12.108 Lab#13: Optics I - Introduction to optical microscopy November 4, 2004

1. Functions of the optical microscope: Name the parts of the microscope numbered on the photograph and briefly describe the function of each, referring to the books on microscopy in the lab.

Photo of a microscope

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13.

2. Magnification: What levels of magnification are possible on your microscope?

3. Polarization of light: Examine samples of calcite and two kinds of mica under the microscope under the following conditions, and note what happens you rotate the stage.

a) plane-polarized light

quartz:

plagioclase:

K-feldspar:

muscovite:

biotite:

b) crossed polars

quartz:

plagioclase:

K-feldspar:

muscovite:

biotite:

4. Symmetry and optical properties of minerals: The optical properties of minerals are determined by their crystal structures, which can be grouped in three optical classifications: *isotropic, uniaxial* and *biaxial*. Referring to the conditions for assignment to the various crystal systems, (Zoltai and Stout, p 44-45) list which crystal systems would correspond to each category.

Optical classification:	**Variation in velocity of light propagation through crystal:**	**Crystal systems:**
isotropic	Velocity is the same parallel to all crystallographic axes, (a_1, a_2, a_3). and in all other directions as well.	
uniaxial	Velocity depends on orientation: one extreme value is parallel to a principal symmetry axis (c-axis) and the other extreme value is parallel to all directions within the plane formed by two axes of equal length (a_1, a_2).	
biaxial	Velocity depends on orientation: extreme values may or may not be parallel to the three unequal crystallographic axes (a, b, c).	

5. Physical properties of minerals: Some of the properties used in the identification of hand samples of minerals will also be useful for their microscopic identification.

a) Which properties do you expect to be able to observe under a microscope?

b) Are there other properties for which the microscope is the only means of observation?

c) Examine the thin sections under the microscope and list properties which might enable you to distinguish between the minerals present.