

Environmental Chemistry U6220

Summer 2020

Instructor: Steven Chillrud **Office Hours:** Monday, 8 – 10 pm, by appt.
Office: Zoom

Email: chilli@ldeo.columbia.edu or snc2@columbia.edu

TAs: [Seonyoung Park](#) [Nalyn Siripanichgon](#) [Andrew Wilson](#)

Class liasons: [Josh Cooper](#) [Jiaqi Wang](#)

Textbooks: *An Introduction to Environmental Chemistry, 2nd Edition* by Julian E Andrews, Peter Brimblecombe, Tim D. Jickells, Peter S. Liss, Brian Reid. Blackwell Publishing
 We are trying to get this listed with Columbia as an E-book (free to students). However, for physical copies, there currently are some 30 used copies available via Amazon: used condition for \$8-15 plus shipping. New copies are ~\$75).

This will be a resource, especially for those of you who want a text for reviewing or learning fundamental principles of environmental chemistry. In addition, this text book includes case studies and a very good bibliography of many other useful texts in general chemistry and environmental geochemistry that allow the student to easily find additional materials to delve more deeply into different topics.

An Introduction to Environmental Chemistry by Julian E Andrews, Peter Brimblecombe, Tim D. Jickells, Peter S. Liss, Brian Reid. Blackwell Publishing

This book has more in depth readings on environmental chemistry subjects

Earth System Science: From Biogeochemical Cycles to Global Change by Michael Jacobson, Robert J. Charlson and Henning Rodhe. 2000 There is a Columbia E-book for this. This book is primarily being used for its description of the global cycles of C, N, S, and P.

Schedule: Thursdays, 10 am -12 noon (Eastern Daylight Time) entire class by zoom
 Additional Session: zoom 1:00 pm - 4 pm (Eastern Daylight Time)

On line course: Each student is required to attend the 10 am – 12 noon (Eastern Daylight Time) periods every week. This is the time slot chosen to allow all students from different time zones to attend in person and many of these sessions will involve group discussions and group work in breakout rooms. Some lecturing may occur in this slot also. The afternoon session will be when the lectures are given and will be recorded so that they can be watched asynchronously. Homework and/or group reports are due the following Weds to avoid conflicts with other courses. Assignments are graded on a point scale. We may have short quizzes each week based on the previous week; these quizzes are intended to test your understanding, and to provide the instructor and TAs with feedback so we can decide what topics need additional attention in office hours.

Weekly Report Submission Deadlines

1. Summer Sessions (May 28 – July 9)

	Monday	Tuesday	Wednesday	Thursday	Friday
Climatology					
Environmental Chemistry					
Principles of Ecology					
Environmental Policy					

Blue boxes indicate when class is held, and when the assignments are given.
 Arrows extend for the period allotted for each assignment.
 Arrowheads indicate the day each assignment is due.

For example, climatology assignments are given on Tuesdays and due on Fridays,
 environmental chemistry assignments are given on Thursdays and due on Mondays, etc.

Homework: The major assignments that will be performed in this course will be laboratory reports, many of which will be completed in small groups. We may have additional exercises that are given during the term, including some that will be evaluated by your peers. Group work can be turned in by a single group member, but all group members should be clearly indicated on what is turned in. All assignments will be turned in using Courseworks in the Assignments tab.

Exams: Material from lectures, labs and readings will be covered on the mid-term exams and the final. To avoid complicated scheduling, the mid-term exam will be given out during the regular class period of Week 3, done independently, and turn in by email to me within 24 hours. It should not be overly complicated to complete within 1-2 hours and will be of a similar format to that of the final. *The final may be a take home exam.*

	Model 1
Grading: Midterm Practice Exam:	5%
Labs, Assignments, Quizzes:	35%
Final Project	20%
Final Exam:	25%
Participation/Attendance:	<u>15%</u>
	100%

Participation will be based on both attendance during the 10 am – 12 noon (Eastern Daylight Time) time slot when all students are expected to attend, as well as active participation in lectures, discussions, group projects, and of particular note, providing feedback to the recorded lectures and to each others presented work. Note that some of this participation will be done via tools for providing threaded discussion and questions to the recorded lectures or group projects; these software tools will be provided.

I also expect to see each of you individually to discuss any questions you have, your progress, and anything else that comes to mind. My office hours are above which were chosen given the time zones you are all spread across; in addition appointments can be made by email most weekdays during the 8 pm – 10 pm time slot, so this should not be overly difficult.

Grading will use the standard 100-90, 80-89, 70-79 grading scale.

Course Project: A short group project (15 groups of three students and 2 groups of two students) should be written that examines a research topic in the field of environmental geochemistry. This project should be detailed and show in-depth knowledge and research concerning a *specific* aspect of environmental chemistry. **This paper can pertain to any subject of environmental chemistry, and should (1) identify an environmental problem, (2) identify a key research questions that we need to address to solve that problem, (3) have a thesis statement related to that research question and how it will relate to the (policy-based) solution to the environmental problem, (4) research the scientific literature to support or refute that thesis statement, and (5) use the information presented to propose a path towards solving the environmental problem.** Think about the environment that is affected by that problem, the chemistry that is of interest to the problem, how humans affect it, the stakeholders involved, and suggest a realistic policy-based solution to the problem. It may also contain laboratory, data aggregation, or other research pertaining to the system. It should involve the synthesis of at least 5 research papers from primary literature on the subject. No subjects may be duplicated in the class, although this is seldom a

problem. **To ensure that reasonable progress is made towards this goal, I expect that each of you will discuss your proposed project topic and your literature search with me by the date of the mid-term exam**, and we will discuss your proposed sources at that (or another) time to ensure that your topic is sufficiently focused and achievable. Sources should be from the primary research literature. I will be available to consult with you regarding your progress throughout the term. It is best to get started early, as it will both help the quality of the project, and your final grade on it. In addition to the written report, you will give short presentations on your project to the entire class, and you will be expected to give peer feedback on each others projects that will include a grading schematic that will be provided.

Disabilities: I encourage students with disabilities to take this course. Any student with a documented disability needs to speak with me during the first week of class to make accommodation for their disability. All discussions will remain confidential, although the Student Disabilities Coordinator may be consulted to verify the documentation of the disability.

Week	Topic	Case study/Class Activities
Week 1. Thursday May 28th	Chemical fundamentals and basic chemistry	Box models & partitioning coefficients
Week 2 Thursday Jun 4th	The Hydrosphere	Safe Drinking Water Act and Drinking Water Standards
Week 3. Thursday Jun 11th	The Geosphere	Mercury in Estuaries. Lakes
Week 4. Thursday Jun 18th	The Atmosphere	Atmospheric lead and its legacy
Week 5. Thursday Jun 26th	The Biosphere	Biogeochemistry of soils and sediments
Week 6. Thursday Jul 2 nd	Class Presentations Wed July 1st 10- noon Thurs. Jul 2 nd 10- noon	TBD Case Study; potential topics include: Arsenic in the Environment, Geo-engineering approaches for combating global warming, emissions of household air pollutants, air pollution and severity of Covid-19
Week 7: Final exam due date: Thursday Jul 9th	Final exam due date: Thursday Jul 9 th (note your first day of second semester classes is 6 th of July)	N/A