HW1
DUE: 09/08/2017 – 11:30 AM

1. What is the energy of single photon (in both Joules and ev) at the peak of the spectrum of:
    a. Blue cone
    b. Green cone
    c. Red cone

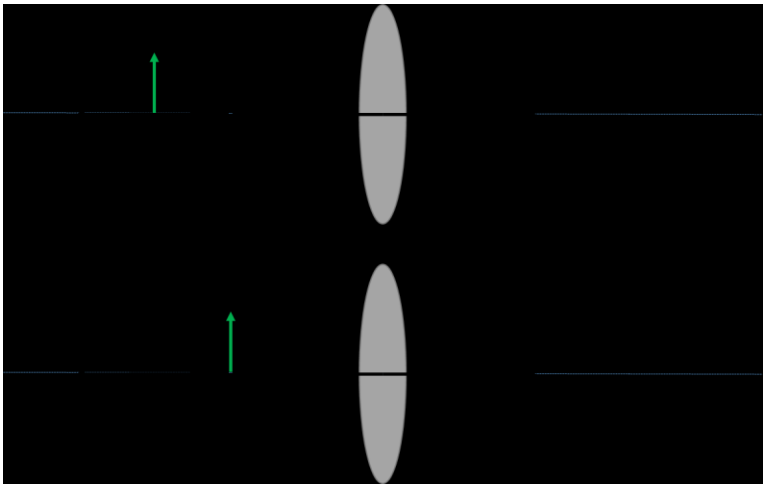
2. How photons per second does it take to generate a 5 mW red laser (note, a watt is a joule per second). The fastest a human can blink is ~100ms. During that time, how many photons hit your eye before you can blink?

3. If the damage threshold for the human eye is 10^{13} blue photons, what power do you need in order to cause damage to the retina? What is the power of a strong laser pointer online?

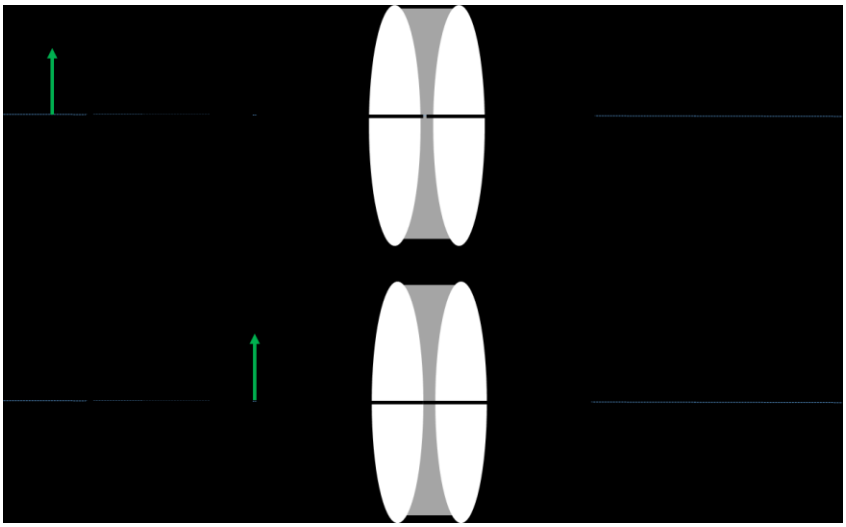
4. Why does UV, and not green, light cause skin damage even though it is a small chunk of the solar spectrum?

5. Why do you think it took so long to notice that light comes in discrete bunches called photons?

6. Draw the ray diagram for the following



7. Draw the ray diagram for the following



8. Assume an object is 2 cm high, and is 40 cm away from a lens with focal length 25 cm.

    a. What is the image distance?
    b. What is the magnification?

MATLAB stuff

1. Using the wave equation, plot a light wave of lambda = 500 nm, t = 0, across 5 um of space
    a. Start by defining an array x from zero to 5 um
    b. Use the wave equation to calculate y(x,t)
    c. Plot it by using the plot command.
    d. Now add on a second plot with light of 700 nm, and make it red.

2. The speed of an object falling from a height h: v = sqrt(2*9.8m/s^2*h)
    a. Use matlab to calculate velocity if falling from 10 m
    b. falling from 100 m
    c. Plot out height vs velocity from 1 to 1000 m

3. Assume a lens with focal length 50 cm. Use Matlab to calculate the image distance if:
    a. The object distance is 60 cm away?
    b. 120 cm away
    c. Make a plot of object distance vs image distance for 1 to 200 cm away
    d. Now make another plot on the same figure with a focal distance of 30 cm.