

Chemistry 5670/6670
Intermediate Environmental Chemistry
Spring 2022

Instructor: Kimberly Hageman

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Meeting: MWF 10:30-11:20, ESLC 053

Office Hours: By appointment

Textbook: Stanley E. Manahan *Environmental Chemistry* 10th Edition, CRC Press 2017 (required)

Auto Access eBook: Auto Access eBook: Environmental Chemistry eBook, 10e by Manahan. This course requires all-inclusive digital materials that are provided to you at a lower price than traditional printed materials. These materials are paid for through an “Auto Access Digital Materials” charge placed on your student account when you registered for the course. To access the materials, visit the Canvas course site. For more details, including dates, deadlines, and opt-out information, visit: <https://portal.verba.io/usu/login>.

Prerequisites: Quantitative Analysis CHEM 3000/3005 (or equivalent); Physical Chemistry CHEM 3070 (or equivalent) is recommended. Permission from the instructor is required for CHEM 6670.

CHEM 5670/6670 Cross-Listing: CHEM 5670 is designed for undergraduate chemistry majors. CHEM 6670 is designed for graduate students with a research focus or interest in environmental chemistry. The lectures are the same for both courses; however, a higher level of understanding will be required of CHEM 6670 students and this will be reflected in the course assignments and exams. In addition, CHEM 6670 students will be required to give a special topic lecture to the class and lead discussion on the topic.

Course Content: This course examines the chemistry of the environment and issues of a chemical nature involved in global change. Lectures and assignments are used to educate the student in current issues associated with environmental chemistry. A host of environmental problems are not confined to any one medium (air, soil, water) but are characterized by dynamic transfers among media. This interdisciplinary study of environmental chemistry aims to prepare students to understand the fundamental principles governing pollutant transport and transformation in all environmental settings.

Course Objectives: Descriptive chemistry is used to understand environmental problems associated with modern society. Particular emphasis is placed on the chemical nature of the problem and how these problems may affect our environment and the quality of our lives. The theories, models, concepts, and data analysis, as they apply to environmental degradation, will be discussed. The focus on chemistry is intended to further our understanding of chemical principles

that, together with physical and biological processes, determine the environmental conditions in which we must find a sustainable way to live.

Lectures: The lectures will build from basic elements of air, soil, and water chemistry to enhance our understanding of problems associated with pollution from both natural and anthropogenic substances. The lecture will emphasize chemical reactions, chemical equilibrium within natural settings, transport, chemical degradation, and toxicological effects. All phases will be considered; water pollution in the hydrosphere; stratospheric ozone depletion, urban smog in the atmosphere; and soil and subterranean pollution in the lithosphere. This class will apply the principles of analytical, inorganic, organic, and physical chemistry, to the complex milieus encountered outside the laboratory. This course will include several lectures from outside guest lecturers; material from these lectures is examinable.

Quizzes: A quick quiz will be given at the start of some lectures. Quizzes are designed to assess the degree to which students are keeping up with reading assignments and lecture material, and actively participating in class discussions. Zero points will be assigned when students are late to class or miss a lecture (exceptions will only be granted if an anticipated absence is discussed with the instructor well before the lecture).

Presentations: Each CHEM 5670 and 6670 student will give a 15-minute PowerPoint presentation to the class on either a “hot topic” in environmental chemistry or a topic of local significance. Development of the presentation will require independent reading on the topic area and in some cases, selection of an article for the rest of the class to read. Topic assignments will be discussed in class. The presentation grade will be composed of three parts. First, the PowerPoint slides will be sent to Dr. Hageman one week before the presentation is given and a grade will be assigned based on the quality of the slides. Second, Dr. Hageman will provide feedback for improvement of the slides; the second grading component will be based on the degree to which improvement is made. The third grading component will be based on the quality of the presentation (speaking style, delivery, ability to answer questions, etc.). CHEM 6670 students will be required to give and addition Special Topic lecture to the class and lead discussion on the topic – the topic will be selected with approval from Dr. Hageman.

Assignments: Assignments will be based on reading from the textbook, lecture material, and outside resources. Some questions will require use of the internet to research topics associated with environmental chemistry.

