

Optical Microscope – Primary Standard for Measurement

Theory of the optical microscope

light path

objective lens – also see

<http://www.microscopyu.com/tutorials/java/objectives/immersion/index.html>

numerical aperture of objective lens $NA = m \sin(\theta/2)$

limit of resolution $LR = \lambda / (2 NA)$

depth of field $DF = LR / \tan(\theta/2)$

maximum useful magnification

calibration and use of Porton graticule

calibration and use of filar micrometer

Sampling for particles

sampling train

representative sampling – from still air, breathing zone air, moving air

filters – refractive index, sample stability over time

automatic counting and sizing programs – ImageJ at <http://rsb.info.nih.gov/ij/>

Lab Procedures

3 groups of two each

times

Characteristics of Optical Microscope Objective Lenses

	wavelength	0.52	micrometers			
	Lens	NA	Theta	m	Limit of Resolution	Depth of Field
	10X	0.25	29	1	1.27	4.90
	45X	0.85	116	1	0.37	0.23
	90X	1.32	122	1.51	0.24	0.13
Olympus	4	0.10	11	1	3.17	31.6
	10	0.25	29	1	1.27	4.91
	20	0.40	47	1	0.79	1.82
	40	0.65	81	1	0.49	0.57
	100	1.30	119	1.51	0.24	0.14
ESE						
1777	10	0.25	29	1	1.27	4.91
	43	0.65	81	1	0.49	0.57