**Lab assignment 1: by Furkan Kaya**

Our first task was to explain three different forms of microscope. The first one is the ***Phase contrast microscopy:*** is a contrast-enhancing optical technique that can be used to make high-contrast images of transparent specimens. These objects that are to be investigated include living cells and microorganisms.

The working principle for the phase contrast microscopy is to make phase changes visible in phase-contrast microscopy is by separating the illuminating light from specimen-scattered light. You can visualize it as difference in image contrast.

Basically a phase contrast microscope is a microscope where the analysed samples do not have to be coloured to be shown. The microscope can give identity difference in transparent, uncoloured objects by changing the path of the light. To change the light a special condenser is used.

***DIC microscopy:*** stands for differential interference contrast microscopy. Also known as Nomarski microscopy. In this form of microscopy the gradient in optical path length are transformed into amplitude differences. The image in the optical path length again is caused by differences in refractive index and varying thickness of the sample.

Instrument can be used with a full numeric aperture. This leads to good resolution (a high increase) and allows imaging of relatively thick samples.

***Dark field microscopy:*** has the same working principle as Light field microscopy, but with negative contrast. Objective lens and ocular are the same as in LF microscopy, but the field diaphragm is different. This gives that only light which is scattered during interaction with the sample will reach the detector.

For the second part, we were to answer 6 questions.

1. We are to explain what the advantage with Kohlers illumination is. Kohler illumination has the effect that it gives a very even illumination of the shape. It also ensures that an image of the illumination source is not visible in the image it creates.
2. Reducing the numerical aperture gives a lower resolution. The image is changed because the angle is changed
3. I did not participate in the experimental part, but in general bright-field microscopy requires fewer adjustments before one is bale to observe the specimens. Optics do not change the colour of the observed structures, while with the phase contrast microscopy it is possible to visualize certain structures that are otherwise invisible.
4. Phase ring: it has the effect that undeviated light passing through the phase ring travels a shorter distance in traversing the glass of the objective than does the diffracted light.
5. The difference is the optical basis upon which images are formed. Phase contrast microscopy produces image intensity values that vary as a function of specimen magnitude with very dense regions appearing darker than the background. DIC gives excellent contrast and better resolution.
6. I was not there and due that cannot evaluate that.