Sample exam questions on the two microscope lectures

1. Specimen “contrast” refers to:
   a. the intensity of the object minus the intensity of the local background
   b. the local background minus the intensity of the object
   c. the intensity of the object minus the intensity of the local background divided by the overall background intensity.
   d. the difference between the refractive index of the object and the local background.
   e. the difference between a dye that is bound to a cell structure and the surrounding cell cytoplasm.

2. Bright field microscopy works best
   a. when the cells or tissue being observed are very thick.
   b. when the cells or tissue being observed are very thin
   c. when light absorbing stains are used that bind to specific cell or tissue structures
   d. when the phase rings are perfectly superimposed (aligned)
   e. when strongly fluorescent molecules are added to the cells

3. Kohler illumination:
   a. is important for phase contrast microscopy
   b. is important for DIC microscopy
   c. assures equal distribution of illumination light across the specimen field
   d. if properly obtained, eliminates the halo effect.
   e. only “d” is incorrect

4. The “phase ring”
   a. Changes the speed of direct illuminating light in the phase contrast microscope
   b. Changes the speed of direct illuminating light in Nomarski (DIC) microscope
   c. Is built into the objective of the microscope
   d. Acts like a prism dispersing the different wavelengths of light
   e. a and c are correct, but not b and d.

5. Which type of microscopy is likely to give halos around the object being observed.
   a. bright field
   b. phase contrast
   c. Normaski (DIC)
   d. fluorescence
   e. Confocal

6. What is the difference between refraction and refractive index? (2-3 sentences only)
7. A diffraction pattern:
   a. occurs when light passes through a slit larger than the wavelength
   b. occurs when light passes through a slit smaller than the wavelength
   c. results, in part, from constructive interference of light waves
   d. results, in part, from destructive interference of light waves
   e. all except a are correct.

8. In confocal microscopy the pinhole:
   a. apertures the light to a small size in order to increase optical resolution.
   b. replace the phase rings in order to improve resolution.
   c. allows light from the imaged objects to pass but blocks scattered light that would increase background fluorescence.
   d. is necessary to insure proper Koehler illumination.

9. List the following materials/situations from **highest** to **lowest** “refractive index”

10. Why is refractive index so important in microscopy? (two - three sentences)

11. The numerical aperture (NA) of an objective:
   a. Is the same for all objectives
   b. Increases with a decrease in objective magnification.
   c. Is important in determining **objective resolution**
   d. Is important in determination objective magnification
   e. c and d are correct.