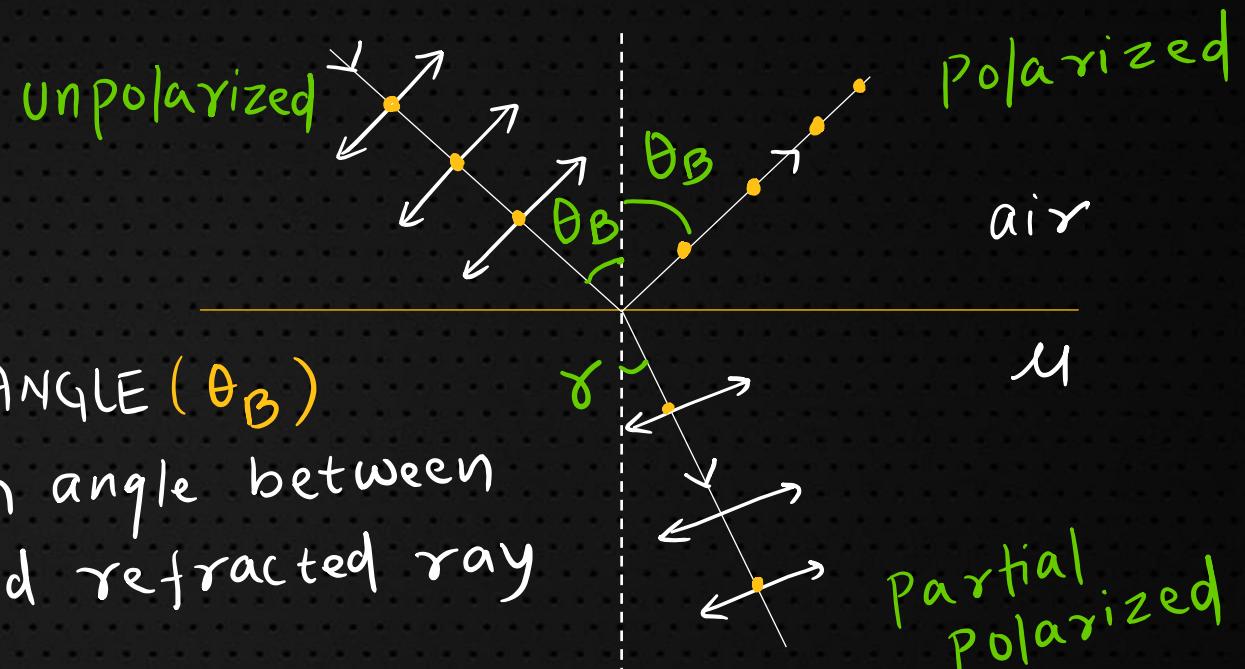


#Generalized



7. METHODS OF POLARIZATION OF LIGHT

(a) REFLECTION (BREWSTER'S LAW)

#BREWSTER'S ANGLE (θ_B)

θ_B for which angle between reflected and refracted ray is 90°

$$\therefore \gamma = 90 - \theta_B$$

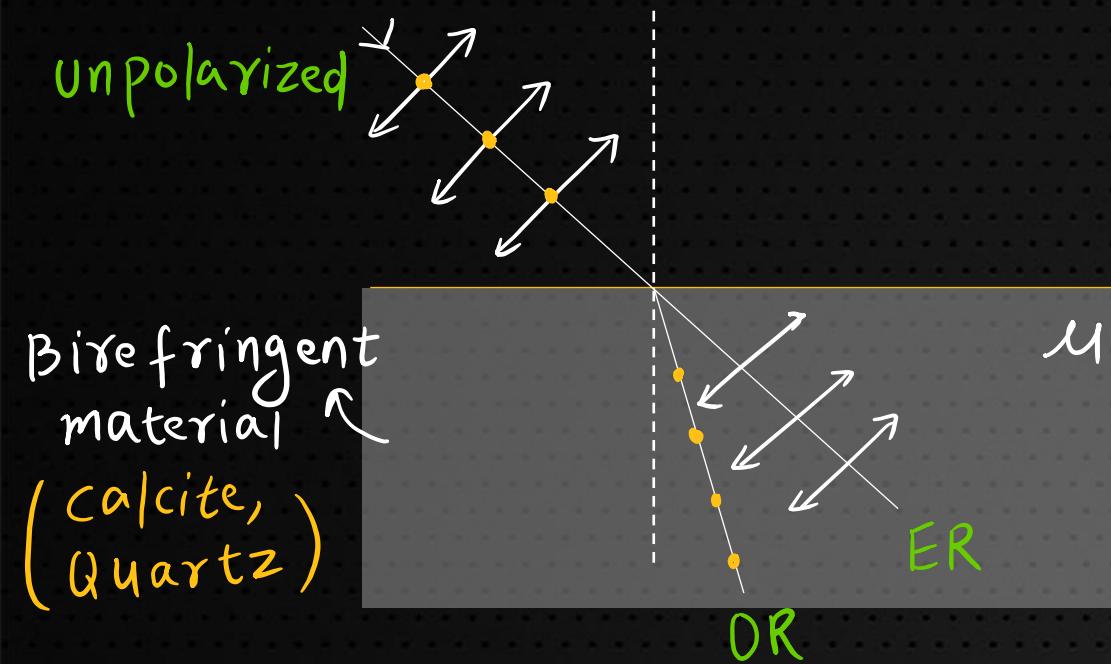
SNELL'S LAW : $\sin \theta_B = \mu \sin(90 - \theta_B)$

