**Ge 114**

**Hand Specimen Lab Exercise 1**

I. Physical Properties of Minerals

II. Halides, Oxides, and Phosphates

What do I turn in? **Everything in bold should be written up and handed in**. Every week that there are new minerals, there will be a table of properties to submit, and there will be a few questions about the topics in lab and class.

We suggest that you read through the whole lab each week before starting it.

Reference specimens of minerals will be found in the appropriate drawers of oxides, hydroxides, phosphates, and halides in the Dana Collection on the south wall of the lab. *The Dana Collection is a permanent collection, so please do nothing that will deface, damage, or alter the specimens in this collection*. Please put specimens from the Dana Collection back in their places when you have finished examining them.

**Tests that involve scratching, cleaving, dissolution in acid, etc., should be performed ONLY on the WORKING material provided, NEVER on the Dana Collection**

Goals:

* learn methods for recognizing minerals
* Identify 10 halide, oxide, and phosphate minerals, plus 2 important ores

Reading:

Dutrow & Klein, chapter 2, or Klein and Hurlbut, p. 17-32.

**I) Write up your answers to the following questions after the class exercise (contact Oliver if you missed the first lab):**

* Which descriptions were most useful for the activity? Which were not helpful?
* What are the differences between structure, habit, cleavage, and fracture? (A table might be useful)
* Why is colour not recommended as a diagnostic characteristic?

II) Property tests

i) Cleavage: Examine the fragments of fluorite and halite (which show excellent cleavage) and magnetite (which does not). **Draw sketches of the cleavages for these minerals, as seen through the microscope**. If you want to perform cleavage tests, use the specimens in the trays of WORKING material on the table.

ii) Streak: Perform streak and hardness tests on hematite, magnetite, goethite, and ilmenite using samples from the WORKING material. **Report the differences in the color of the streak of the various iron minerals.**

iii) Magnetism: **Compare the magnetism of ilmenite with that of magnetite** (caution that some samples of ilmenite have small amounts of magnetite as an impurity due to exsolution.)

iv) Hardness: Test the hardness of apatite, fluorite, and halite on samples from the WORKING material and **report which are more easily scratched. What contributes to a mineral’s hardness?** Hint: think about why diamond has a hardness of 10 while graphite has a hardness of ~1.5.

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

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Corundum Magnetite Halite Rutile Ilmenite Fluorite Hematite Spinel Goethite Apatite

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 and formula

- 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. To describe these properties, use the terminology you read about above, also given in Berry and Mason, Mineralogy (1968) pp. 167-174, and in Dana's Manual of Mineralogy.

- 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.

A note about the data you record in your table: it is for YOU to learn the physical properties of these minerals, so that you can identify them later. Try to determine these properties for yourself before looking up the mineral in a reference. If you look up information such as the mineral formula, occurrence, and density of the mineral, please note the reference where you found the information.

IV) Examine: limonite These two materials are mixtures of minerals of

 bauxite the type you are examining which are important

 ores of iron and aluminum, respectively.

**Record the three most distinguishing properties of these two materials, and note their occurrences.**

Other oxides, halides, and phosphates are in the Dana Collection. You may examine these as your time allows and interests dictate.