

Physics 422 - Spring 2015 - Assignment #7
Due Friday, April 17th

1. Natural light is shining upon the surface of water ($n = 1.33$).
 - (a) Calculate the relative intensity of reflected light at normal incidence.
 - (b) Calculate Brewster's angle, θ_p .
 - (c) Calculate the relative intensity of reflected light when natural light shines on the water with an angle of incidence of θ_p .

2. (*Hecht, 8.48*) The specific rotary power for sucrose dissolved in water at 20°C ($\lambda_0 = 589.3\text{ nm}$) is $+66.45^\circ$ per 10 cm of path traversed through a solution containing 1 g of active substance (sugar) per cm^{-3} of solution. Vertically polarized light enters one end of a 1 m tube containing 1000 cm^{-3} of solution, of which 10 g is sucrose. What will be the orientation of the polarization axis of the emerging light?

3. (*Hecht, 8.70*) An optical filter can be described by a Jones matrix

$$\begin{bmatrix} \cos^2 \alpha & \cos \alpha \sin \alpha \\ \cos \alpha \sin \alpha & \sin^2 \alpha \end{bmatrix}$$

- (a) Obtain the form of the emerging beam when the incident light is plane polarized at angle θ to the horizontal.
- (b) Deduce from the result of part (a) the nature of the filter. plane polarized at angle θ to the horizontal.
- (c) Confirm your deduction above with at least one other test.