

SUNY Cortland
Department of Geology

GLY 301 – Mineralogy

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Credit hours: 4

Semester: Fall 2009

Lecture: Bowers 339, Tues. / Thurs. 11:40 am-12:55 pm

Lab: Bowers 333, Thurs., 1:15-4:05 pm

Texts: 1) *Guide to Rocks and Minerals*, Simons and Schusters.
2) *Minerals in Thin Section*, Perkins, D. and Henke, K.R., 2004, 2nd ed., Prentice-Hall, Inc.

Supplies: 1) *a box of colored pencils; geologist's hand lens.*

Course Description

Principles of physical and optical crystallography and crystal chemistry; descriptive mineralogy; identification of minerals using physical, chemical, and optical methods. Three lecture hours and three-hour laboratory; required all day field trip. Prerequisite: GLY 261, CHE 221. GLY 301 and CHE 221 may be taken concurrently. (4 cr. hr.)

Course Attendance Policy

There is no formal attendance policy. However, exam questions are derived from lecture material. Therefore, students who regularly attend lectures will have a decisive advantage over those who do not.

Field Trip Attendance Policy

The field trip is *required*. Failure to attend the field trip will result in an "Incomplete" grade for the course. The incomplete grade can be made up the following year by attending the field trip. An incomplete grade in GLY 301 can prevent you from: 1) graduating if you are a senior, 2) student teaching if you are a Junior Adolescence Education major, or 3) receiving financial aid.

Academic Integrity:

The College Handbook clearly defines plagiarism and its consequences (refer to Chapter 340, pp. 50-52).

Evaluation of Student Performance

Your final course grade will be based on 3 hour exams, a cumulative final exam, 2 laboratory exams, and 6 laboratory quizzes. The relative weight of each is outlined below along with letter grade numerical equivalents. All course requirements (including the field trip) must be completed to receive a grade.

Final Grade = Hour Exam 1 = 10 %

Hour Exam 2 = 10 %

Hour Exam 3 = 10 %

Final Exam (cumulative) = 25 %

Lab Exam 1 = 10 %

Weekly Mineral Quizzes (n = 6) = 20 %

Final Mineral Exam (cumulative) = 15 %

Grades = A+ = 97-99 B+ = 87-89 C+ = 77-79 D+ = 67-69

A = 94-96 B = 84-86 C = 74-76 D = 64-66

A- = 90-93 B- = 80-83 C- = 70-73 D- = 60-63 E = 0-59

Conceptual Framework: This course adheres to the spirit of the SUNY Cortland Conceptual Framework regarding liberal learning and the Learning Outcomes / Expectations of SUNY Cortland Teacher Candidates. Specifically, Mineralogy (GLY 301) addresses *Learning Outcomes 2* (Possess in-depth knowledge of the subject area to be taught).

