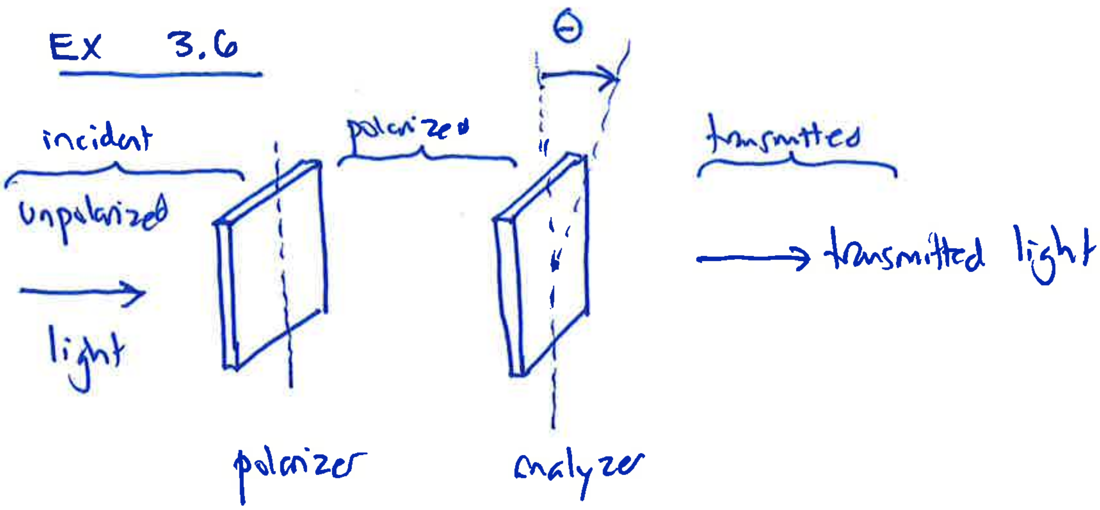
EX 3.6



- When $\theta = 0$, a maximum amount of transmission happens. As $\Theta \to 90$, a minimum of transmission happens.
- What is the intensity as $\Theta \to 60^\circ$?
- The incident light has intensity given by

$$S_{Inc.} = \frac{1}{2} \frac{1}{\mu_0 c} E_{Inc.}^2$$

$\llcorner$ amplitude of incident electric field

- The incident light is unpolarized, so it has both the vertical and horizontal components. All of the horizontal components are blocked by the polarizer, so only half of the electric field makes it through. Thus, the electric field magnitude in the region between the plates (the polarized light) has a magnitude $E_{pol} = \frac{1}{2} E_{Inc.}$

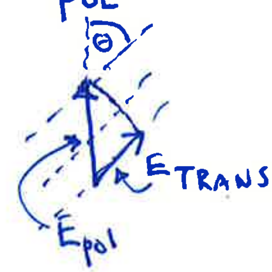
So $S_{pol} = \frac{1}{2} \mu_0 c \left(\frac{E_{inc}}{2}\right)^2 = \frac{1}{4} S_{inc.}$

- If $\theta = 0$, then all of the polarized light make it through and $E_{TRANS} = E_{POL}$

  so $$S_{TRANS} = S_{POL} = \frac{1}{4} S_{inc.}$$

- But if $\theta \neq 0$, then only the component of the polarized light's electric field along the direction θ makes it through the analyzer. This

  means $$E_{TRANS} = E_{POL} \cos\theta$$



Thus, $$S_{TRANS} = S_{POL} \cos^2\theta$$

$$S_{TRANS} = \frac{1}{4} \cos^2\theta \, S_{INC}$$

If $\cos\theta = \cos 60^\circ = \frac{1}{2}$

Then $$S_{TRANS} = \left(\frac{1}{4}\right)\left(\frac{1}{4}\right) S_{inc} = \boxed{\frac{1}{16} S_{inc}}$$