

GLY 302-001; GLY 302-501 – Petrology

(Spring, 2015)

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Office: 324 Bowers
Office hrs: Tuesdays & Thursdays., 11:30 am – 2:00 pm.

Lecture Room 339 Bowers Hall, Tuesday & Thursday, 10:05 am to 11:20 pm.
Lab Room 333 Bowers Hall, Monday, 12:40-3:30 pm.
Website <http://web.cortland.edu/darlingr/class/petrology/index.html>

Texts: 1) Blatt, Tracy, & Owens 2005, *Petrology: Igneous, Sed. and Metamorphic*: 3rd Ed., Freeman.
2) *Minerals in Thin Section*, Perkins, D. and Henke, K.R., 2000, Prentice-Hall, Inc.
3) One issue of *Elements* magazine.

Course Description: Petrogenesis of igneous, metamorphic and sedimentary rocks; description and classification and interpretation based on hand specimens and thin-section. Three lecture hours and three hour laboratory; required all-day field trip. Prerequisite: GLY 301. (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. If you miss an exam or lab quiz, you will be given a chance to make them up **only** if your absence was a valid absence. Valid absences are those due to approved College activities (see undergraduate college catalog). If you miss an exam or lab quiz because of illness, I will administer a make-up exam or quiz only if you contact me by phone before the scheduled exam or lab quiz. My office number is 2923. It is always best to talk to me about an expected absence before it occurs, when possible, so that we can work out a make up time.

Field Trip Attendance Policy: The field trip is required. Failure to attend the field trip will result in an incomplete (INC) grade for the course. The incomplete grade can be made up the following year by attending the field trip. An incomplete grade in GLY 302 can prevent you from: 1) graduating if you are a senior, 2) student teaching if you are a junior Adolescence Education / Earth Science [AES] major, or 3) receiving financial aid.

Evaluation of Student Performance: Your final course grade will be based on two exams, a cumulative final exam, three laboratory quizzes, two writing assignments including a 5 or 11 p. term paper, and an oral presentation. 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. GLY 302-001 students will complete the 5 page term paper; GLY 302-501 students will complete the 11 page paper.

Breakdown of final grade:

10% 1st Exam	15% Laboratory Rock Quizzes (each = 5 %)
10% 2nd Exam	37% Writing Assignments:
8% Oral Presentation	1 page outline with 1 page of references (5%),
20% Final Exam (cumulative)	5 or 11 page term paper + 1 page abstract + 1 page references min.,
	(1 st draft - content 16%; 1 st draft - tech 8%; 2 nd draft - tech 8%)

<i>Grades =</i>	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

Late Written Assignments: I will accept late written assignments, but at a penalty of one third of a letter grade per hour up to 3 hours, one additional letter grade penalty between 3 and 24 hours late, and then one additional letter grade penalty per 24 hr period afterwards.

Course Requirements: All course requirements, including written assignments, must be completed to receive a grade. If not, an incomplete (INC) grade will be awarded for the course. See *Field Trip Attendance Policy* (previous page) for consequences of an INC grade.

Students with Disabilities: 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 302 – Petrology Course Objectives

At the end of this class, each of you should be able to:

- 1) **Classify igneous rocks and interpret their textures in thin section and hand specimen.**
(lab. exercises on *Plutonic and Volcanic Igneous Rocks*)
- 2) **Interpret binary and ternary igneous phase diagrams.**
(lab. exercises on *Simple Binary Phase Equilibria*, and *Complex Binary & Ternary Phase Equilibria*)
- 3) **Make use of the phase rule.**
(lab. exercises on *Simple Binary Phase Equilibria*, and *Complex Binary & Ternary Phase Equilibria*)
- 4) **Understand igneous processes such as fractional crystallization and partial melting.**
(lecture on *Fractional Crystallization & Partial Melting*)
- 5) **Understand the relationship between plate tectonic processes and magma sources.**
(lectures on *Fractional Crystallization & Partial Melting; Origin and Rise of Magma*)
- 6) **Classify sedimentary rocks and interpret their textures in thin section and hand specimen.**
(lecture on *Sedimentary Rocks and Classification*; laboratory on *Sedimentary Structures*)
- 7) **Understand the controls on and significance of textural maturity**
(lecture on *Sedimentary Provenance and Environments*)
- 8) **Understand the chemical and physical controls on sediment formation and deposition.**
(lectures on *Sedimentary Rocks and Classification*; *Sedimentary Provenance and Environments*)
- 9) **Classify metamorphic rocks and interpret their textures in thin section and hand specimen.**
(lecture on *Petrogenetic Grid, Facies, Isograds*; laboratory on *Metamorphic Rocks*)
- 10) **Understand the significance of index minerals, isograds and mineral assemblages.**
(laboratories on the *Petrogenetic Grid, Metamorphic Isograds*)
- 11) **Understand the role of external variables (temp. and pressure) on mineral assemblages.**
(lectures on *Metamorphic Controls [P + T]; Experimental Metamorphic Petrology*)
- 12) **Understand the role of compositional variables (bulk and fluid) on mineral assemblages.**
(lecture on *Bulk Rock Composition Controls, Phase Rule; Oxidation and Fluid Composition Controls*)
- 13) **Understand the relationship between tectonic processes and metamorphic environments.**
(lectures on *Metamorphism and Plate Tectonics, PT Paths; Ultra High Pressure Metamorphism*).

