Geology 250: Mineralogy

Winter 2008
Carleton College

MW 9:50–11:00 AM, F 9:40–10:40 AM, Mudd 73
Lab: W or Th 1:00–5:00 PM, Mudd 73

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Teaching Assistants:
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Evaluation:
Problem sets - 35%
Mineral quizzes - 15%
Mid-term Exam - 15%
Final exam- 15%
Research paper- 20%

Reading: Nesse, W.D., Introduction to Mineralogy. Oxford, New York, 2000.

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.

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

Due dates: Late work penalized 20%/day.

Week	Topic
1. Jan 3	Physical properties of minerals, atoms, bonding, packing, and Pauling's rules. Nesse: 3-5, 97-112, 39-56. Minerals to Learn #1: Tectosilicates (Nesse: 183-186, 201-228)
2. Jan 7	Physical properties of minerals, atoms, bonding, packing, and Pauling's rules. Nesse: 57-73. Minerals to Learn #2: Phyllosilicates (Nesse: 235-260) **Mineral Quiz in Lab (Tectosilicates)** Introduction to Pet Rock project.
3. Jan 14	Concepts of symmetry and crystallography. Nesse: 6-38. Minerals to Learn #3: Carbonates et al. (Nesse: 326-355) **Due Wednesday:** Problem Set #1 - Crystal structures. **Mineral Quiz in Lab (Phyllosilicates)**

4. Jan 21 Optical mineralogy: the nature of light, Snell's Law, isotropic minerals.
Nesse: 114-122.
Minerals to Learn #4: Oxides and Sulfides (Nesse: 356-396)
Due Wednesday: Problem Set #2 - Symmetry and crystal classes
Mineral Quiz in Lab (Carbonates et al.)

5. Jan 28 Optical mineralogy: anisotropic minerals, uniaxial optics.
Nesse: 122-133, 139-143.
Due Wednesday: Problem Set #3 – Refractometry (Nesse: 157-159)
*******Mid-Term Exam in Lab*******

6. Feb 4 Optical mineralogy: biaxial optics.
Nesse: 133-139, 143-151.
Minerals to Learn #5: Neso-, Cyclo-, and Sorosilicates (Nesse: 291-325)
Mineral Quiz in Lab (Oxides and Sulfides)

7. Feb 11 Geogizmos. X-ray and electron beam instruments.
Nesse: 160-174.
Mineral to Learn #6: Inosilicates (Nesse: p. 261-290)
Due Wednesday: Problem Set #4 - Anisotropic properties, Uniaxial & Biaxial
Mineral Quiz in Lab (Neso-, Cyclo-, and Sorosilicates)

8. Feb 18 Crystal chemistry of selected silicates.
Due Wednesday: Problem Set #5 – Halide solid-solutions.
Mineral Quiz in Lab (Inosilicates)

9. Feb 25 Crystal chemistry of selected silicates.
Due Wednesday: Problem Set #6 - Mineral formulae.

10. Mar 3 Crystal chemistry of selected silicates.

11. Mar 10 **Due Monday:** Pet rock paper. Review

Th, Mar 13: Final Exam, 8:30 - 11:00 AM

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 or one of the TA's and we 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 most lab periods, 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). 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 (friends) you already met (only different in superficial characteristics like color or texture).

Pet Rock Project

Early in the term we will form groups (by lab period) to work on the thorough description of most or all of the minerals in a given rock. During the course, you will learn about the physical and optical 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 rock. By the end of the term, you will have identified and described the physical, optical, x-ray, and chemical properties of the minerals that make up your rock. The final product of your research will be a scientific paper (8 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 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, names 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