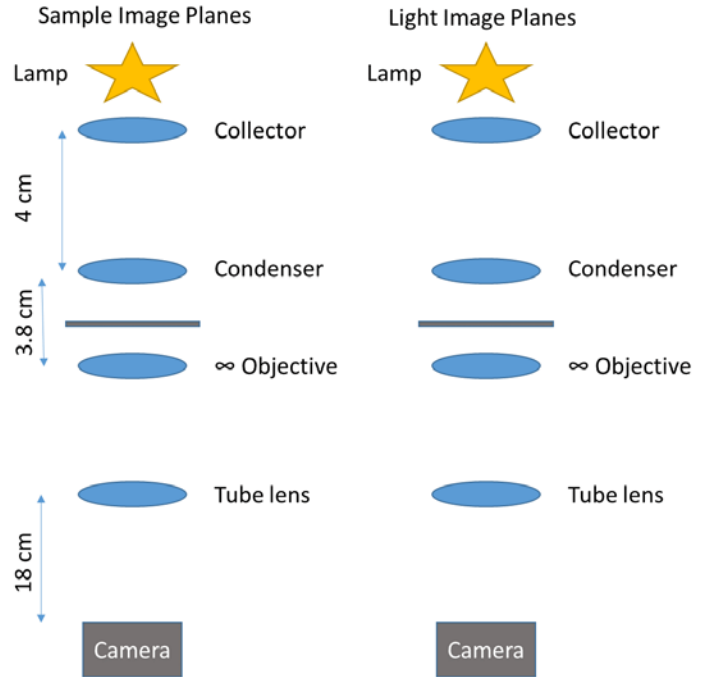


HW3

DUE: 09/22/2017 – 11:30 AM

Analysis Questions:

1. Draw the sample and lamp image planes in the following diagram.
 - a. What is the tube lens focal distance
 - b. If the condenser has a focal distance of 10 mm, what is the focal distance of the objective?
 - c. What is the focal distance of the collector lens?
 - d. What is the magnification of the objective?



2. Assume a 1.2 NA, 60x objective with a field number of 20.
 - a. If you send in 2 mW that completely fills the field of view, what is the intensity
 - b. What is the size of a diffraction limited spot?
 - c. If you focus to a diffraction limited spot, what is the intensity
 - d. What do you think the immersion fluid might be for this objective, and why?
3. Find 2 liquids you could use instead of water to minimize scattering from cells.
4. Given the scattering equation:
 - a. Why is the sky blue?
 - b. Why are sunsets red?
 - c. Why are sunsets during forest fires (and in LA all the time) spectacular?
5. Diffraction – assume light with a photon energy of 2 eV strikes an aperture of 10 μm .
 - a. If the detector is 10 cm away from the aperture, where is the first minimum?
 - b. Why should you care about the numerical aperture of an objective more than the magnification?

Matlab Questions:

1. Using regionprops, calculate how many quarters and pennies there are in the field of view for the posted image. Make separate masks showing the quarters and pennies, and overlay them with the original (black and white) image. What is ratio of the average quarter intensity divided by the average penny intensity?

Hint: Quarters are bigger than other coins. Eccentricity measures how round objects are. $e = 0$ means they are completely circle, $e = 1$ means they are completely straight line.