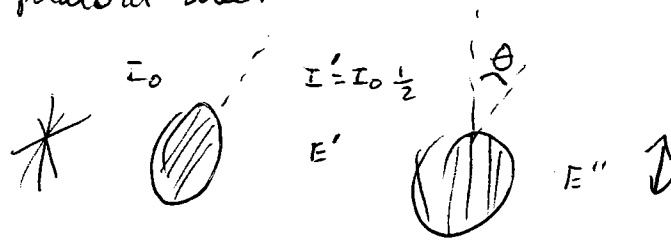


Suppose the light having passed thru the 1st polaroid film - Now passes thru a second film which has a transmission axis that makes an angle of θ w/ that of the 1st polaroid sheet



$$E' \uparrow \theta \downarrow E'$$

$$E'' = E' \cos \theta \quad \therefore I'' = I' \cos^2 \theta = I_0 \frac{1}{2} \cos^2 \theta$$

$$I \sim E^2$$

What is the magnitude of $|\vec{E}|, |\vec{B}|$ in light incident on Earth from the sun.

$$\text{Dist Earth-Sun} = 149 \times 10^6 \text{ km}$$

$$\text{TOTAL power output from Sun} = 3.9 \times 10^{26} \text{ watts}$$

$$\text{Intensity of light at Earth} = \frac{\text{Power}}{\text{m}^2}$$

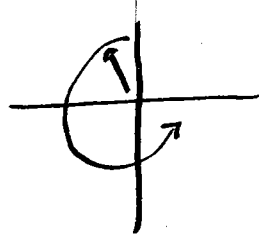
$$I = \frac{3.9 \times 10^{26} \text{ watts}}{4\pi (149 \times 10^9 \text{ m})^2} \quad \begin{matrix} \text{for } 1360 \text{ W/m}^2 \\ \text{surface} \\ \text{area of sphere} \\ \text{w/ R earth} \end{matrix}$$

$$I = \frac{1}{2} \frac{E_0 B_0}{\mu_0 c} = \frac{1}{2} \frac{E_0^2}{\mu_0}$$

Solve for E_0

$$B_0 = \frac{E_0}{c}$$

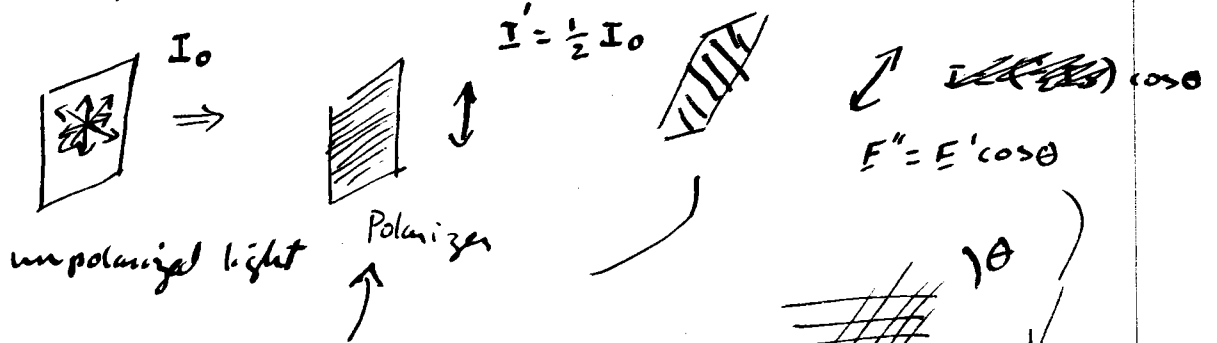
if $\Sigma = -\pi/2$ you'll see left circular polarization



if $E_{0x} \neq E_{0y}$ can get elliptical Polarization

Natural light is unpolarized

No coherence / correlation between emission of light from diff atoms



unpolarized light

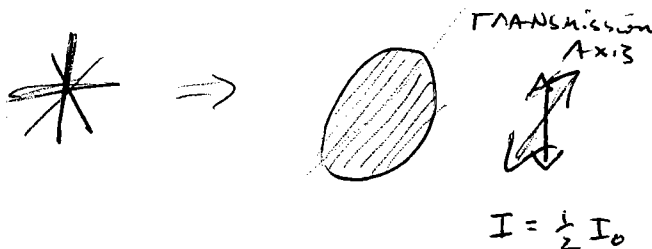
Polarizer

Many ways to polarize light

- Polaroid sheets
- dichroic crystals
- reflection

Do this on problem form

Suppose unpolarized light, intensity E_0 , passes thru a Polaroid film
What is the intensity?



