

Biogeochemistry

Textbook: Biogeochemistry: an analysis of global change, 2nd edition by Schlesinger

Course Description: This course introduces the atmospheric, lithospheric, terrestrial, marine, and global cycles for carbon, nitrogen, phosphorus, and sulfur, as well as discussing the water and energy associated with these cycles. We follow the elements most necessary for life on earth from their origins in the universe through the present day and consider their future in a warming climate. Students also learn the format of scientific articles and develop their abilities in analyzing these resources. 3 hours of lecture per week. Prerequisites are one year of chemistry and one earth science course, or permission of the instructor.

Assessments: Participation 5%, 2 Exams 15% each, 4 Paper discussions 7.5% each (write up summary of paper and questions beforehand for 3%, participation 4.5%), Final Paper 30% (5% for annotated bibliography, 5% for the outline, 5% draft, 15% final), 4 homework assignments 5% each

Learning objectives:

- Describe the origin of the solar system, earth, and its components.
- Describe the earth system in terms of biogeochemical cycles in the lithosphere, atmosphere, terrestrial biosphere, and oceans.
- Explain the processes leading to the relative amounts of elements in different earth system components.
- Compute limiting reagents, energies of reaction, and redox potential of chemical reactions in the earth system.
- Scientific papers: describe the component parts, analyze the writing techniques used in each and their effect, connect subject matter to other course materials and determine areas of agreement.

Schedule

Week	Monday	Wednesday	Friday
1		Introductions, syllabus Read Chapter 1	Earth as a biogeochemical system
2	Thermodynamics Read Chapter 2	Origins of the elements and the earth	Earth's elemental reserves
3	Homework 1 due Earth's subsystems Read Chapter 3	Introduction to the atmosphere Read Article 1	Structure of a scientific journal article
4	<i>Paper discussion 1</i>	Atmospheric reactions	Atmospheric reactions Read Chapter 4
5	Introduction to the lithosphere	Lithospheric reactions	<i>Homework 2 due</i> Lithospheric reactions Read Article 2
6	<i>Paper discussion 2</i>	Review	<i>Exam 1</i>
7	--Tuesday schedule--	Introduction to terrestrial processes Read Chapter 5	Terrestrial carbon cycle

8	Terrestrial carbon cycle	Contribution of land to the global carbon cycle Read Chapter 11	Global Carbon Cycle
9	<i>Homework 3 due</i> Implications of the global carbon cycle for climate	Paper topics discussion Read Article 3	<i>Paper discussion 3</i> Read Chapter 6
10	--Tuesday schedule--	<i>Annotated bibliographies due</i> Terrestrial biogeochemistry	Terrestrial biogeochemistry Read Chapter 9
11	Ocean properties	Ocean properties	Ocean reactions
12	Ocean reactions Read Chapter 10	<i>Paper outlines due</i> Global water cycles	---Holiday--
13	<i>Homework 4 due</i> Global water cycles	Review	<i>Exam 2</i> Read Chapter 12
14	Global N and P cycles <i>Send drafts to reviewers</i>	<i>Paper peer review</i> Read Article 4	<i>Paper discussion 4</i>
15	Global N and P cycles	Relative contributions of subsystems to global cycles	<i>Final paper due</i> Relative contributions of subsystems to global cycles

Policies

Late Assignments: Late assignments without prior approval lose 10% credit per day. Please talk to me in advance if you are having trouble. Talking in person is best, but email is okay.

Missing Class: If you miss class when no assignments are due, please get notes from a classmate. If assignments are due, you must let me know in advance that you are missing class. Illness, car trouble, and family emergencies are understood.

Academic Honesty: Your homework may be discussed with classmates but copying is forbidden. Writing for your final paper should be entirely your own, barring improvements in wording from peer review. Exams are individual activities—you must not look at any exam but your own.

Academic Accommodations: Academic accommodations are available for students who are registered with the Office of Accessibility. If you are registered with that office, please share with me your accommodations letter.