HW4
DUE: 10/13/2017 – 11:30 AM

Analysis Questions:
1. Considering the Jablonski diagram…
   a. Draw in and label energy flow for photon absorption, vibrational relaxation, fluorescent emission, and non-radiative decay.
   b. What is the wavelength of emitted light?
   c. What is the wavelength of light to excite the second elctromic state?
   d. If the fluorescent lifetime is 1 ns, what is the rate of photon emission?
   e. If the non-radiative decay has a lifetime of 3 ns, what is the quantum yield?
   f. Why is the triplet state so much longer lived as compared to fluorescent emission rate?

$\Delta E = 0.8$ eV

$\Delta E = 2.6$ eV
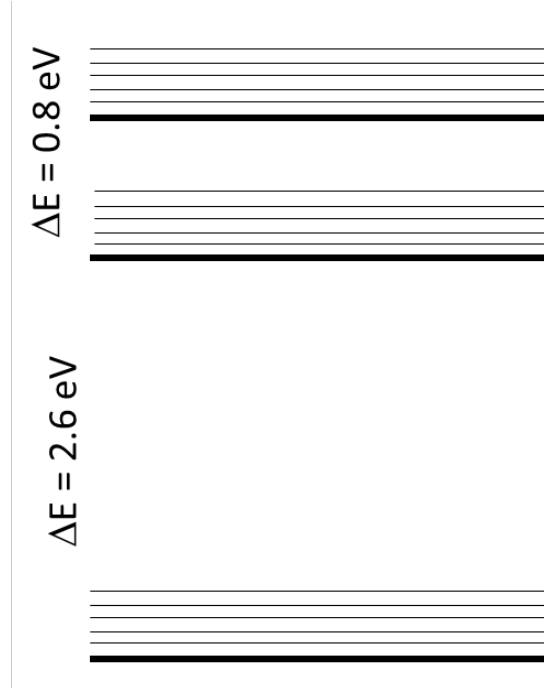
2. Consider the following image and structured element.
   a. Draw in the 1/0 of a dilated image
   b. Draw in the 1/0 of an eroded image
   c. What will happen to in image of cells if you perform an opening with a structured element larger than every cell?

   Image   Strel
   0 0 0 0 0 0 0 0 1 1 0 0 0 0 0   1 1
   0 1 1 1 1 0 0 0 1 1 1 0 0 0 0   1 1
   1 1 1 0 0 0 0 0 1 0 1 0 0 0 0
   1 1 0 0 0 0 0 0 0 1 1 1 0 0 0
   0 1 1 1 1 0 0 0 0 0 1 1 1 1 1

3. Fluorophores
    a. What are 4 important properties of organic dye fluorophores to consider?
    b. What are 3 additional properties of fluorescent proteins to consider?
    c. For the following spectra, what are 2 potential fluorophores for each?
    d. What is the energy lost (in eV) to vibrational relaxation for each?
    e. What are two environmental factors that will tune the properties of each?
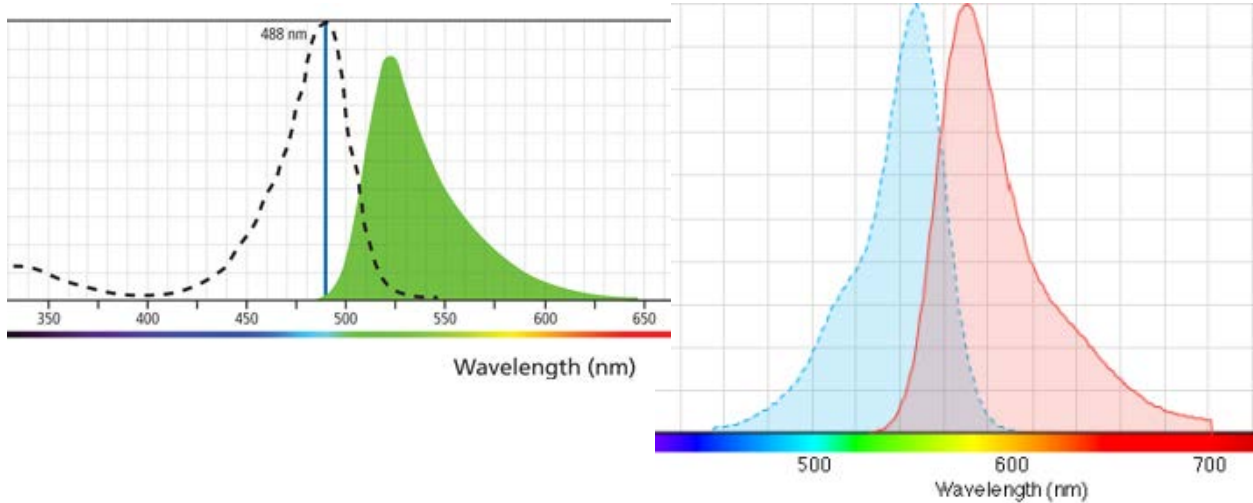
4. Filters:
    a. What are the wavelengths passed by a 490/50 filter?
    b. If the filter blocks other wavelengths with an OD 3, what percentage of photons of get through?
    c. Why are excitation filters typically less expensive than emission filters?
    d. Is a dichroic mirror needed for trans-illumination fluorescence?

Matlab Questions:

1. Open up blobs.png.
    a. Isolate all the horizontal lines > 8 pixels. Plot a histogram of lengths of the horizontal lines.
    b. Isolate all objects with circles > 6 pixel radius. Plot a histogram of the area of the objects

2. Open printedtext.png. Correct for the background illumination and noise. See if you can write the entire text.