

Mineral Identification IV

Lab groups (as requested):

Topic	1	2	3	4	5	6
A	Leighton	Marrs	Johnson	Benedetti	Williams	Darst
B	"Brady"	Henrichs	Walter	Mongomery	Youngquist	Marshall
C	Isaacson	Messer	Lykken	Kaemingk	Lembrick	Futch
D	Sayler	Carlile	Bowerman	Ault	Wheeler	Bratz

Instructions for this exercise

The main goal of this lab is introducing you to the second set of minerals you will learn about in detail. In this lab, you will continue to make a catalog of minerals from which you can study.

Your task is to learn the important features of each mineral. One important feature of every mineral is its chemical composition. Most geologists, in identifying a mineral, will ask what other minerals it was found with, or what rock type it was found in. This is because minerals that form together frequently share aspects of their chemistry.

→ For each mineral, you should therefore record:

1. Name
2. Chemical formula (if the formula is complex, then only the elements, not their proportions - see below)
3. Geologic occurrence (not locations, but environments. e.g., Pyrite - sulfide ore deposits)
4. Identifying Characteristics. This is the key. What is it important to know about this mineral to be able to identify it? To distinguish it from most minerals is easy, but what about minerals that share many features? (i.e., for pyrite, the important features are not those that distinguish it from quartz, but those that distinguish it from chalcopyrite and pyrrhotite - see Plate II in your text)

Cooperative strategy:

We will be doing the same type of exercise as in the previous labs. You are a member of a team (1-6), and you must become an expert on a topic (A-D). You will develop answers to your topic material first on your own (**before** the lab session), then you will share your answers with the other experts on that topic from the other 5 teams. Finally, we will go through four rotations in which each expert will teach their topic to the other members of their team.

Each team will turn in a single lab report, but you are responsible for knowing all the material in this lab. In addition, you must **critically review** the results of the other experts on your team while they are teaching.

What you should have done when you come into lab:

When you arrive at lab, you should have written-down answers for your topic. These **will be collected** briefly, then returned in the first part of the lab session, and will form part of your individual lab score. They need not be terribly neat, but should be legible.

Topic A, Mineral Identification - Amphiboles & a few Framework silicates (SiO₂ minerals)

Using your text and any other reference materials you wish, learn to identify the following minerals and distinguish them from similar ones. Turn in a sheet with the four items mentioned above for each mineral, and answer the following questions about the minerals as well.

→ Tremolite	→ Hornblende	→ Glaucophane
→ Actinolite	→ Quartz	→ Cristobalite
→ Opal		

- Glaucophane and jadeite ($\text{NaAlSi}_2\text{O}_6$) have in common their conditions of formation (and thus geologic occurrence) and chemistry. Explain why. (Note that there was some earlier confusion, but Na^+ is larger than Ca^{2+} , if they're both in the same site, and thus have the same coordination number).
- What general conditions are required for the crystallization of Cristobalite? (find an SiO_2 phase diagram) What is its most common occurrence?
- What causes opalescence, generally?

Note: Only perform destructive tests (hardness, acid) on mineral samples if your professor says it is okay to do so!

Topic B, Mineral Identification - Layer Silicates I & a few more Framework silicates (Plagioclase)

Using your text and any other reference materials you wish, learn to identify the following minerals and distinguish them from similar ones. Turn in a sheet with the four items mentioned above for each mineral, and answer the following questions about the minerals as well.

→ Serpentine	→ Talc	→ Chrysocolla
→ Kaolinite	→ Pyrophyllite	→ Albite
→ Anorthite		

- Serpentine is a layer silicate, but the chrysotile variety forms fibers. How is this possible?
- Can one tell talc from pyrophyllite in the field? If so, how?
- Both albite and anorthite are plagioclase minerals, but they occur in very different igneous rocks. In what types of rocks are each generally found?

Note: Only perform destructive tests on mineral samples if your professor says it is okay to do so!

Topic C, Mineral Identification - Layer Silicates II & yet more Framework Silicates (Kspar)

Using your text and any other reference materials you wish, learn to identify the following minerals and distinguish them from similar ones. Turn in a sheet with the four items mentioned above for each mineral, and answer the following questions about the minerals as well.

→ Muscovite	→ Biotite	→ Chlorite
→ Lepidolite	→ Microcline	→ Orthoclase
→ Sanidine	→ Anorthoclase	

- Lepidolite and pink tourmaline are typically found together. The reason for this is the same as the reason they have similar colors. What is similar about their chemistry?
- Examine the composition of anorthoclase, and Figure 11.51, p. 481. Do you think this mineral cooled quickly or slowly?
- Microcline, orthoclase, and sanidine are polymorphs of KAlSi_3O_8 . How do they differ in occurrence and conditions of formation?

Note: Only perform destructive tests on mineral samples if your professor says it is okay to do so!

Topic D, Mineral Identification - Framework Silicates (Feldspathoids & Zeolites)

Using your text and any other reference materials you wish, learn to identify the following minerals and distinguish them from similar ones. Turn in a sheet with the four items mentioned above for each mineral, and answer the following questions about the minerals as well.

→ Nepheline	→ Sodalite	→ Leucite
→ Analcime	→ Sodalite	→ Heulandite
→ Natrolite	→ Stilbite	

- What is the main chemical difference between feldspathoids and feldspars (your book mentions this in Ch. 11)?
- What would happen if an quartz-bearing magma were to mix with a feldspathoid-bearing magma?
- If you have a quartz-bearing igneous rock, and there is a mineral in it that might be either, say, kspars or leucite, is there a really easy way to know which?
- Where are zeolites generally found?

Note: Only perform destructive tests on mineral samples if your professor says it is okay to do so!