on average $\frac{1}{2}$ the E -vectors
the incident light has an
 E vector along the
TRANSMISSION AXIS

More Properties of light - Geometrical optics

recall

$$c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$$

recall ϵ, μ are now different

Do same derivation ... but in materials find

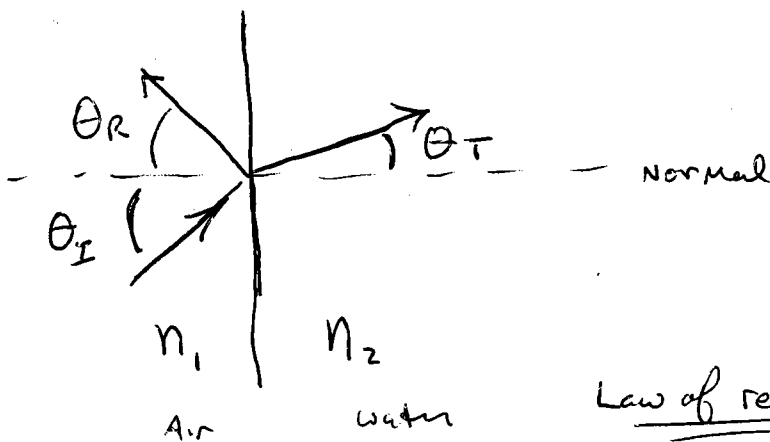
$$c = \frac{1}{\sqrt{\epsilon \mu}}$$

No longer c
But $v < c$

$$n = \frac{c}{v} \geq 1 \equiv \text{index of refraction}$$

\Rightarrow light moves slower in a medium than in vacuum
different media can have different n 's

\Rightarrow leads to interesting effects

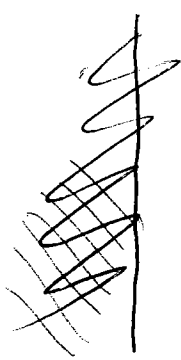


Law of reflection:

$$\theta_I = \theta_R$$

Law of refraction (Snell's law)

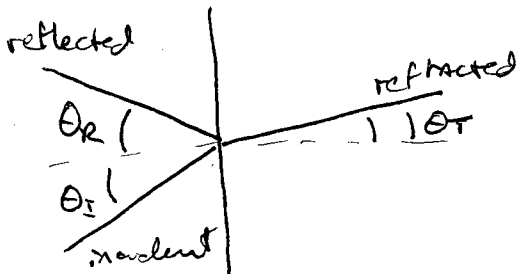
$$n_1 \sin \theta_I = n_2 \sin \theta_T$$



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National Brand

Geometrical Optics cont'd

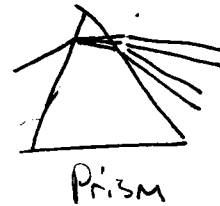


$\theta_I = \theta_R$ Law of Reflection

$n_1 \sin \theta_I = n_2 \sin \theta_T$

$n_1 = \frac{c}{v_1}$ $n_2 = \frac{c}{v_2}$

Dispersion: variation of n w/ v or λ

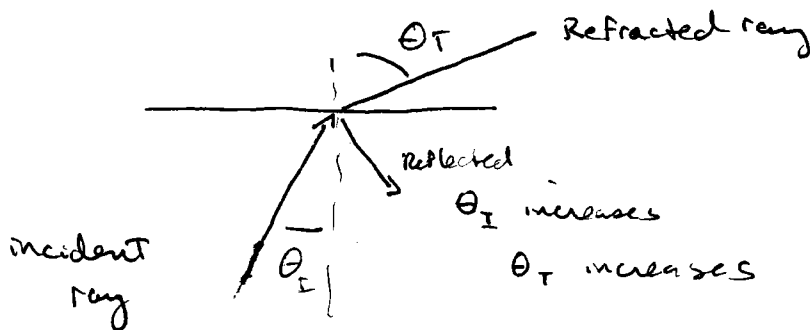


demo

low n to high n Air \rightarrow glass

Bend toward normal

High n to low n " away from normal
draws this



10-382 500 SHEETS, FULLER, 9 SQUARE
42-381 50 SHEETS, RELEASE, 9 SQUARE
42-382 200 SHEETS, RELEASE, 9 SQUARE
42-383 100 RECYCLED WHITE, 9 SQUARE
42-389 200 RECYCLED WHITE, 9 SQUARE
Made in U.S.A.

National Brand