Examinations: There will be two examinations during the semester and a final examination during finals week. Examination questions will be drawn from homework assignments, reading, problems from the book, and concepts addressed in the lectures. Examinations will be in-class, closed book.

Assessment: Assessment will be in the form of quizzes, presentations, assignments, and exams, with percent contributions to the final grade shown below.

% of Final Grade	Assignment
10	Quizzes
15	Presentations
25	Assignments
50	Examinations

Withdrawal Policy: This course will follow the University policy on withdrawals stated in the current Catalog. Drop dates are listed in the Spring Schedule of Classes.

Missed Examination Policy: Students may be excused from an examination in cases of emergency. Documentation to support the emergency must be supplied to the instructor. In cases of an excused absence, the exam may be scheduled for another time and when not possible, grades will be assigned based on the percent of an adjusted total score.

Absentee and Covid Policy:

- In person lecture attendance and participation is mandatory unless your absence has been approved by the instructor before the start of the lab class.
- See the following website for all current university covid protocols and information: <https://www.usu.edu/covid-19/communications/students>.
- Kindly wear a mask during class, even if you are vaccinated. Get vaccinated (it is free) if you haven't already done so – vaccine clinics are being held on USU campus in Spring Semester. Register your vaccine status on the AggieHealth website.
- If you feel ill: do not come to class, contact Dr. Hageman as soon as possible, get a covid test (available free on campus), and fill out the USU covid questionnaire (<https://www.usu.edu/covid-19/questionnaire/index>). The covid CARES team will provide quarantine instructions and they will inform Dr. Hageman about your quarantine start and end dates. Covid-related absences will not be excused if you have not contacted the covid CARES team. If you in quarantine, arrangements will be made for you to attend the lecture via zoom or view the lecture on canvas.
- If you have been in contact with someone with a confirmed case of covid, contact Dr. Hageman and complete the USU covid questionnaire (<https://www.usu.edu/covid-19/questionnaire/index>). Dr. Hageman will be contacted by the covid CARES team if you need to quarantine. The university policy is that if you are fully vaccinated, you do NOT need to quarantine after contact with someone who had covid unless you have symptoms. However, fully vaccinated people should get tested 5-7 days after exposure, even if you don't have symptoms, and wear a mask indoors in public for 14 days following exposure or until your test result is negative.
- We will switch to remote delivery if our class moves into the covid Red Status (i.e. if the USU covid team determines that our class has too many Covid exposures).
- If you are unable to attend a lecture due to a non-covid illness or for another reason, you must contact Dr. Hageman at the earliest date possible to make arrangements and/or to request an

extension on an assignment deadlines.

Student Disability Statement: Any student with a disability that requires accommodations must contact the Instructor. The disability must be documented by the Disability Resource Center. Course materials may be requested in alternative formats.

University Policy and Procedures: Please see this website (<http://www.usu.edu/provost/faculty-life/syllabus.cfm>) for University policies and procedures concerning academic freedom, professional responsibilities, academic integrity, the honor pledge, plagiarism, course fees, grievances, sexual harassment, student disabilities, withdrawal, no-test days, assumption of risk, and mental health.

Chemistry 5670/6670 Planned Lecture Topics

Subject	Textbook Chapter
Environmental Chemistry & the Five Spheres	Chapter 1
The Hydrosphere and Water Chemistry	Chapter 2
Oxidation and Reduction Reactions in Aquatic Chemistry	Chapter 3
Phase Interactions in Aquatic Chemistry	Chapter 4
Aquatic Microbial Biochemistry	Chapter 5
Water Pollutants	Chapter 6
The Atmosphere & Atmospheric Chemistry	Chapter 8
Particles in the Atmosphere	Chapter 9
Gaseous Inorganic Air Pollutants	Chapter 10
Organic Air Pollutants	Chapter 11
Photochemical Smog	Chapter 12
The Endangered Global Atmosphere	Chapter 13
The Geosphere & Geochemistry	Chapter 14
Soil: Earth's Lifeline	Chapter 15
The Anthropocene: Industrial Ecology & Green Chemistry	Chapter 16
Hazardous Waste	Chapter 19
Toxicological Chemistry	Chapter 22
Toxicological Chemistry of Chemical Substances	Chapter 23