

Spring 2-1-2004

GEOL 306.01: Igneous and Metamorphic Petrology

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Geology 306 Igneous and Metamorphic Petrology

Don Hyndman

Lectures Tu, Th 9–10; Lab Th 10–12

office SC357

Text: Sen, “Earth Materials – Minerals and Rocks”, 2001, p. 178–370, 423–end

Tentative

date (lab
days bold)

Lecture

(text pages, incl. some *key diagrams*)

Lab

(text pages)

| | | |
|------|---|--|
| 1/27 | Equilibrium, phase diagrams relevant to basaltic magmas <i>189, 195</i> , 186–198, 342–345 | |
| 1/29 | (more on same, including effect of pressure) <i>199</i> , 198–205, <i>203, 205, 229, 342, 343</i> Clausius–Clapeyron equation/LeChatellier’s Rule: 182–183 | Recognition of minerals in common rocks. Begin Igneous Structures and Textures 234–243 |
| 2/3 | (more on same, including ternary diagrams) <i>207, 211</i> , 205–217 | |
| 2/5 | Crystallization and melting; Influences causing melting or crystallization: 281–296 Role of temp., pres., water, compos. <i>268</i> | (complete Igneous Textures) |
| 2/10 | Chemistry and chemical classifications of Igneous rocks: <i>257–265</i> | |
| 2/12 | Review of plate tectonics, Igneous environments: igneous processes, spreading ctrs, subduction zones: 8, <i>9–11–17</i> ; 248–252, 266–274 | Mineral–based Classification of Igneous Rocks]; 249, 251 CIPW Norms: 252–256, 510–515 |
| 2/17 | (more on same ... continental collision zones) | |
| 2/19 | Plateau basalts, hotspots, and spreading ridges 328–331, <i>326, 329, 331</i> | Peridotite, serpentinite, density measurem, and calculation of % serpentization |
| 2/24 | Ophiolites and peridotite: <i>321</i> | |
| 2/26 | 9–11 am 1st MIDTERM ON LECTURES & TEXT | at 11 am–12 Gabbro, anorthosite, granophyre |
| 3/2 | Gabbroic layered intrusions 246, <i>298, 300</i> , 296–308 | |
| 3/4 | Basalts: association, environments, minerals, chemistry: <i>280</i> , 278–296 | Basalt, diabase dikes |
| 3/9 | (more on basalts) 309–328, <i>335, 338</i> | |
| 3/11 | Volcanic arc rocks: basalt, andesite, rhyolite | Andesite and rhyolite |

| | | |
|---------------|--|--|
| | <i>298, 334, 333-341, 350-352</i> | |
| 3/16 | Shallow granites, calderas, rhyolite ash flows: 246-248, 368- 369 | |
| 3/18 | Phase diagrams for granites: 359-361 -363 | Granites, granodiorite, diorite |
| 3/23 | Deep granite batholiths: 246-248, 352- 357 -368 | |
| 3/25 | 9-11 am 2 nd MIDTERM ON LECTURES & TEXT | at 11-12 Alkaline igneous Rocks |
| 3/30- 4/1 | Spring Break: No Classes | |
| 4/6 | (more on deep granite batholiths; strontium isotopes and source of granite magma) 360-370; 516-520 | |
| 4/8 | 9-11 am LAB MIDTERM | 11 am-12: Textures in metamorphic rocks 432-441, rock names 441-443 |
| 4/13 | Alkaline igneous rocks: 309-310, 197-198, 315, 335, 337, 351 | |
| 4/15 | Metamorphic types, rock structures and tectonic environments 423, 424-429 -432; 446 , 449-451 | Pelitic (shale-composition) rocks 441-443, 460- 461 -463 |
| 4/20 | Metamorphic conditions: P, T, fluids, equilibrium; Clausius-Clapeyron Equation/ LeChatellier's Rule, phase rule: 184 , 423- | |
| 4/22 | Metamorphic reactions and zones 444-453; 460-463 ACF, AFM diagrams 452- 454-456-458 -460 | Mafic (basalt-composition) rocks 455 , 463- 466 -467 |
| 4/27 | Metamorphic Facies:448-452 Petrogenetic grids and determination of pressure and temperature: 446, 460-488, 446 | |
| 4/29 | Diffusion in metamorphism; porphyroblasts, metamorphic differentiation | Calc-silicate and quartzofeldspathic rocks |
| 5/4 | High-pressure; Low-pressure contact facies, skarns: 467-470, 477 | |
| 5/6 | 9:00-12:00: FINAL LAB EXAM (comprehensive) | |
| 5/12- 5/16 | FINALS WEEK: LECTURE FINAL: 8:00-10:00am Thursday, May 15 | |

| | | | | | | | | | | | | | | | |
|---|--|---------------------------------|-------|---------------------------------|-------|---------------|-------|-------------|-------|-----------|-------|------------|-------|--------------|---------------|
| <p>Term paper: Review some topic in Igneous or Metamorphic Petrology (e.g.: on a process or origin of a rock or association).</p> <p>Form: Typed, double spaced; at least 1-inch margins, no more than 5 pages excluding diagrams and list of references cited.</p> <p>List of references should be in same style as Geological Society of America Bulletin.</p> <p>References: >90% should be post-1995 and >80% from the professional literature (journals); use Geo-Ref to obtain most-recent references, and Science Citation Index. Web okay for some; encyclopedias not okay.</p> <p>*Check with me to okay topic before proceeding</p> | <p>Paper grading: Equally on content, including good reference list, and on writing. Rephrase everything in your own words; if you must use phrase from the author, enclose that part in quotes and cite the author.</p> <p>Course grade based on:</p> <table> <tr> <td>1st lecture midterm</td> <td>= 14%</td> </tr> <tr> <td>2nd lecture midterm</td> <td>= 14%</td> </tr> <tr> <td>Lecture final</td> <td>= 20%</td> </tr> <tr> <td>Lab midterm</td> <td>= 17%</td> </tr> <tr> <td>Lab final</td> <td>= 23%</td> </tr> <tr> <td>Term paper</td> <td>= 12%</td> </tr> <tr> <td>Total</td> <td>= 100%</td> </tr> </table> | 1 st lecture midterm | = 14% | 2 nd lecture midterm | = 14% | Lecture final | = 20% | Lab midterm | = 17% | Lab final | = 23% | Term paper | = 12% | Total | = 100% |
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