NSTA Standards: Students enrolled in GLY 302 and majoring in Adolescence Education: Earth Science 7-12 will focus on acquiring knowledge and developing skills aligned with learning outcomes from the College's Conceptual Framework for Teacher Education and those established by the National Science Teachers Association. In particular, this course addresses Conceptual Framework Learning Outcome 2: Possess in-depth knowledge of the subject area to be taught; NSTA Standard I: Content; NSTA; Standard 2: Nature of Science; and NSTA Standard 3; Inquiry.

Date	Lecture	Assign.	Laboratory
Jan 26			Mineral / Melt behavior, the Phase rule
Jan 27*	More Binary Igneous systems	Ch. 5	
Jan 29*	Complex Binary and Ternary Systems	Ch. 5	
Feb 2			Binary Phase Equilibria
Feb 3	Fractional crystallization & Partial melting	Ch. 5,6	
Feb 5	Effect of water on magma; Classific. of Granites	Ch. 5,3	
Feb 9			Complex Binary & Ternary Equilibria
Feb 10	Origin and rise of magma; Granite textures	Ch. 1,2	
Feb 12	Pegmatites; Mafic classification,	Ch. 3	
Feb 16			Plutonic rocks (HS+TS)
Feb 17	Processes in mafic magmas; Layered intrusions,	Ch. 6	
Feb 19	Ophiolites, Magma origin and Plate Tectonics.	Ch. 8,9,10	
Feb 23			Plutonic rocks (HS+TS)
Feb 24*	Basaltic, Andesitic volcanic processes	Ch. 4	
Feb 26	Rhyolitic volcanic processes		
Mar 2			Volcanic rocks (HS+TS)
Mar 3	FIRST HOUR EXAM		
Mar 5*	Sedimentary rocks and classification	Ch.11,12	
Mar 9			Ig. rock qz. , Clastic rocks (HS+TS)
Mar 10	Clastic sed. rocks: sandstones, cong.		
Mar 12	Clastic sed. rocks: mudstones, Sed structures	Ch. 13	
Mar 16			Spring Break, No Lab.
Mar 17	Spring Break, no lecture.		
Mar 19	Spring Break, no lecture.	Ch. 14	
Mar 23			Sedimentary structures
Mar 24	Sedimentary Provenance and Environments	Ch. 13	
Mar 26	Crystalline sedimentary rocks (lms + dolo)	Ch. 15	
Mar 30			Crystalline sedimentary rocks (HS+TS)
Mar 31*	Crystalline rock environments + interpret.	Ch. 15	
Apr 2	Evaporites + banded iron formations	Ch. 16	
Apr 6			Evaporites + banded iron formations
Apr 7	SECOND HOUR EXAM		
Apr 9	Isograds, Facies, Petrogenetic grid,	Ch.17,18	
Apr 13			Sed. rock quiz , Meta. rocks (HS)
Apr 14	Metamorphic controls: Pressure & Temperature	Ch. 19	
Apr 16*	Law of limiting reagents, bulk rock controls	Ch. 20	
Apr 19	Petro Field Trip (departure 7 am!)		Adk igneous & metamorphic rocks.
Apr 20			Meta. rocks (HS), Petrogenetic grid
Apr 21	Fluid composition & oxidation controls	Ch. 20	
Apr 23*	Mineral composition controls	Ch. 19	
Apr 27			Meta. Rocks (HS+TS) Thermobarometry I
Apr 28*	Experimental techniques	Ch. 17	
Apr 30	Prograde & Retrograde metamorphsim, PT paths		
May 4			Oral Presentations (PowerPoint req.)
May 5	Blueschist & Ultra high-pressure metamorphism		
May 7	Meta. Rock quiz		
May 11	FINAL HOUR EXAM (Cumulative) (Monday; 10:30 am to 12:30 pm)		

HS = hand specimen; TS = thin section

All laboratory exercises are to be turned at the end of the lab period.

- *Jan 28 Topics for writing assignment distributed.
- *Jan 30 Topic for writing assignment selected by student.
- *Feb 25 1st writing assignment due (1 p. proposed outline + 1 p. references).
- *Mar 6 Writing assignment 1 returned.
- *Apr 1 2nd writing assignment due (5 or 11 p. term paper + 1 p. abstract + 1 p. references).
- *Apr 17 Return of 2nd writing assignment.
- *Apr 24 Resubmission of 2nd Writing assignment due.
- *Apr 29 Return of resubmission of 2nd writing assignment.

Classroom Etiquette:

- 1) Please come to class a few minutes early.
- 2) Please turn your cell phone off while in class or lab (no calling, texting, surfing, gaming)
- 3) Please do not talk to your neighbor while I'm lecturing.
- 4) Please do not close your notebooks five minutes before class is over. I will let you know when class is over.