15.15: The rotation of pol. light in an optically active medium is proportional to the inverse of the square of the wavelength:

$$\underbrace{\beta = \rho L d}\ \propto \frac{1}{\lambda^2}$$

Eq (15.4) for light path L through a solution of d grams of active solute per cm^3, ρ is the specific rotation of the material (degree/dm · cm^3/g)

15.23: The fraction r of the incident field that is reflected from a dielectric plane surface for the TE polarization mode is given by Eq. (23.27):

$$r_{TE} = \frac{E_r}{E} = \frac{\cos\theta - \sqrt{n^2 - \sin^2\theta}}{\cos\theta + \sqrt{n^2 - \sin^2\theta}}$$

θ: angle of incidence, $n = \frac{n_2}{n_1}$.

Reflectance $R = r^2$

(a) Polarizing angle (Brewster's angle): $\theta_p = \tan^{-1}\left(\frac{n_2}{n_1}\right)$ (15.2)

$\Rightarrow$ Reflectance for TE mode when light is incident from air to glass ($n = 1.50$) at θ_p is $R = 0.1479$ $\rightarrow$ 14.8% reflected.

(b) R is valid for an internal reflection as light leaves the glass going into air. Calculate the net fraction of the TE mode transmitted through 10 plates relative to the incident irradiance I_0.

For TE mode: $(I_0/2)$: 14.8% reflected $\rightarrow$ 85.2% transmitted at each surface.

TM mode $(I_0/2)$: 100% transmitted

For N plates, there are 2N interfaces:

$\Rightarrow$ % TE transmitted $= (0.852)^{2N}\, I_0/2 = 0.0203\, I_0$.

(c) Degree of polarization of the transmitted beam:

$$P = \frac{I_{TM} - I_{TE}}{I_{TM} + I_{TE}} = \frac{I_0(0.5 - 0.0203)}{I_0(0.5 + 0.0203)} = 0.922$$