## 1. N.A. : Numerical Aperture

N.A. determines resolving power, focal depth, and luminosity of the image. The larger N.A. is, the higher resolving power and smaller focal depth are.

$$N.A. = n \cdot Sin\theta$$

n is an index of refraction made by the medium between an objective and a sample. n=1.0 forair. θ is an angle made by the ray of light that goes through one end of an objective and an optical axis.

## 2. R: Resolving Power

Minimum distinguishable space between points. N.A. and wavelength λ determine resolving power.

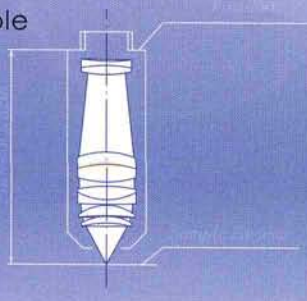
$$R = \frac{0.61\,\lambda}{N.A.}$$

## 3. W.D. : Working Distance

Distance between the surface of the sample and the surface of the objective when in focus.

## 4. Parfocal Length

Distance between the surface of the sample and the objective mounting position when in focus.



## 5. Infinity correction system

An optical system in which the image is formed by an objective at infinity and at an intermediate image plain by the tube lens.

## 6. Greenough system

An optical system in which utilizes twin bodies at different angles to produce a stereo effect.

## 7. Common Main Objective [CMO]

An stereo optical system that utilizes a single large object to projected the image in a stereo effect to infinity.

## 8. F : Focal Length

Distance between a principal point and a focal point. F1 is a focal length of objective, f2 is a focal length of tube lens. Magnification is determined by the ratio of objective focal length

$$\frac{Focal\ length\ of\ tube\ lens}{Focal\ length\ of\ objective}$$

$$(Ex.)\quad 1x = \frac{200mm}{200mm}$$

$$(Ex.)\quad 10x = \frac{200mm}{20mm}$$

## 9. Object field

(1) Range [diameter] of specimen observable with a microscope.

$$\textit{Real field of view (mm)} = \frac{\textit{Field number of eyepiece}}{\textit{Magnification of objective} \cdot \textit{200m factor}}$$

**Field number of eyepiece is 24mm*

*(Ex.) Object field for 1x objective is*

$$\frac{24mm}{1} = 24mm$$

*(Ex.) Object field for 10x objective is*

$$\frac{24mm}{10} = 2.4mm$$

(2) Object field on TV monitor

$$\textit{Object field of view (mm)} = \frac{\textit{Size of CCD Camera Image Element}}{\textit{Magnification of objective} \cdot \textit{200m factor} \cdot \textit{magnification of video adapter}}$$

* Size of 1/2" CCD image element is 4.8 x 6.4 mm

*(Ex.) Real field of view for 1x objective is 4.8 x 6.4 mm*

*Real field of view for 10x objective is 0.48 x 0.64mm*

## 10. D.F. : Depth of focus

Range around the focal point in which the image is still clear. The larger the N.A., the smaller the focal depth.

$$D.F.(\mu m) = \frac{\lambda}{2 \cdot (N.A.)^2}$$

$\lambda = 0.55$ *microns* ($\mu m$)

*Focal depth in this case is* $\frac{0.55\mu m}{2 \times (0.7)^2} = 0.56\ \mu m$

## 11. Bright field illumination and dark field illumination

In bright field illumination the ray of light reflects upon the object goes through the objective giving a bright background." Dark Field is coming.

In dark field illumination the ray of light is shut off by a central stop in the ray path, thus only allowing diffracted light to pass through the objective.

## 12. Apochromatic objective

Apochromatic objective is chromatic aberration corrected for red, blue and green.