$$\Rightarrow \boxed{\theta_B = \tan^{-1} \mu}$$

Brewster's Law



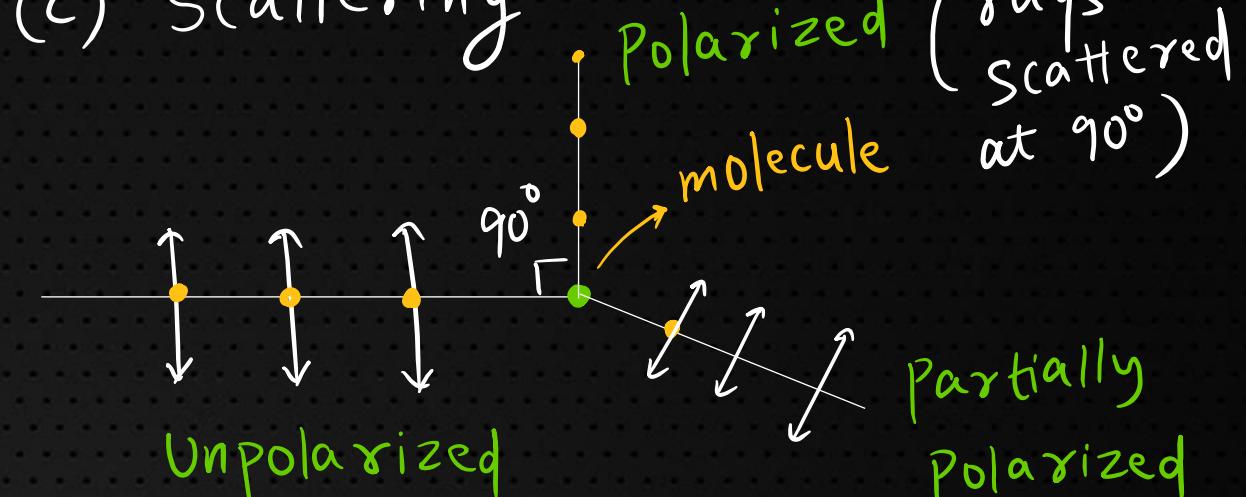
(b) Double Refraction



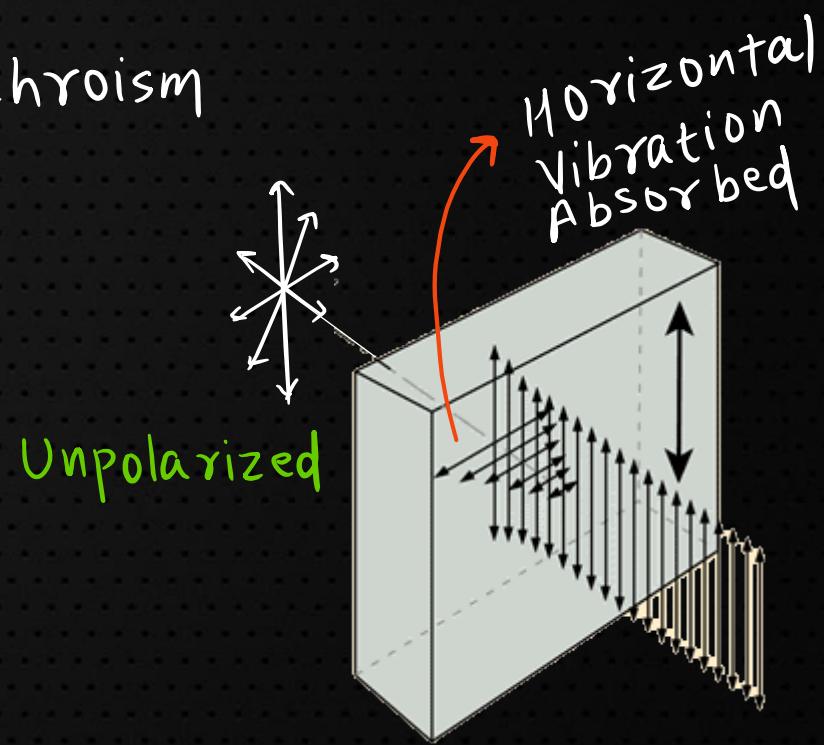
OR: Ordinary ray
(Polarized normal to plane)

ER: Extraordinary ray
(Polarized in plane)

(c) Scattering



(d) Dichroism



8. NICOL PRISM

↳ uses Double Refraction

