

SYLLABUS

Petrology is the study of rocks, in this case igneous and metamorphic ones (“hard rocks”). Because rocks are aggregates of minerals, this course is a natural continuation of Mineralogy. In Petrology laboratory you will learn to recognize, describe, and classify many rocks in both hand specimen and thin section. Your skills at hand specimen and optical mineralogy will improve throughout the semester. In the classroom portion you will learn about igneous melt generation, evolution, and crystallization process, mid-ocean ridge and subduction zone igneous processes, metamorphic processes and occurrences and general principles that will allow you to interpret the rocks that you encounter.

Lab work, principally the study of rock specimens in hand sample and thin section, is a major focus of the course, and will commonly require individual work outside of the scheduled lab time. Labs will be considerably more structured than in Mineralogy. Although you will work outside the normal hours, I strongly recommend that you do as much as you can during the scheduled lab period, when you have me as a resource. There will also be weekly quizzes on hand specimens.

Texts:

*If you haven't already done so, consult the **Text Support** area on my web page for text errors and mark your text accordingly.* You can be of great service to me (and future generations of students) by giving me feed-back on errors and places in the text that you think need improvement in clarity or coverage.

I will keep copies of a lab manual ***Petrography of Igneous and Metamorphic Rocks***, by Philpotts, and more encyclopedic lab manuals in the lab: ***An Introduction to the Rock-Forming Minerals***, by Deer *et al.* is very helpful for optical data on minerals, and the other. There will also be some assignments from ***Petrography*** by Williams, Turner and Gilbert, and perhaps a few other materials designed to help you in labs. There are also two books with color illustrations of important textures in thin section. One is for igneous rocks and the other for metamorphics.

Note: It is important that you complete the assigned readings and all assignments on time. PLEASE read all assignments BEFORE the class or lab for which it is assigned. Petrology is complex, and it is simply not possible to grasp the material if your first exposure to it is during class. Be prepared for classes by reading up on the subject, looking at the PowerPoint material on the web, and doing any written assignments. We will then discuss it during class. Warning: *getting behind in Petrology is detrimental to your physical and mental well-being.* Lab assignments are due at the beginning of the following week's lab. I plan on posting lab answers as soon as assignments are due, so that you can use the information to improve on the next lab. *This makes it impossible for me to give credit for late labs that are handed in after the answers have been posted.* Check with me if you need an extension, but don't do it often.

Grading:

Petrology is in a state of flux as I attempt to move away from a course based exclusively on the formal lecture format. As a result it is not yet possible for me to tell you what the exact grading policy will be, but the following should come close. There will be short in-class quizzes on Chapters 3 and 4, mostly to be certain you have read and understood them. Chapter 4 material is not very complicated and we will cover Chapter 3 (and 23) principally in lab. There will probably be 2 or 3 take-home or class exams and several in-class and homework exercises (similar to those in Mineralogy). Chapter quizzes and exams will be weighted to comprise 40-50% of your final grade. Labs are worth 30%, rock-ID quizzes and homework problems will comprise the remaining 20-30%, depending on how they develop.

Class Schedule

Class	Date	Topic	Reading	Due	Lab	Due
1	Tu Jan 17	Review	7.2 - 7.5		1 Optical	Review Optical
2	Th 19	Volatiles				
3	M 23	Major Element Chemistry: analyses, norms	8.1 - 8.5			
4	Tu 24	Major Element Chemistry: variation diagrams, magmatic evolution	8.6 (ignore 8.6.1)	Prob 8-1 (alt. handout), 8-2	2 Felsic Plutonics	Chapter 2, 3, Prob. 2-1
5	Th 26	"	8.7	Prob 8-6		
6	M 30	Trace Elements: fractionation, distribution coefficients, models	9.1, 9.2	Worked Ex. 1 (in Excel)		
7	Tu 31	"		Quiz Ch 4	3 Plutonics	Chapter 3 (esp. 3.2.4)
8	Th Feb 2	Trace Elements: REE and spider diagrams	9.3, 9.4	Prob 9-3, 9-4	see also WTG 161-171	
9	M 6	Trace Elements: misc.	9.5, 9.6			
10	Tu 7	Isotopes: fractionation, stable, radiogenic	9.7.1, 9.7.2.0	Quiz Ch 3	4 Plutonics	2.3.4
11	Th 9	Isotopes: K/Ar, Rb/Sr	9.7.2.1, 9.7.2.2	Prob. 9-6, 9-7		
12	M 13	"			5 Plutonics	
13	Tu 14	Isotopes: Nd/Sm, U/Pb-Th	9.7.2.3, 9.7.2.4	Prob. 9-8, 9-9, 9-10		
14	Th 16	"		Exam		
15	Tu 21	Magma Generation in the Mantle	10.1, 10.2		6 Volcanics I	2.4, 2.5, 3.1.10
16	Th 23	"	10.3 - 10.5		see also WTG 138-47, 188-91, 260-74	
17	M 27	"				
18	Tu 28	Magma Diversification	Chapter 11		7 Volcanic Evolution	
19	Th Mar 2	"				

WTG is Williams, Turner, and Gilbert. Photocopies for general use are in the back of the lab.

Class	Date		Topic	Reading	Due	Lab	Due	
20	M 6		Mid-Ocean Ridge Volcanism	Chapter 13	Exam			
21	Tu 7		"			7 Continued		
22	Th 9		"					
23	M 27		Subduction Zones	16 intro, 16.1 to p. 297, 16.4				
24	Tu 28		"	16.6, 16.7, 16.8		8 Cataclasis & Rextrization	p. 440-445, 449-453	
25	Th 30		"			see also Table 23-1		
26	M Apr 3		"		Exam			
27	Tu 4	Undergraduate Conference						
28	Th 6		Intro to Metamorphism	Chapter 21 to p. 423				
29	M 10		"	p. 423-432				
30	Tu 11		"			9 Met of Mafics	Ch 22	
31	Th 13		Metamorphic Mineral Assemblages and Chemographic diagrams	Chapter 24 to p. 483		see also Table 23-1		
32	M 17		ACF and AKF diagrams	p. 483 - 487				
33	Tu 18		AFM diagrams	p. 488 - 495		10 Contact Met	p. 445 - 449	
34	Th 20		"			see also Table 23-1		
35	M 24		Metamorphic Facies	Chapter 25	Exam			
36	Tu 25		"			11 Regional Met	p. 453-475	
37	Th 27		"			see also Table 23-1		

Class	Date		Topic	Reading	Due
38	M May 1		Metamorphic Reactions	Chapter 26 through sec. 26.3	
39	Tu 2		Metamorphic Reactions	26.4 & 26.5	
40	Th 4		"	26.6 - 26.8	
41	M 8		Whetstone Lake	Handout	
42	Tu 9				