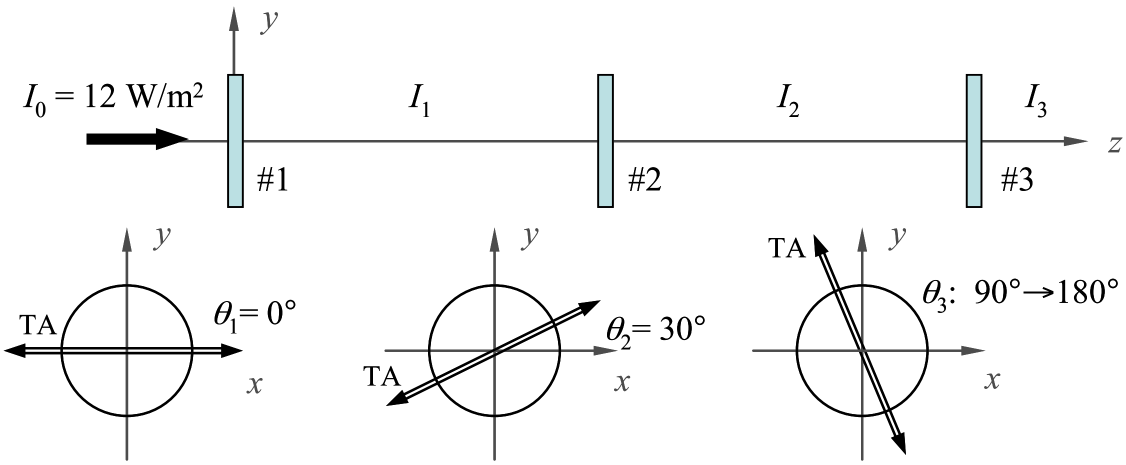
Name: ________________________ Sec. _______ **P212: Quiz 10A Week 13**

A beam of light of intensity $\boldsymbol{I_0 = 12\ \mathrm{W/m^2}}$ is incident in the $+z$ direction upon a set of three linear polarizers, each oriented perpendicular to the beam. The transmission axes (TA) of the first two polarizers make angles of $\theta_1 = 0°$ and $\theta_2 = 30°$ with respect to the x axis (see figure). The angle θ_3 of polarizer #3 can be varied from 90° to 180°.



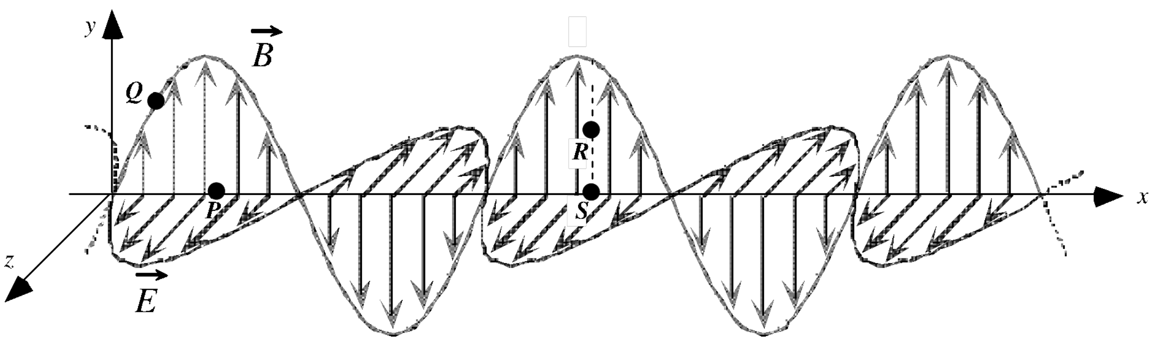
1. Calculate the intensity I_1 of the light after the first polarizer if the incident beam I_0 is linearly polarized at an angle $\theta = 25^\circ$ to the x-axis. **[5]**

2. The incident beam is now linearly polarized along the x-axis. Consider polarizer #3: are there any angles θ_3 between 90° and 180° for which the final intensity I_3 will be zero? If so, what are they? (There may be only one, of course, or none.) **[5]**

3. The incident beam is again linearly polarized along the x-axis. At what angle θ_3 between 90° and 180° will the final intensity I_3 be maximized? Determine both the angle and the maximum intensity. **[5]**

Shown below are mathematical and pictorial representations of an electromagnetic plane wave propagating through empty space. The electric field is parallel to the z-axis.

$$\vec{E}(x, y, z, t) = E_o \sin(kx + \omega t)\,\hat{z}$$



4. If $E_o = 125$ V/m, what is the average intensity of the plane wave? **[5]**