p694 53-59 all

(53) $I = I_0 \cos^2\theta$

$$\frac{I}{I_0} = \cos^2(65^\circ) = 0.1786$$

but half the intensity goes through the first polarizer

so $(0.1786)(.5) = \underline{0.089}$

(54) $n = \tan\phi$

$\phi = \tan^{-1}(n) = \tan^{-1}(1.52) = \underline{56.7^\circ}$

(55) $\frac{n_2}{n_1} = \tan\phi$

$$\phi = \tan^{-1}\left(\frac{n_2}{n_1}\right) = \tan^{-1}\left(\frac{2.42}{1.33}\right) = \underline{61.2^\circ}$$

(56) $I = I_0 \cos^2\theta$

$\cos^2\theta = .5$

$\theta = \cos^{-1}(\sqrt{.5}) = \underline{45^\circ}$

(57) (a) first polarizer reduces by $\frac{1}{2}$

$\therefore$ second polarizer $\frac{1}{3} = x\,\frac{1}{2}$

$x = \frac{2}{3}$

$I = I_1 \cos^2\theta$

$\cos^2\theta = \frac{I}{I_1} = \frac{2}{3}$

$\theta = \underline{35^\circ}$

57 (b) 1^{st} polarizer $= .5 I_0$

2^{nd} $\frac{1}{10} = x \cdot .5$

$x = .2$

$I = I_1 \cos^2\theta$

$\cos^2\theta = .2$

$\theta = \underline{63^\circ}$

(58) 2nd Polarizer

$I_2 = I_1 \cos^2\theta$

$\frac{I_2}{I_1} = \cos^2(40^\circ) = 0.587$

but the total is .15

so $x(0.587) = .15$

$x = .256$ for 1^{st} polarizer

$I_1 = I_0 \cos^2\theta$

$\cos^2\theta = .256$

$\theta = \underline{60^\circ}$

(59) 1^{st} polarizer $\quad I_1 = I_0 \cos^2\theta$

$\frac{I_1}{I_0} = \cos^2(19^\circ) = 0.894$

2^{nd} polarizer $\quad I_2 = I_1 \cos^2\theta$

$\frac{I_2}{I_1} = \cos^2(38^\circ) = 0.621$

so total $= (0.894)(0.621) = 0.555$ transmitted

$\therefore$ The <u>reduction</u> is $1 - .555 = \underline{0.445}$