Physics 133 Physics IIb—Thermodynamics and Waves
Test 3
November 21, 2014

Name: _____

All problems *must* begin with either a fundamental principle or with an equation from the equation sheet. If any question is unclear, please ask immediately. Be sure to show your work **clearly**. Partial credit may be given for work *if* it can be understood.

Problem 1: (15 pts.) Unpolarized light of intensity 60 W/m^2 is incident on a polarizer with its polarization axis at an angle of 20° away from the vertical. The light then passes through a second polarizer with its polarization axis at an angle of 50° away from the vertical.

a. (10 pts.) What is the intensity of the light after the second polarizer?

b. (5 pts.) Now suppose a third polarizer is added on the end with its polarization axis at an angle of 90° away from the vertical. What would be the intensity after this last polarizer?
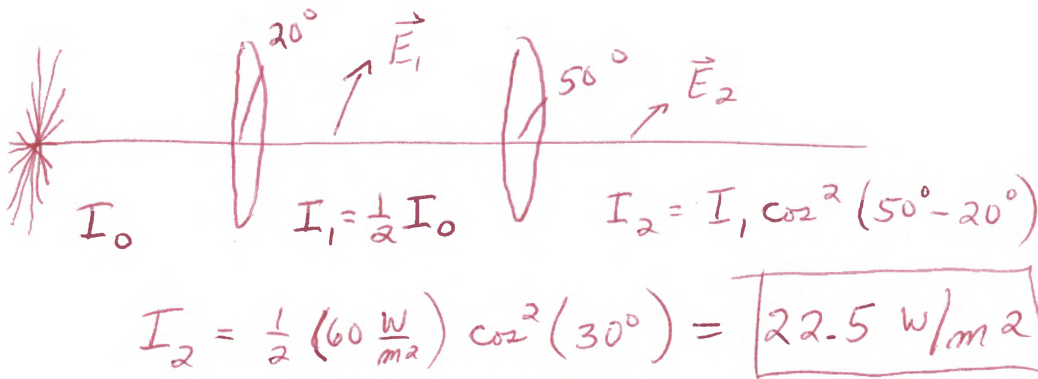
Name: _____ SOLUTIONS _____

All problems *must* begin with either a fundamental principle or with an equation from the equation sheet. If any question is unclear, please ask immediately. Be sure to show your work clearly. Partial credit may be given for work *if* it can be understood.

Problem 1: (15 pts.) Unpolarized light of intensity 60 W/m^2 is incident on a polarizer with its polarization axis at an angle of 20° away from the vertical. The light then passes through a second polarizer with its polarization axis at an angle of 50° away from the vertical.

a. (10 pts.) What is the intensity of the light after the second polarizer?

$$I_1 = \frac{1}{2}I_0$$

$$I_2 = I_1 \cos^2(50° - 20°)$$

$$I_2 = \frac{1}{2}\left(60 \frac{W}{m^2}\right)\cos^2(30°) = \boxed{22.5 \ W/m^2}$$

b. (5 pts.) Now suppose a third polarizer is added on the end with its polarization axis at an angle of 90° away from the vertical. What would be the intensity after this last polarizer?

$$I_3 = I_2 \cos^2(90° - 50°)$$

$$\boxed{I_3 = 13.2 \ W/m^2}$$