Homework Problems for Chapter 8

1. Unpolarized light from a mercury discharge is passed through a filter which isolates the green line. Slits and lenses form a parallel beam propagating in the +z direction. A photomultiplier is placed at z = 100 cm. The photomultiplier has a counting rate of R = 64 counts/s.
(A) a quarter wave plate with the fast axis along \( \mathbf{i} \) is placed at z = 10 cm. What is the counting rate, \( R \), now?
(B) A linear polarizer with the easy transmission axis along( \( \mathbf{i} + \mathbf{j} \))/2 is placed at z = 20 cm. What is \( R \) now?
(C) A half wave plate with its fast axis along \( \mathbf{i} \) is at z = 30 cm. What is \( R \) now?
(D) A linear polarizer with its easy transmission axis along \( \mathbf{i} \) is placed at z = 40 cm. What is \( R \) now?
(E) A left hand circular polarizer is placed at z = 50 cm. What is the maximum counting rate possible? What is the minimum possible counting rate?
(F) With the left hand circular polarizer set to the maximum counting rate if we insert a half wave plate with the fast axis along \( \mathbf{i} + \mathbf{j} /2 \) at z = 60 cm and a linear polarizer with the easy transmission axis along \( \mathbf{j} \) at z = 70 cm what is \( R \)?

2. Circularly polarized light of intensity I is incident on a sandwich of three polaroids. The first and third polarizers are crossed and the middle polarizer makes an angle of \( \theta \) with respect to the first polarizer. What is the intensity of the transmitted light?