

Earth Sciences 3341b – Waters and Geochemical Cycles - January-April 2018

Where: Monday 12:30-1:30 Biology and Geology Building 1053
Wednesday 12:30-2:30 Biology and Geology Building 1053

Instructor: Dr. Liz Webb, ewebb5@uwo.ca, 519-661-2111 x 80208
Office hours by appointment; B&G room 0168

Grading: Mid-term test: 30%
Final examination: 40%
Problem sets 30% (weekly tutorials)
Participation in tutorials is required

Important dates: Mid-term test: **Wednesday February 14, 2018 (in class)**
Final exam date will be set by the Registrar's office

Learning Outcomes - Upon successful completion of this course, students will be able to:

- communicate effectively using a working vocabulary of geochemical terms,
- explain how water obtains its chemical composition in natural environments (rain, soils, ground water, oceans),
- describe how geochemical processes modify water compositions;
- relate the chemistry of minerals to natural waters through weathering, precipitation and oxidation reactions,
- manipulate data to interpret natural processes and identify geochemical processes,
- evaluate how geochemical data is used in primary research to reveal chemical tracers of processes in nature like weathering, pollution, evaporation and ocean circulation,
- compare processes that result in beneficial versus detrimental concentrations of elements in natural waters,
- predict which geochemical processes have been involved in a water's evolution,
- predict whether a mineral is stable in water under various natural conditions.

Prerequisites: Earth Sciences 2230A/B or Chemistry 1301A/B or the former Chemistry 1100A/B or the former Chemistry 1050, 1020, or permission of the Department.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites

Course Outline:

1. Origin and Geochemical properties of major subdivisions of earth
 - a. Mineral chemistry
2. Rainwater composition and Processes affecting composition
 - a. Acquisition/removal of solutes and aerosols over oceans and continents
 - b. Natural and anthropogenic sources of acids and pH of rain water
3. Processes affecting soil water and surface water compositions
 - a. Soil development and the role of acids
 - b. Acquisition of solutes by chemical weathering processes
4. Processes affecting ground water compositions
 - a. Solute acquisition and removal from Groundwater
 - b. Metal mobility
 - c. Saline ground water geochemistry
5. Processes affecting the composition of seawater
 - a. Acquisition and removal of solutes and the salinity of seawater
 - b. Seawater interactions with sediments
 - c. Submarine hydrothermal processes

Online Material: Online material for this course including hand-outs, some reading material and discussions may be accessed through the OWL program (<https://owl.uwo.ca/portal>).

Recommended (not required) Text:

Berner, E.K. & Berner, R.A. (1996) *Global Environment: Water, Air and Geochemical Cycles*. Prentice-Hall. ISBN 0-13-301169-0

Other Useful Resources

Drever, J.I. (1997) *The Geochemistry of Natural Waters, Surface and Groundwater Environments*. Prentice-Hall. ISBN 0-13-351396-3

Eby, N. (2004) *Principles of Environmental Geochemistry*. Thompson Nelson. ISBN 0122290615

Academic offences:

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Plagiarism is a serious academic offence. The UWO Senate Academic Handbook defines plagiarism as "The act of appropriating the literary composition of another, or parts or passages of his writings, or the ideas or language of the same, and passing them off as the product of one's own mind." Students must write their assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using proper referencing such as citations. For more information see Scholastic Offence Policy in the Western Academic Calendar.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Statement on Use of Electronic Devices

Calculators will be permitted and required for tutorials, tests and examinations. No other electronic devices will be allowed during tests and exams.

Student's responsibilities in the event of a medical issue:

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately.

Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x.82147 for any specific question regarding an accommodation.

Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.