Physics II

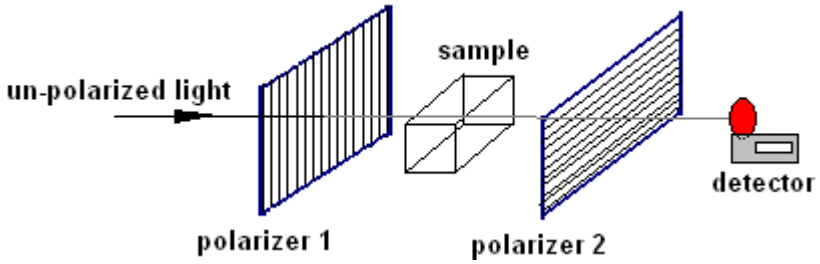
Malus's Law

Polarizer equations:

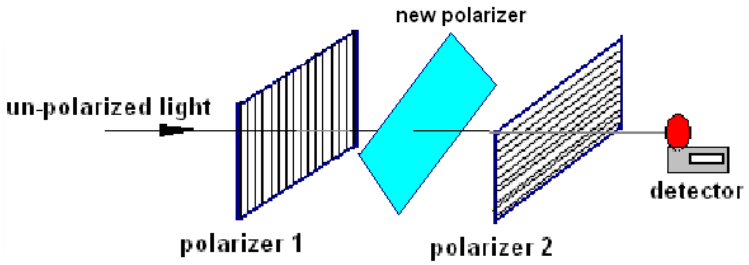
i) The intensity of unpolarized light drops one half when passing through a polarizer

ii) The intensity of polarized light drops a factor of $\cos^2\theta$ when passing through a polarizer at an angle θ

Problem 1.- Two polarized films are rotated with respect to each other by 90º, so no light goes through them.
Then a sample of a crystal is put between the two films. The sample rotates the axis of polarization by 3º, without any loss of intensity. Find the fraction of the original intensity that is detected with the sample in place.



Problem 1a.- Two polarized films are rotated with respect to each other by 90 degrees, so no light goes through them.
Then a third polarizer is put in between the other two, so now a detector finds that 0.15% of the initial unpolarized light intensity goes through the three polarizers.
Find the angle of rotation between the first polarizer and the new one that was inserted. [Note: there will be two solutions]



Problem 2.- Two polarizers reduce the intensity of incident unpolarized light to only 10%. Calculate the angle between the two polarizers.

Problem 3.- Find how much intensity of a beam of un-polarized light will go through two polarizers that are rotated 60º with respect to each other.
Give your answer in percentage.

Problem 3a.- Find how much intensity of a beam of un-polarized light will go through two polarizers that are rotated 45º with respect to each other.

Problem 4.- Find how much intensity of a beam of un-polarized light will go through three polarizers, where the first and second are rotated θ_1=37º with respect to each other and the second and third are rotated θ_2=30º with respect to each other.