**Ge 114**

**Hand Specimen Lab Exercise 4**

Silicates II: Chain Silicates and Ring Silicates

**Items in bold type will be written up and handed in as part of the lab report.**

Goals:

* Learn about the silicate classification system for chain and ring silicates
* Identify 10 major minerals in these two groups
* Describe cleavage angles in pyroxene and amphibole and what causes them

I) **Explain the structural characteristics of minerals in each of these groups**. Looking at one or more of the mineralogy textbooks will be helpful.

II) The minerals to be studied in this lab are:

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Chain Silicates:

*Pyroxenes* (augite, enstatite, jadeite, diopside)

*Amphiboles* (hornblende, actinolite-tremolite, glaucophane)

Ring Silicates:

Tourmaline Beryl Cordierite

Plus one mineral of your choice from the collection, not on this list

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**Prepare a brief written description of your characterization of these minerals, in the form of a table. This table should include the following:**

- Mineral name, formula, and SiO2 polymerization (i.e., tectosilicate, orthosilicate, etc.). For *mineral groups*, you may list a general formula for the group and distinguish the minerals in that group by noting the elemental substitutions into each site for each mineral.

- Physical properties and attributes such as: cleavage or fracture, crystal form or habit, luster, color, density to the hand, and possibly magnetism, taste, and other properties if relevant. You may describe the general physical properties of all minerals in a *mineral group* once, instead of for each mineral, but be sure to include how to distinguish one mineral from another in a particular group (for example, note color differences)

- Indicate the three most important diagnostic properties of each mineral.

- Include variations in these properties among different specimens of the same mineral in the Dana and working collections.

- Geological occurrences (rock types) and economic importance.

III) Amphibole and Pyroxene Cleavage

Using one of the large cleavage fragments of hornblende (hand samples provided), measure the angle between cleavage faces using the goniometer. **Compare this value to published values, and also compare it to cleavage angles for pyroxenes**. There are a couple of hand samples of pyroxenes to examine visually, but measuring cleavage angle may be difficult.

**Why do amphiboles and pyroxenes have different cleavage angles?** See p. 450 and p. 454 in Klein and Dutrow 23rd ed. or p. 455 and p. 460 in Klein 22nd ed.

Cleavage angles are a useful way to distinguish these two mineral groups even in microscopic sized specimens. Look at the microscope slide that contains a slice of both hornblende and augite. You are looking down the c-axis of both crystals. **Sketch the abundant, excellent cleavage of the hornblende and less common, imperfect cleavage of the augite and estimate the cleavage angle for each**

Other chain and ring silicates are in the Dana Collection. You may examine these as your time allows and interests dictate!