Course Schedule and Activities

| Lecture / Laboratory | | | Meets NYS Standard |
|----------------------|-------------|--|-----------------------|
| Sept. 1 | Lecture: | Crystal Systems, Crystal Forms | 08-0001 |
| Sept. 3 | Lecture: | Intro to Miller Indices | 08-0001 |
| Sept. 3 | Laboratory: | <i>Intro to Crystallography, Symmetry Operations</i> | |
| Sept. 8 | Lecture: | Miller Indices, Crystal Forms, Twinning, | 08-0001 |
| Sept. 10 | Lecture: | Mineral Solubilities, Chem. of Earth's Crust, Coordination | 08-0001 |
| Sept. 10 | Laboratory: | <i>Crystal Classes, Miller Indices, Crystal Forms, Mineral Twins.</i> | |
| Sept. 13 | | All Day Sunday Field Trip (required) | |
| Sept. 15 | Lecture: | Coordination, Packing, Unit Cell, Crystal Forms. | 08-0001 |
| Sept. 17 | Lecture: | Polymorphism + Pseudomorphism | |
| Sept. 17 | Laboratory: | <i>X-ray diffraction by Minerals</i> | 08-0007 |
| Sept. 22 | Lecture: | Intro to Optics, Refractive Index (R.I.) | 08-0001 |
| Sept. 24 | Lecture: | Light Behavior, Uniaxial Optics, Interference Figures | 08-0001 |
| Sept. 24 | Laboratory: | <i>The Optical Microscope, R.I., Isotropic Minerals</i> | 08-0007 |
| Sept. 29 | Lecture: | 1st Hour Exam | |
| Oct. 1 | Lecture: | Indicatrices + Biaxial Interference Figures | 08-0006 |
| Oct. 1 | Laboratory: | <i>Interference Figs., R.I. of Uniaxial Minerals</i> | 08-0007 |
| Oct. 6 | Lecture: | Solid Solution + Graphic Presentation | 08-0001 |
| Oct. 8 | Lecture: | Mineral Formulas + Exsolution (<i>Feldspar Formula Calculation.</i>) | 08-0001 |
| Oct. 8 | Laboratory: | (Lab Exam 1) , <i>Interference Figs., Optic sign, (Wards)</i> | 08-0007 |
| Oct. 13 | Lecture: | Native Elements + Sulfide Minerals | |
| Oct. 15 | Lecture: | Oxide Minerals | |
| Oct. 15 | Laboratory: | <i>Native elements, sulfides; Minerals in Thin Section (Wards)</i> | 08-0019 |
| Oct. 20 | Lecture: | Hydroxide + Halide Minerals | |
| Oct. 22 | Lecture: | Carbonate Minerals | |
| Oct. 22 | Laboratory: | Quiz-1; Oxides, Hydroxides, Halides; Minerals in Thin Section (HL) | 08-0019 |
| Oct. 27 | Lecture: | More on Carbonate Minerals; Intro to Silicate Minerals. | |
| Oct. 29 | Lecture: | 2nd Hour Exam | |
| Oct. 29 | Laboratory: | Quiz-2; Carbonates, Sulfates, Phosphates; Minerals in Thin Section (BR) | 08-0019 |
| Nov. 3 | Lecture: | Quartz varieties and other Silica polymorphs | |
| Nov. 5 | Lecture: | Feldspars I | |
| Nov. 5 | Laboratory: | Quiz-3; Tectosilicates (SiO_2 varieties, feldspars); Minerals in Thin Section (06) | 08-0019 |
| Nov. 10 | Lecture: | Feldspars II | |
| Nov. 12 | Lecture: | Trioctohedral + Dioctohedral Micas | |
| Nov. 12 | Laboratory: | Quiz-4; Phyllo, Cyclo, Sorosilicates. Minerals in Thin Section (FL) | 08-0019 |
| Nov. 17 | Lecture: | Other Phyllosilicates | |
| Nov. 19 | Lecture: | Cyclo, Soro-silicates; Pyroxenes | |
| Nov. 19 | Laboratory: | Quiz-5; Inosilicates. Minerals in Thin Section (LF) | 08-0019 |
| Nov. 24 | Lecture: | 3rd Hour Exam | |
| Nov. 26 | Lecture: | <i>No Lecture, Thanksgiving Break</i> | |
| Nov. 26 | Laboratory: | <i>No Lab, Thanksgiving Break</i> | 08-0019 |
| Dec. 1 | Lecture: | More Pyroxenes | |
| Dec. 3 | Lecture: | Amphiboles | |
| Dec. 3 | Laboratory: | Quiz-6; Nesosilicates. Minerals in Thin Section (Cann + MR) | 08-0019 |
| Dec. 8 | Lecture: | Olivine + Garnet Group | |
| Dec. 10 | Lecture: | Aluminosilicate polymorphs | |
| Dec. 10 | Laboratory: | Cumulative Mineral Exam | 08-0019 |
| Dec. 17 | Final Exam | (cumulative) 10:30 am – 12:30 pm | |

Disability Statement: If you are a student with a disability and wish to request accommodations, please contact the Office of Student Disability Services located in B-1 Van Hoesen Hall or call (607) 753-2066 for an appointment. Information regarding your disability will be treated in a confidential manner. Because many accommodations require early planning, requests for accommodations should be made as early as possible.

GLY 301 -- Mineralogy

Course Objectives

At the end of this class, each of you should:

- 1) **Be able to explain what controls mineral nucleation and growth.**
(Mineral Solubilities + Symmetry Operations Lecture)
- 2) **Be able to describe the symmetry of a mineral specimen.**
(Symmetry Operations Lab)
- 3) **Be able to define the seven crystal systems.**
(Symmetry +Crystal Classes Lecture; Crystal Classes, Miller Indices, Crystal Forms Lab)
- 4) **Be able to identify Miller Indices of crystal faces.**
(Miller Indices +Crystal Forms Lecture; Crystal Classes, Miller Indices, Crystal Forms Lab)
- 5) **Be able to explain what controls mineral stability.**
(Polymorphism + Pseudomorphism Lecture)
- 6) **Be able to explain what controls ionic substitution and coordination number.**
(Unit Cell, Packing, Atomic Coordination Lect.; Mineral Formulas + Graphic Presentation Lect.)
- 7) **Be able to plot onto and interpret binary and ternary diagrams.**
(Mineral Formulas + Graphic Presentation Lecture; Solid Solution + Exsolution Lecture)
- 8) **Be able to calculate a mineral formula from a chemical analysis.**
(Solid Solution + Exsolution Lecture (*Feldspar Formula Calculation; take home assign.*))
- 9) **Be able to explain what controls mineral exsolution.**
(Solid Solution + Exsolution Lecture)
- 10) **Be able to operate a petrographic microscope and describe basic optical properties of minerals.**
(Light Behavior, Uniaxial Optics Lecture; Interference Figures Lecture; The Optical Microscope, R.I., Isotropic Minerals Lab; Interference Figs., R.I. of Uniaxial Minerals Lab; Interference Figs., Optic sign Lab)
- 11) **Be able to describe chemical formulas for common rock forming minerals.**
(All seven mineral laboratory exercises)
- 12) **Be able to identify common rock forming minerals in hand specimen as well as thin section.**
(All seven mineral laboratory exercises)

Classroom Etiquette:

- 1) Please come to class a few minutes early.
- 2) Please turn your cell phone off while in class or lab.
- 3) Please do not text your friends or relatives while in class or lab.
- 4) Please do not talk to your neighbor while I'm lecturing.
- 5) Please do not close your notebooks five minutes before class is over. I will let you know when class is over.