Geology 250: Mineralogy Winter 2004

MW 9:50–11:00 AM, F 9:40–10:40 AM, Mudd 66 Carleton College

Lab: W or Th 1:00–5:00 PM, Mudd 66

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Teaching Assistants:

Dave Auerbach (W lab)
Joseph Graly (W lab)
Kristin Bergmann (Th lab)
Bre MacInnes (Th lab)

Evaluation:
Problem sets - 40%
Mineral quizzes - 15%
Mid-term quiz - 10%
Final exam- 20%
Research paper- 15%

Reading: Klein, C., Mineral Science, 22nd Edition. Wiley, New York, 2002.

Available in Lab: Nesse, W.D. Introduction to Optical Mineralogy, 3rd Edition. Oxford University Press, 2003.

Reference: Available in Lab: Deer, W.A., Howie, R.A., and Zussman, J. An Introduction to the Rock-Forming Minerals, 2nd Edition. Halsted Press, 1992.

Due dates: Late work penalized 20%/day.

Week	Topic
1. Jan. 5	Physical properties of minerals, atoms, bonding, packing, and Pauling's rules. Klein: preface, p. 1-90. Minerals to Learn #1: Tectosilicates (Klein: p. 543-563) Introduction to Pet Mineral project.
2. Jan. 12	Concepts of symmetry and crystallography. Klein: p. 170-213; review p. 251-289. Minerals to Learn #2: Phyllosilicates (Klein: p. 527-543) **Due Wednesday:** Problem Set #1 - Using spreadsheets to solve problems. **Mineral Quiz in Lab** **Due Friday**: Pet mineral physical properties.
3. Jan. 19	Concepts of symmetry and crystallography. Klein: p. 213-251. Minerals to Learn #3: Carbonates et al. (Klein: p. 411-440) **Due Wednesday:** Problem Set #2 - Crystal structures. **Mineral Quiz in Lab**

4. Jan. 26 Optical mineralogy: the nature of light, Snell's Law, isotropic minerals.
Nesse: p. 1-36.
Minerals to Learn #4: Oxides and Sulfides (Klein: p. 351-369; 378-393)
Due Wednesday: Problem Set #3 - Symmetry and crystal classes
Mineral Quiz in Lab
Due Friday: Pet mineral crystallography.

5. Feb. 2 Optical mineralogy: anisotropic minerals, uniaxial optics.
Nesse: p. 37-75.
Minerals to Learn #5: Neso-, Cyclo-, and Sorosilicates (Klein: p. 491-514)
Due Wednesday: Problem Set #4 - Refractometry
Mineral Quiz in Lab

Fri, Feb. 6 **Mid-Term Quiz**

6. Feb. 9 Optical mineralogy: biaxial optics.
Nesse: p. 76-109; review 122-127.
Mineral to Learn #6: Inosilicates (Klein: p. 514-527)
Due Wednesday: Problem Set #5 - Anisotropic properties and uniaxial minerals
Mineral Quiz in Lab

7. Feb. 16 Geogizmos. X-ray and electron beam instruments.
Klein: p. 290-291; 309-321.
Due Wednesday: Problem Set #6 - Biaxial minerals
Mineral Quiz in Lab
Due Friday: Pet mineral optical properties.

8. Feb. 23 Mineral chemistry, reactions, and phase diagrams.
Klein: p. 90-131; 134-141.
Due Wednesday: Problem Set #7 – Halide solid-solutions.
Due Friday: Pet mineral x-ray properties.

9. Mar. 1 Crystal chemistry of selected silicates.
Klein: p. 441-490.
Due Wednesday: Problem Set #8 - Mineral formulas.

10. Mar. 8 Catch-up
Due Wednesday: Pet mineral paper.

Sat., Mar. 13: Final Exam, 3:30 - 6:00 PM

Problem Sets

I assign various problem sets throughout the term ranging from relatively easy (i.e. not very time-consuming) to rather difficult and/or involved. To do an adequate job on the later, you will need to invest a considerable amount of time. Please feel free to (and do!) work with your colleagues on these problems, however, turn in your own work. Some of these problem sets are best solved using a spreadsheet; for those of you not familiar with spreadsheets, please see me so I can get you started. Again, work with your colleagues on this, but construct and turn in your own spreadsheet calculations.

Mineral Quizzes

At the beginning of every lab period (except weeks 1, 8, 9, 10), there will be a quiz on the minerals from the Dana collection. The chemical compositions of the starred (*) minerals must be learned (or memorized and then promptly forgotten after the quiz). Plan on 5 minerals per quiz. Approach these minerals like you would new friends. At first you might have problems remembering names, faces, and characteristics. But the more you spend time with that person (mineral), the easier it becomes to remember who they are and their physical properties. In fact, you should become so familiar with these individuals that you can pick out traits in their close relatives (mineral unknowns) and realize that they are just like the minerals (the friends) you already met (only different in superficial characteristics like color or texture).

Pet Mineral Project

By the end of the first week, you need to identify and posses a pet mineral to study throughout the course. During the course, you will learn about the physical properties of minerals, how and why minerals form, and various techniques for identifying minerals. As different techniques are learned, you will apply what you learned to your pet mineral, and turn these data into me for review (see syllabus for due dates). By the end of the term, you will have identified your mineral and described its physical, crystallographic, optical, and x-ray properties. The final product of your research will be a scientific paper (5 pages or less) describing your results and the techniques you used. Follow the formatting guidelines of the *American Mineralogist*, the official journal of the American Mineralogical Society (http://www.minsocam.org/MSA/AmMin/AmMineral.html). Use 12 point Times Roman font. Like the American Mineralogist (and most journals today), you need to save your paper and figures in PDF format and send to me electronically. We will talk about how to do this in class. Here is the grading rubric I will use on your papers:

	Points
1. Title, name and address, appropriate headings and subheadings, proper format	10
2. Abstract	10
3. Body of paper	
a. Writing style	10
b. Spelling	10
c. Content	30
d. Figures and tables	15
4. Acknowledgements	5
5. References (format and completeness)	10
Total:	100